



P r o f e s s i o n a l   E x p e r t i s e   D i s t i l l e d

# Getting Started with Citrix XenApp® 7.6

Install, configure, and support your XenApp® systems with the  
power of Citrix XenApp®

**Konstantin Cvetanov**

**[PACKT]** enterprise   
PUBLISHING professional expertise distilled

# Getting Started with Citrix XenApp® 7.6

Install, configure, and support your XenApp® systems  
with the power of Citrix XenApp®

**Konstantin Cvetanov**



BIRMINGHAM - MUMBAI

# Getting Started with Citrix XenApp® 7.6

Copyright © 2015 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 author, 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: November 2015

Production reference: 1281015

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

ISBN 978-1-78439-423-3

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

# Notice

The statements made and opinions expressed herein belong exclusively to the author and reviewers of this publication, and are not shared by or represent the viewpoint of Citrix Systems®, Inc. This publication does not constitute an endorsement of any product, service, or point of view. Citrix® makes no representations, warranties or assurances of any kind, express or implied, as to the completeness, accuracy, reliability, suitability, availability, or currency of the content contained in this publication or any material related to this publication. Any reliance you place on such content is strictly at your own risk. In no event shall Citrix®, its agents, officers, employees, licensees, or affiliates be liable for any damages whatsoever (including, without limitation, damages for loss of profits, business information, or loss of information) arising out of the information or statements contained in the publication, even if Citrix® has been advised of the possibility of such loss or damages.

Citrix®, Citrix Systems®, XenApp®, XenDesktop®, and CloudPortal™ are trademarks of Citrix Systems®, Inc. and/or one or more of its subsidiaries, and may be registered in the United States Patent and Trademark Office and in other countries.

Some of the images in the chapters are taken from the Citrix® website and documentation.

# Credits

**Author**

Konstantin Cvetanov

**Project Coordinator**

Kranti Berde

**Reviewers**

Markus Darda

Shankha Mukherjee

**Proofreader**

Safis Editing

**Commissioning Editor**

Usha Iyer

**Indexer**

Mariamammal Chettiyar

**Acquisition Editors**

Manish Nainani

Llewellyn Rozario

**Production Coordinator**

Nilesh Mohite

**Cover Work**

Nilesh Mohite

**Content Development Editor**

Kirti Patil

**Technical Editor**

Rahul C. Shah

**Copy Editor**

Sonia Cheema

# About the Author

**Konstantin Cvetanov** is a principal architect at ProSys Information Systems, which is one of only ten Citrix National Partners in the United States. He designs, implements, and supports enterprise virtualization systems and end user computing solutions for Fortune 500 companies across a variety of industries. Before he joined ProSys, he worked for Citrix as an escalation engineer, fixing production outages on a daily basis and participating in the development and testing of the latest Citrix product releases and patches. Besides his experience inside and outside the Citrix organization, he has his own technical blog at <http://www.pvsguy.com>, where most frequently, he writes about Provisioning Server, XenApp, and XenDesktop.

From the rest of the Citrix products, he is very passionate about NetScaler. Beyond this, he is a cloud enthusiast with a strong passion for automation and troubleshooting methodologies. He is very interested in the transition from private to hybrid and public clouds. In his spare time, he enjoys reading about robotics and artificial intelligence.

# About the Reviewers

**Markus Darda** is the owner of MD Consultancy (Germany) and DaComp GmbH (Switzerland). As a Senior Citrix Engineer and Architect, he works for enterprise customers in Europe where he designs and implements Citrix (XenApp and XenDesktop) environments based on different hypervisors. As a Citrix and Microsoft trainer, he also teaches about Microsoft server and Citrix products to customers who reside in Europe. He works for Citrix as a subject matter expert (SME) for different courseware and exams as well.

He has worked for German companies, such as LANXESS and T-Systems, Koenen en Co in the Netherlands, and companies in Switzerland, Sweden, and Norway.

Markus has worked on different Citrix courseware and has also reviewed Citrix XenApp 7.5 Desktop Virtualization Solutions.

**Shankha Mukherjee** has over 8 years of experience in the IT industry. He is currently working as a Windows L2 engineer at Accenture Services Pvt. Ltd., supporting client infrastructure for Windows, Citrix, and VMware architecture. He is currently working on a project to migrate and transform the applications/servers/databases from legacy to new generation datacenter environment for clients.

He has a BTech degree in information technology. Previously, he reviewed *Getting Started with Citrix XenApp® 6.5* and *Citrix® XenApp® 6.5 Expert Cookbook*, both by Packt Publishing.

---

I would like to thank Packt Publishing and its team for providing this wonderful opportunity and I definitely look forward to more such opportunities. A special thanks to Kranti Berde for her cooperation and for patiently bearing me.

---

# www.PacktPub.com

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

For support files and downloads related to your book, please visit [www.PacktPub.com](http://www.PacktPub.com).

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.



<https://www2.packtpub.com/books/subscription/packtlib>

Do you need instant solutions to your IT questions? PacktLib is Packt's online digital book library. Here, you can search, access, and read 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 a 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 9 entirely free books. Simply use your login credentials for immediate access.

## Instant updates on new Packt books

Get notified! Find out when new books are published by following [@PacktEnterprise](#) on Twitter or the *Packt Enterprise* Facebook page.





*To my wife, Ljubinka - I am forever grateful for your love and support.*

*To my daughter, Yoana - daddy is truly blessed to have you in his life.*

*To my brother, Daniel - your youth is your gift...make it count.*



# Table of Contents

<b>Preface</b>	<b>vii</b>
<b>Chapter 1: Why Citrix XenApp® – Making the Case for App Virtualization</b>	<b>1</b>
<b>Understanding virtualization</b>	<b>2</b>
Application virtualization	3
<b>Understanding Remote Desktop Services</b>	<b>4</b>
<b>Introducing Citrix XenApp®</b>	<b>5</b>
Design transformation in 7.x	7
New features in XenApp® 7.6	8
Application delivery models in XenApp® 7.6	8
<b>The user logon process</b>	<b>9</b>
<b>Citrix® licensing</b>	<b>10</b>
<b>Microsoft licensing</b>	<b>11</b>
<b>Other components</b>	<b>12</b>
<b>XenApp® supportability</b>	<b>13</b>
<b>XenApp® certifications</b>	<b>14</b>
<b>Summary</b>	<b>15</b>
<b>Chapter 2: Designing a Citrix® Solution to Fit Your Needs</b>	<b>17</b>
<b>Project planning</b>	<b>18</b>
<b>Reference Architectures</b>	<b>20</b>
<b>Designing XenApp® for an enterprise</b>	<b>21</b>
Goals	22
Users	22
Concurrency rate	23
Active Directory considerations	23
User location	24
Devices and peripherals	24
Networks	25

Storage	26
Profiles	27
Citrix® Profile Management	28
Folder Redirection	29
Core applications	29
Printing	30
<b>Creating your first architecture</b>	<b>30</b>
The host hardware	30
The VM infrastructure	31
Host A	31
Host B	32
Host C	32
Resource allocation	32
Microsoft licensing	32
Citrix® licensing	33
<b>Examples from the IT field</b>	<b>33</b>
<b>Summary</b>	<b>34</b>
<b>Chapter 3: Preparing Your System for XenApp® Deployment</b>	<b>35</b>
<b>Control layer</b>	<b>37</b>
XenApp® Delivery Controller	37
Citrix® Studio	38
Citrix® Director	38
Citrix® License Server	39
SQL Server	39
SQL Server mirroring	40
SQL Server clustered instances	41
AlwaysOn Availability Groups	42
Database permissions	42
Database collation	44
Citrix Provisioning Services™	44
<b>Access layer</b>	<b>45</b>
Citrix® StoreFront™	45
NetScaler VPX™	47
Citrix Receiver™	48
<b>Resource layer</b>	<b>49</b>
Server OS VDA	49
<b>Hardware layer</b>	<b>51</b>
Host requirements	51
Domain infrastructure requirements	52
<b>Summary</b>	<b>52</b>

<b>Chapter 4: Installing and Configuring Citrix XenApp®</b>	<b>53</b>
<b>Creating a VM in XenCenter®</b>	<b>54</b>
<b>Installing the Citrix XenApp® 7.6 Delivery Controller</b>	<b>63</b>
Site setup	70
Remote PC access	71
Scale your deployment – existing site	71
<b>Installing Citrix License Server 11.12.1</b>	<b>71</b>
<b>Configuring Citrix XenApp® 7.6</b>	<b>73</b>
Hypervisor support	74
XenApp® Service Account	74
Securing the host connection with SSL	77
<b>Configuring the Delivery Controller</b>	<b>78</b>
Machine catalogs	88
Delivery Groups	88
Policies	89
Logging	89
Configuration	90
<b>Joining a second controller to the XenApp® site</b>	<b>90</b>
<b>Summary</b>	<b>91</b>
<b>Chapter 5: Installing and Configuring Citrix® StoreFront™</b>	<b>93</b>
<b>Installing Citrix StoreFront™</b>	<b>94</b>
<b>Configuring Citrix StoreFront™</b>	<b>97</b>
SSL certificates	98
Setting up the StoreFront™ site	100
Configuring authentication methods	104
Joining a second ary server to the StoreFront™ deployment	105
<b>Testing the StoreFront™ user access</b>	<b>107</b>
<b>Summary</b>	<b>111</b>
<b>Chapter 6: Installing and Configuring NetScaler Gateway™</b>	<b>113</b>
<b>Installing the NetScaler Gateway VPX™</b>	<b>114</b>
<b>Configuring the NetScaler Gateway VPX™</b>	<b>117</b>
Licensing your NetScaler® appliance	117
Basic modes and settings	119
Configuring High Availability	121
Configuring the LDAP authentication	122
Adding a Subnet IP	123
Managing SSL certificates	124
Configuring session policies and profiles	126
Creating a virtual server	128
<b>Summary</b>	<b>132</b>

---

<b>Chapter 7: Load Balancing with Citrix® NetScaler®</b>	<b>133</b>
<b>Configuring Citrix NetScaler® for load balancing</b>	<b>134</b>
Network requirements	134
Verifying settings and licensing	135
Obtaining SSL certificates	136
Adding StoreFront™ servers in NetScaler®	136
Creating Service Groups	137
Configuring a load balancing VIP	139
Testing NetScaler® load balancing	142
<b>Summary</b>	<b>144</b>
<b>Chapter 8: Building Your First XenApp® Farm – Machine Creation Services</b>	<b>145</b>
<b>Explaining Machine Creation Services</b>	<b>146</b>
<b>Preparing your master image</b>	<b>147</b>
Designing your master image VM	148
Configuring your master image for Citrix XenApp®	148
Installing the Citrix® VDA on the master VM	150
<b>Building XenApp® Catalogs with MCS</b>	<b>156</b>
Adding, updating, and deleting VMs with MCS	164
What is the maintenance mode, anyway?	167
<b>Summary</b>	<b>167</b>
<b>Chapter 9: Building Your First XenApp® Farm – Provisioning Services™</b>	<b>169</b>
<b>Getting started with PVS</b>	<b>170</b>
Single image management	170
The power of read-only	171
Scalability	171
Infrastructure needs	171
Licensing	171
MCS versus PVS	172
<b>Designing the PVS environment</b>	<b>172</b>
Write caching in PVS	173
Building the PVS infrastructure	173
Installing Citrix® PVS	174
Configuring Citrix® PVS	174
Configuring the PVS target device software	184
Running the XenDesktop® setup wizard in PVS	189
<b>Summary</b>	<b>190</b>

<b>Chapter 10: Administering a XenApp®</b>	
<b>Environment – Application Management</b>	<b>191</b>
<b>Application delivery – hosted apps</b>	<b>193</b>
Creating Delivery Groups	193
Updating hosted applications – MCS	198
Updating hosted applications – PVS	199
Accessing hosted applications via NetScaler Gateway™	201
Accessing hosted applications via StoreFront™	206
App-V integration	207
<b>Summary</b>	<b>208</b>
<b>Chapter 11: Administering a XenApp® Environment – Server</b>	
<b>Management</b>	<b>209</b>
<b>RDS licensing</b>	<b>210</b>
<b>Citrix® Profile Management</b>	<b>211</b>
So, why UPM profiles?	211
Configuring profile management in a XenApp® environment	212
Profile Streaming	213
<b>Taking advantage of Session Prelaunch and Session Linger</b>	<b>214</b>
<b>Facilitating XenApp® administration with Citrix® policies</b>	<b>217</b>
How do you get started with Citrix® policies?	218
<b>The role of Active Directory Group Policies</b>	<b>220</b>
Disabling Administrative Tools	221
Hiding XenApp® system drives	222
Folder Redirection	223
The potential drawbacks of Folder Redirection	224
<b>Upgrading VDA and PVS target device software</b>	<b>224</b>
Upgrading the VDA via MCS	225
Upgrading the Citrix® Agents via PVS	225
There must be another way...	227
XenApp® permissions and delegated administration	228
<b>Monitoring the XenApp® site</b>	<b>229</b>
<b>Summary</b>	<b>230</b>
<b>Chapter 12: Printing</b>	<b>231</b>
<b>Printing in the Windows world</b>	<b>232</b>
What happens in the background?	233
Windows Printing challenges	235
<b>Printing in a Citrix® world</b>	<b>235</b>
The fundamentals	236
Printer provisioning	236
Local printers versus network printers	239



---

*Table of Contents*

---

The Citrix® Print Management service	242
Citrix® Printing policies	243
Autocreation	243
UPS and UPD	244
So, how do we deploy UPS, anyway?	245
<b>Summary</b>	<b>248</b>
<b>Chapter 13: Troubleshooting Tools, Tips, and Tricks</b>	<b>249</b>
<b>Troubleshooting methodology</b>	<b>250</b>
Notes and templates	250
Research	254
Citrix® Knowledge Base	255
Citrix® discussion boards	255
Community websites	255
<b>Case studies</b>	<b>256</b>
Provisioning Services™	256
Case 1 – Retries	256
Case 2 – BNISStack errors	259
Case 3 – Target device boot failure	261
XenApp® and XenDesktop®	264
Case 1 – 1030 error when launching the app	264
Case 2 – RDS license errors	266
Case 3 – Citrix® Studio showing incorrect VM states	267
<b>Summary</b>	<b>269</b>
<b>Chapter 14: The Big Day – Going Live with Citrix XenApp®</b>	<b>271</b>
<b>Environment must-do's</b>	<b>271</b>
Functional and performance testing	272
Database backups	275
NetScaler® configuration backup	277
Testing HA	277
NetScaler® HA	278
StoreFront™ HA	278
Delivery Controller HA	278
<b>Production rollout strategies</b>	<b>279</b>
Going virtual for the first time	279
Virtual-to-virtual migration	279
Upgrading to the latest version	280
Expansion of existing systems	280
<b>Summary</b>	<b>281</b>
<b>Index</b>	<b>283</b>

---

# Preface

*Getting Started with Citrix XenApp® 7.6* is a beginner's book that is based on the latest version of the Citrix XenApp product. It is aimed at providing an introduction to application virtualization and is a step-by-step implementation guide for Citrix administrators, system engineers, and consultants. Leveraging his expertise both as a consulting architect and a former Citrix escalation engineer, the author takes an end-to-end approach to the XenApp deployment by incorporating components, such as NetScaler and Provisioning Services, to lay the foundation for an enterprise-focused solution.

## What this book covers

*Chapter 1, Why Citrix XenApp® – Making the Case for App Virtualization*, aims at explaining the benefits of Citrix XenApp in the context of the latest trends in the field of virtualization technology. It will help you adopt the ideas presented to you and justify the Citrix solution to your management team.

*Chapter 2, Designing a Citrix® Solution to Fit Your Needs*, explains that even though system architecture is suitable for a more advanced-level book, some design knowledge is needed in order to be able to build a relevant XenApp system that meets the needs of your IT enterprise. In this chapter, you will learn how to create a simple design of a Citrix solution that meets your business needs.

*Chapter 3, Preparing Your System for XenApp® Deployment*, explains the various methods of deployment and system requirements that need to be in place before deploying XenApp.

*Chapter 4, Installing and Configuring Citrix XenApp®*, covers how to install the Citrix XenApp solution and perform initial configurations.

*Chapter 5, Installing and Configuring Citrix® StoreFront™*, provides a walkthrough of the steps needed to install and configure StoreFront in order to present XenApp resources to end users.

*Chapter 6, Installing and Configuring NetScaler Gateway™*, provides a walkthrough of the steps needed to install and configure NetScaler Gateway in order to provide end users with remote access to their published applications.

*Chapter 7, Load Balancing with Citrix® NetScaler®*, provides a brief overview of Citrix NetScaler and how a load balancing implementation fits into the XenApp deployment.

*Chapter 8, Building Your First XenApp® Farm – Machine Creation Services*, covers the first steps involved in deploying a XenApp farm using the Machine Creation Services method.

*Chapter 9, Building Your First XenApp® Farm – Provisioning Services™*, covers the first steps involved in deploying a XenApp farm using the Provisioning Services method.

*Chapter 10, Administering a XenApp® Environment – Application Management*, introduces an IT administrator to the XenApp administration (specifically, application publishing and management of the newly built XenApp system).

*Chapter 11, Administering a XenApp® Environment – Server Management*, introduces an IT administrator to administration and maintenance of XenApp servers and Delivery Controllers.

*Chapter 12, Printing*, is dedicated to explaining how printing works in a XenApp environment and deploying Citrix Group Policies to satisfy printing needs.

*Chapter 13, Troubleshooting Tools, Tips, and Tricks*, introduces basic and advanced troubleshooting techniques and teaches you how to leverage Citrix and third-party tools to support the XenApp environment.

*Chapter 14, The Big Day – Going Live with Citrix XenApp®*, provides a prelaunch checklist and best practice recommendations on rolling the XenApp environment out to production.

## What you need for this book

This is based on the Citrix XenApp 7.6 Platinum edition and all its associated components, including StoreFront 2.6, Provisioning Services 7.6, and License Server 11.12. As part of an enterprise deployment, important products, such as NetScaler 10.5 and SQL Server, are explored. In order to conduct an implementation, in addition to the XenApp 7.6 installation media, you will need access to Microsoft Windows 2012 (trial versions are acceptable for a temporary Proof of Concept).

## Who this book is for

This book is intended for IT administrators and consultants who want to build application and desktop virtualization solutions for their employers and customers. No prior knowledge of Citrix technologies is required.

## Conventions

In this book, you will find a number of text styles 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: "Create a new folder called C:\SSL on the Delivery Controller and save the file there."

A block of code is set as follows:

```
[default]
sp_configure 'show advanced options', 1;
GO
RECONFIGURE;
GO
sp_configure 'Agent XPs', 1;
GO
RECONFIGURE
GO
```

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

```
asnp citrix.*
Get-BrokerHypervisorConnection
```

**New terms** and **important words** are shown in bold. Words that you see on the screen, for example, in menus or dialog boxes, appear in the text like this: "Upon launching the VM creation wizard, under **Template**, scroll down and select **Windows Server 2012 (64-bit)**."



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 disliked. Reader feedback is important for us as it helps us develop titles that you will really get the most out of.

To send us general feedback, simply e-mail [feedback@packtpub.com](mailto:feedback@packtpub.com), and mention the book's title in 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 at [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.

## Errata

Although we have taken every care to ensure the accuracy of our content, mistakes do happen. If you find a mistake in one of our books – maybe a mistake in the text or the code – we would be grateful if you could report this to us. By doing so, you can save other readers from frustration and help us improve subsequent versions of this book. If you find any errata, please report them by visiting <http://www.packtpub.com/submit-errata>, selecting your book, clicking on the **Errata Submission Form** link, and entering the details of your errata. Once your errata are verified, your submission will be accepted and the errata will be uploaded to our website or added to any list of existing errata under the Errata section of that title.

To view the previously submitted errata, go to <https://www.packtpub.com/books/content/support> and enter the name of the book in the search field. The required information will appear under the **Errata** section.

## **Piracy**

Piracy of copyrighted material on the Internet is an ongoing problem across all media. At Packt, we take the protection of our copyright and licenses very seriously. If you come across any illegal copies of our works in any form on the Internet, please provide us with the location address or website name immediately so that we can pursue a remedy.

Please contact us at [copyright@packtpub.com](mailto:copyright@packtpub.com) with a link to the suspected pirated material.

We appreciate your help in protecting our authors and our ability to bring you valuable content.

## **Questions**

If you have a problem with any aspect of this book, you can contact us at [questions@packtpub.com](mailto:questions@packtpub.com), and we will do our best to address the problem.



# 1

## Why Citrix XenApp® – Making the Case for App Virtualization

Whether we like it or not, change is upon us. The evolution in technology has changed the way we work, learn, and live. In fact, the world has become so data driven that we can subscribe to any type of data we want and receive it through our laptop or mobile device at any given location and time. In order to make all of this possible, something else had to be transformed – information technology. Nothing amazes me more than the change we've experienced in IT over the past 15 years. With the advancement of wireless communications, virtualization, cloud computing, and software-defined networking, IT organizations have had to adapt faster than ever to new demands from end users and management teams alike, while getting accustomed to a permanently steep learning curve. Amidst all these changes experienced in the technology sector, a company called Citrix (formerly known as Xitrix in the early 90s) took a simple and very intuitive concept and transformed it into an industry standard – and this is the mobile workstyle. Enabling companies to allow their employees to work from anywhere (and eventually on any device they want), while saving big on hardware *and* without compromising security – sounds too good to be true? Well, it's here to stay. The big question is how you transform your existing IT infrastructure that has no Citrix software installed on it into a complete and production-ready Citrix solution that will boost the productivity of your users, save unnecessary expense for your management team, and minimize administration efforts for the IT department. Hopefully, you will find the answer you are looking for in this book, and you will enjoy the journey in the meantime.



In this chapter, you will learn about the following topics related to Citrix virtualization:

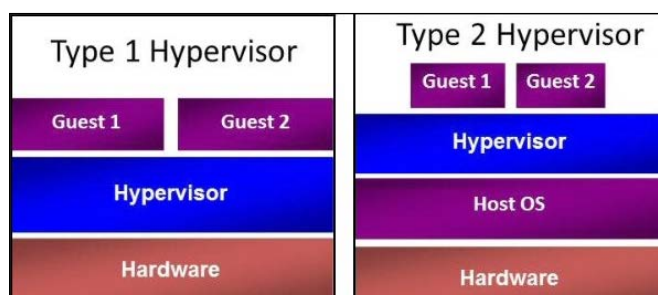
- Hardware and application virtualization
- Introduction to Microsoft Remote Desktop Services and Citrix XenApp
- Design changes and feature enhancements in XenApp 7.x
- Application delivery methodologies in XenApp 7.x
- Microsoft and Citrix licensing models
- Citrix components used for networking and web access
- The XenApp supportability matrix and important product lifecycle dates
- Citrix certifications needed to advance your career

## Understanding virtualization

Before we dive into application virtualization with Citrix XenApp, it is important to make sure we have a fundamental understanding of virtualization. This is not meant to be a by-the-book definition, and generally, most definitions in this book will target your common sense and intuition rather than your ability to memorize dry material. If you are an experienced virtualization engineer, feel free to skip this section.

So, what is hardware virtualization? In a broader sense, it is the unlocking of the OS layer from the underlying physical hardware, making it possible to run multiple OSes (also referred as guest OSes) on top of a single hardware entity. Let's take, for example, a rack server. In a traditional IT infrastructure, we would ship the rack to our data center (or server room), install Windows 2012 R2 on it, and enable **Internet Information Services (IIS)** to run a web server. In this one-on-one relationship, we run a single instance of an OS and a single server role on a physical machine. So, if we require twenty web servers to manage our website, in a traditional environment, we would need to purchase twenty physical servers. Instead, if we decide to virtualize our workloads, we can install a piece of software, known as a hypervisor, onto our rack server that can run multiple guest OSes or VMs. We can now scale up and build many web servers on this single hypervisor, provided that it has sufficient processors and RAM. Since we have installed this software into bare metal and not on top of another OS, this is known as a **Type-1 hypervisor**. Citrix XenServer and VMware ESX are examples of Type-1 hypervisors. However, our options do not end here. If we decide to install a traditional OS, such as Windows 2012 R2 or Linux RedHat, onto our rack, we can then place a hypervisor on top of the OS and run multiple VMs. This is defined as a Type-2 hypervisor. Sun VirtualBox and VMware Workstation are examples of Type-2 hypervisors.

Most hypervisor platforms have a **Graphical User Interface (GUI)**, which makes administration of guest OSes extremely efficient as you have your entire environment in the palm of your hand. Examples of management consoles are XenCenter (for Citrix XenServer), vSphere (for VMware ESX), and SCVMM (for Microsoft Hyper-V). Hypervisor installation and configuration is beyond the scope of this book. VM configurations, however, will be covered in *Chapter 2, Designing a Citrix® Solution to Fit Your Needs*, to the extent that they are relevant to the Citrix XenApp design. The following diagram illustrates the layout of Type-1 and Type-2 hypervisors:



## Application virtualization

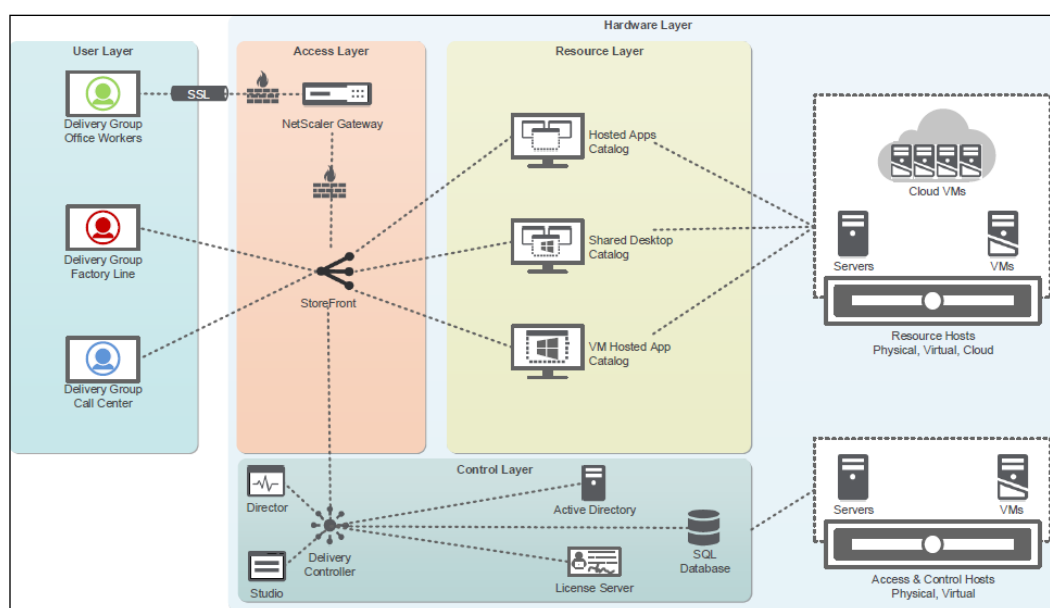
Now that we have a better understanding of hardware virtualization, we can focus on application virtualization. App virtualization is similar to hardware virtualization in the sense that the upper layer is separated from its underlying components. The former, however, entails the isolation of an application from its original OS and the application itself is presented to the end user as if it were native to their device regardless of the OS in use. For instance, Betty can launch a Windows-based accounting app from her Linux home computer, but this app actually runs on a server in the data center and not locally on her machine. This way, she can use any device she wants in order to fill out her spreadsheets and this application never gets exposed to any potential security threats from her device because it never actually executes on her machine. This is the key concept behind application virtualization that is addressed by the Citrix XenApp solution in an enterprise environment. One of many other use cases is running 32-bit apps on a 64-bit endpoint OS. This comes in very handy for financial services companies and healthcare institutions that rely heavily on legacy applications that are not being updated on a regular basis. However, what if Betty wants the full desktop experience instead of individual application instances? In this case, IT can assign a Windows 2012 R2 desktop to her that multiple other users share at the same time. Technically, this is referred to as desktop virtualization; however, in the context of Citrix and Microsoft, it is accomplished by the same product suite—Citrix XenApp in conjunction with **Microsoft Remote Desktop Services** (formerly known as **Terminal Services**).

## Understanding Remote Desktop Services

**Remote Desktop Services (RDS)** from Microsoft is an essential platform and a requirement for app virtualization via Citrix XenApp. It is a role in Windows 2012 Server that enables users to share a physical or virtual desktop located in the data center over the network via the Microsoft proprietary RDP protocol. Every user in an RDS environment needs an RDS license in order to use a remote desktop or application. RDS licensing can be per user or per device. These are also known as **Client Access Licenses (CALs)**. Commonly, organizations employ a per user license, which allows one user to have access to all the instances of a particular product (for example, RD hosts), while device licenses make sense in an environment where multiple users connect to a single RD Host from the same computer (for example, shift workers using kiosks, and so on). So, you may find yourself wondering why you need Citrix in the first place when you can deliver remote apps and desktops to your users by simply configuring RDS on a Windows 2012 server. A lot has been said about the two products and the main arguments in favor of Citrix XenApp are the level of granularity involved in configuring and administering the environment, the security of the Citrix proprietary **Independent Computing Architecture (ICA)** protocol, and the endpoint device support. Currently, 95% of Fortune 500 companies use XenApp to deliver applications and desktops to their end users, and Citrix has been focused on developing its virtualization portfolio for well over a decade with cloud networking and mobility products recently acquired to complete the circle of workspace transformation.

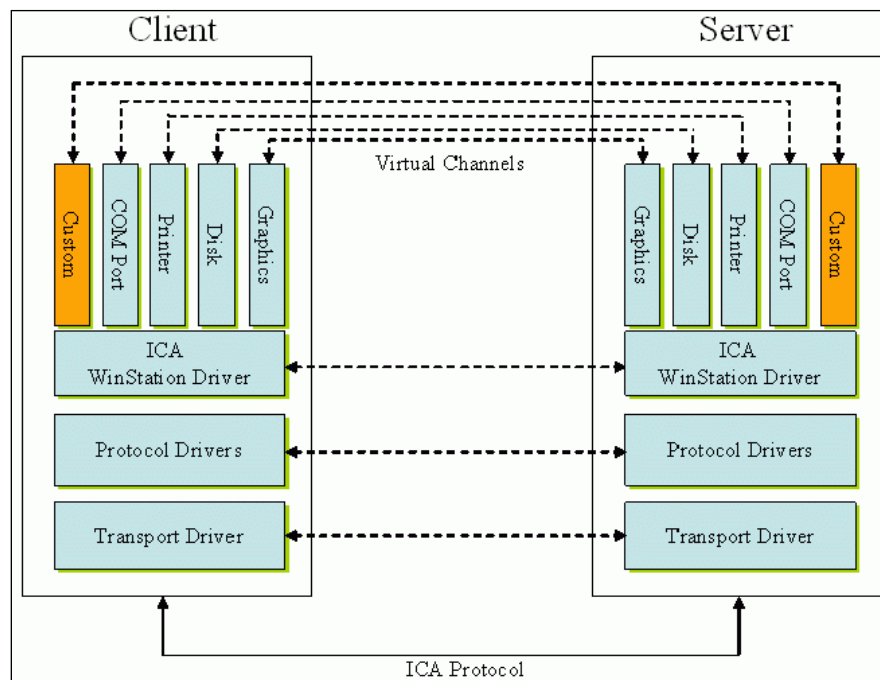
## Introducing Citrix XenApp®

XenApp 7.6 (formerly known as Presentation Server, MetaFrame, and WinFrame) is an application virtualization software built to deliver a secure and highly-customizable set of applications and desktops to end users regardless of their location or endpoint device type. XenApp's **Virtual Delivery Agent (VDA)** is installed on an RDS-enabled Windows Server OS, while the XenApp environment (also known as a farm or site) is managed by a Delivery Controller installed on a separate non-RDS Windows server. The applications can be installed on the XenApp VDA server, and a client software called Citrix Receiver needs to be deployed on the user's endpoint device to enable application launching. We will explore the XenApp architecture in further detail in *Chapter 2, Designing a Citrix® Solution to Fit Your Needs*, but, for now, it is important to remember (much like other enterprise software) that there is a management component (also known as a controller or broker) and a delivery agent. The communication between the two is vital for an operational environment. The following diagram illustrates the conceptual architecture of XenApp:



The XenApp conceptual architecture available at <http://www.citrix.com/>. © Citrix Systems, Inc.

XenApp 7.6 uses a proprietary Citrix communication protocol called ICA. ICA transmits data intercepted by XenApp from an application running on the server to the Citrix Receiver on the client device over standard network protocols, such as TCP/IP and, formerly, IPX/SPX. From the client side, when a user interacts with the application (for example, a mouse movement or keyboard input), the Receiver software on the client device circulates the traffic back to the application running on the XenApp server. Multiple virtual channels exist within the ICA protocol, such as multimedia, printing, USBs, smart cards, and others. These virtual channels define various functions within the ICA stream and different settings can be applied to control their impact based on the requirements of the environment. In *Chapter 11, Administering a XenApp® Environment – Server Management*, we will go into further details regarding Citrix group policies that can be implemented to manage application security and user experience. The following diagram illustrates the ICA protocol and virtual channels:



ICA protocol and virtual channels available at <http://www.support.citrix.com>. © Citrix Systems, Inc.

Citrix XenApp 7.6 uses the **FlexCast Management Architecture (FMA)**, which is conceptually the same model used by Citrix XenDesktop. In fact, in 2013, Citrix merged the XenApp and XenDesktop technologies into a single delivery platform under the umbrella of XenDesktop 7.0. Starting with XenDesktop 7.0, you could deliver both applications and **Virtual Desktop Infrastructure (VDI)** from a single pane of glass. However, less than a year later, Citrix reintroduced XenApp as a standalone licensed product, which once again used the same integrated management model as XenDesktop FMA. You do not have to purchase XenDesktop licenses in order to use XenApp. The latter can also be deployed on both virtual machines and physical servers depending on the nature of the existing infrastructure.

## Design transformation in 7.x

Older versions of XenApp, such as 6.5, have a completely different design than 7.x releases. Pre-7.x XenApp uses **Independent Management Architecture (IMA)** as its operational platform. Citrix has since moved away from IMA and onto FMA, which is a more service-oriented multiproduct platform. If you've had previous experience with XenApp, you will find that 7.5 and 7.6 have a completely different look and feel than older versions. There have been significant changes in administration as well. Here are some examples of architectural modifications in 7.x:

- **Server management:** Application delivery and farm administration is no longer managed from the XenApp server itself but rather from the Citrix Delivery Controller. Application and desktop configuration can also be configured by a server with the Citrix Studio console installed. The Delivery Controller's only unique roles are user access and optimization of connections.
- **Graphical User Interface (GUI):** Citrix Studio (formerly known as Desktop Studio) has replaced the AppCenter and Delivery Services Console.
- **Database:** XenApp no longer uses a local host cache, mirroring the data from the primary SQL data store to a local access database. FMA relies on the high-availability features set in the SQL server instead.
- **Provisioning methods:** **Machine Creation Services (MCS)** can now be leveraged to provision XenApp servers from a single master image. Previously, they could only be deployed as standalone machines on a hypervisor or via Citrix **Provisioning Services (PVS)**.
- **Agent software:** The **Virtual Desktop Agent** has replaced the XenApp 6.5 software installed on a XenApp image.

## New features in XenApp® 7.6

XenApp 7.6 offers features that were either absent in 7.5 but present in 6.5 or nonexistent in previous versions altogether. Here is a list of the main new functions that can be enabled in 7.6:

- **Session PreLaunch (available in 6.5):** This refers to sessions that are launched before users request them
- **Session Lingering (available in 6.5):** This refers to sessions that are not terminated when a user disconnects from an application
- **Anonymous logon:** This refers to credentials not being required in Citrix Receiver or StoreFront, and users can authenticate directly at the application level
- **Connection leasing:** This refers to session information that is cached locally on the Delivery Controller so that if a SQL server outage occurs and the Delivery Controller loses connectivity to the site database, users who request new sessions can be connected to their applications and desktops
- **Cloud integration:** This refers to XenApp servers that can be deployed and managed by cloud solutions, such as Citrix CloudPortal, **Amazon Web Services (AWS)**, and Microsoft Azure

## Application delivery models in XenApp® 7.6

Citrix enables you to deliver resources to end users in a variety of ways. Which model fits your environment best will depend on the business purpose of your solution. There are three methods for application delivery via XenApp—hosted apps, streamed apps, and hosted shared desktops. Let's have a look at them:

- **Hosted apps:** With this model, the application is installed on the XenApp server and will execute there as users launch instances of it on their client devices. The application will consume CPU and RAM on the server and multiple instances of the same process will appear in **Task Manager**.
- **Application streaming:** In this delivery model, apps are packaged and streamed to the endpoint device via Microsoft App-V as part of the XenApp store. With this method, apps will execute and consume the compute resources of the endpoint device instead of the XenApp server.

- **Hosted shared desktops (HSD):** This model is the right approach if the requirement of the environment is to present a full desktop to users instead of individual apps. With the hosted shared model, the XenApp server itself is presented to the end user as a full desktop launched from their Citrix Receiver and it can be shared among multiple users at the same time. The number of users that can utilize the desktop simultaneously is determined by the compute resources allocated to the server and the nature of the applications being run within this desktop. In *Chapter 9, Administering a XenApp® Environment – Application Management*, you will learn how to deploy the different models of application delivery with Citrix XenApp.

The XenDesktop model allows a user to have a dedicated OS and not share resources with other users by delivering a desktop to the user. The desktop can be pooled or private. Pooled desktops are nonpersistent and any changes made by the user outside of their profile are not retained upon reboot. Dedicated desktops are also assigned to a single user. All changes made by the user to the underlying system are retained after a reboot much like a physical computer when a personal vDisk is configured for users. Bear in mind that this approach is only available if you have a XenDesktop concurrent or user/device license.

## The user logon process

In this section, we will explore the user logon process in XenApp in a hosted app scenario. As explained earlier, the true power of XenApp is that a user can launch a variety of remote applications running in a server environment at any time on any device. This is a brief overview of how the traditional logon process in XenApp 7.6 works:

1. A user launches Citrix Receiver on a client device or opens a web browser and navigates to a web portal supplied by an IT administrator.
2. The user types in their credentials in Citrix Receiver or StoreFront.
3. Upon successful authentication, the user is presented with an app store showing the applications and desktops assigned to them by the administrator.
4. The user clicks on one of the applications or desktops available in the store.
5. Within a few seconds, the application runs on their workstations and they are able to use their business application as if it were local to their device. For customers who cannot have the Receiver client installed on user devices, Citrix has included the Receiver for HTML5, which is configured on the StoreFront server and runs a virtual session inside the web browser.