

Mastering VMware Horizon 8

An Advanced Guide to Delivering
Virtual Desktops and Virtual Apps

—
Peter von Oven

Apress®

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*This book is dedicated, first and foremost,
to my family as well as friends and colleagues
who have supported me along the way.*

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About the Author



Peter von Oven is an experienced technical consultant working closely with customers, partners, and vendors in designing technology solutions to meet business needs and deliver outcomes. During his career, Peter has presented at key IT events, such as VMworld, IP EXPO, and various VMUGs and CCUG events across the UK. He has also worked in senior presales roles and presales management roles for Fujitsu, HP, Citrix, and VMware and has been awarded VMware vExpert for the last seven years in a row and vExpert EUC for the last two consecutive years. In 2016, Peter founded his own company specializing in application delivery. Today, he works with a number of partners helping drive and deliver innovative technology solutions. He is also an avid author, having now written 16 books and made videos about VMware end-user computing solutions. In his spare time, Peter volunteers as a STEM Ambassador, working with schools and colleges, helping the next generation develop the skills and confidence in building careers in technology.

About the Technical Reviewer



Tom Howarth is an IT executive with over 20 years of experience. He consults to private and public sector companies; he has a vast amount of experience with a number of IT systems, but specializes in virtualization and infrastructure design utilizing VMware technology to provide efficient and highly available cloud-based platforms that are also cost-effective and more importantly support resilient application delivery in the data center and public cloud. Tom's previous customers have included large IT support providers and technology integrators, government departments, and NGOs with whom he has earned a reputation for being diligent in solving problems in a timely and cost-effective manner.

He has been awarded VMware vExpert every year since inception (currently 13 years), VMware vExpert NSX (4 years), vExpert PRO (2 years), and vExpert Cloud Provider (2 years). Further, he has been awarded HashiCorp Ambassador for 2020 in its inaugural year and again for the second time in 2021.

When he is not whispering clouds, he likes to spend time with his family at the cinema, or in and around Gibraltar.

He can be reached via Twitter at [@tom_howarth](https://twitter.com/tom_howarth).

Acknowledgments

This is now book number 16! I would like to say a big thank you to the team at Apress for giving me another opportunity to write this book with them. As I've said before, the whole process of planning, researching, and writing a book still presents a huge challenge and undertaking. Given the current situation we all find ourselves in at this time of writing, authoring this book has come as a welcome distraction.

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Last but by no means least, a huge thank you to Tom Howarth for providing his valuable skills in reviewing the technical content, which, as you will see, is a lot.

Finally, I would like to acknowledge you, the people that read this. Without you, this whole project would not be possible, so again, thank you. I would also love to hear from you with any suggestions or questions regarding the solutions covered in this book or any other end-user computing solutions for that matter. You can find me on Twitter at @pvo71.

Foreword



The global pandemic, a change in how we work and innovate, especially in the cloud, continues to drive change in the world of end-user computing (EUC) and impacts how we deliver digital workspaces.

This book assists those new to VDI and those already familiar with the VMware solutions, providing an up-to-date reference for those organizations and individuals looking at deploying VDI and DaaS.

Peter is a well-known subject matter expert in VMware solutions and has spent many years deploying solutions, educating many through his previous books, and contributing much to the EUC community. This latest book provides an informative update in the fast-paced world of EUC.

Congratulations and thank you Peter...

—Simon Townsend
Chief Marketing Officer
IGEL

Introduction

The VMware Horizon solution is the foundation for delivering the digital workspace. The term virtual desktop infrastructure, or VDI, was coined back in 2002, where end users simply connected, on a one-to-one basis, to a desktop operating system that was running as a virtual machine on a hypervisor on servers in the data center. Wind the clock forward to today, and although the basic principle remains the same, the technology behind the scenes to deliver a desktop or app experience has advanced massively.

This book will focus on how to get started with VMware Horizon and how to deliver virtual desktop machines and RDSH-based applications and desktop sessions to end users. Throughout this book, we will work through the solution to enable you to design, install, configure, and manage a Horizon deployment, using step-by-step instructions with real-life screenshots as you follow the test lab that is used throughout the book to demonstrate each key feature.

Starting with a high-level overview of remote desktop solutions, followed by an introduction into VDI specifically, this book will then provide an in-depth overview of VMware Horizon and where the solution fits within the market, and its key features. We will then move on to explaining the architecture and components and then look at how to design an optimized solution.

Once you have understood the architecture, the next step is to start installing and configuring Horizon, including best practices for building your virtual desktop gold image and optimizing it in order to deliver the best end-user experience possible.

Note It's worth highlighting that because some chapters are task oriented, they are a fair bit longer than others in order to do the subject justice and to enable you to understand each step in more detail. Additionally, a comprehensive reference guide explaining the API commands is available online at <https://github.com/Apress/delivering-virtual-desktops-apps-vmware-horizon8>.

INTRODUCTION

Throughout the chapters in this book, you will be given hints and tips, along with best practices, all seen from the eyes of somebody who works with this technology day in, day out, and in many different types of environments and scenarios. By the end of this book, you will have acquired the skills to build a Horizon environment for a proof of concept, a pilot, or in a live production environment. The following are some key topics we will cover in this book:

- Learn how the VMware Horizon solution can enhance the management and delivery of virtual desktops and applications within your environment
- Design a real-life Horizon solution, using best practice and following the recommended sizing and configuration guides
- Install, configure, and deploy Horizon ready to start delivering virtual desktop machines and applications to your organization
- Learn about some of the other components of the overall Horizon solution such as App Volumes, ThinApp, and Dynamic Environment Manager
- Understand how Horizon can be used as a cloud-based solution to deliver desktops and apps from a cloud platform
- Understand some of the more advanced management tasks using APIs and command-line tools

I hope that you enjoy reading the chapters and that they help you learn all about VMware Horizon and how to deploy and manage the solution.

CHAPTER 1

Remote Desktop Solutions

Welcome to Chapter 1 of *Mastering VMware Horizon 8*.

We are going to start this book by discussing the different technology solutions available on the market today that are designed to deliver an end-user experience. In this context, the end-user experience is the ability for an end user to access either a full desktop operating system or access individual applications, all of which are delivered remotely, as the desktops and applications are running on server infrastructure. They are either hosted on-premises, delivered from a cloud provider, or delivered via a hybrid model, combining the two.

Collectively, the technologies that deliver the end-user experience have more commonly become known as **digital workspace** solutions.

In This Chapter

In this chapter, we are going to cover the core methods and technology for delivering the end-user experience, before focusing on the VMware-specific technology stack, in the form of VMware Horizon.

In the following sections, we are going to start by discussing each type of technology solution, from a generic perspective, rather than as a VMware-specific product. We will discuss where each one is used, how each one works, and the key benefits that it offers.

Having then described each of the different technology solutions, we will also look at how you would decide which one is appropriate for your organization. In reality, it may not be a single technology that is required to cover all your organization's different use cases. It will likely be a mixture of delivery methods. However, the key point would be that in the case of VMware Horizon, these different delivery methods are all managed from a single management platform.

Finally, in this chapter, we will introduce the VMware Horizon solution and its associated technology for delivering the end-user experience.

Why Deliver Desktops from a Data center or Cloud?

As we have just established, remote desktop solutions deliver the end-user experience remotely, from a data center or cloud platform, but the question is: Why would you consider deploying this type of solution?

There are several benefits that deploying a remote solution can deliver to both your organization and your end-user population. We are going to discuss these in the next sections; however, they are in no particular order, as priorities will be different depending on the specific requirements and use cases for your organization.

Cost Savings

A key reason to deliver end-user computing using a remote solution is to save costs. Cost savings can be realized in several ways. The first of these is the costs in managing end users.

Delivering desktops and applications centrally from a data center or cloud provider enables your organization to reduce the management overheads and deskside visits. However, you just need to be aware that the different models typically use different expenditure models.

If you deploy an on-premises solution, then while in the long run you will reduce management and support costs, or your operational expenditure (OPEX), there will be an up-front capital expenditure (CAPEX) cost to deploy the servers, storage, and networking required to host the solution in the first place. You also need to factor in environmental factors, such as increased power requirements and additional cooling for the new hardware.

Migrating to a cloud-based solution using one of the many “as a service” type solutions available will certainly reduce your CAPEX costs, as you will be essentially using somebody else’s hardware. But what does that look like for the OPEX budget, and what savings will you make?

One thing to be aware of with delivering cloud-based solutions, charged via a subscription-based model where you only pay for what you use, is to calculate the hours that end users will be using the service. Another trap to watch out for, which also applies

to on-premises solutions to a certain degree, is to only provide the resources that are required. Do not get carried away with adding unnecessary CPU, memory, and storage resources, as you will end up paying a lot more than you budgeted for. In my experience, I have seen many customers receive a monthly bill that was much higher than they expected it to be.

Security

As the desktop or application that the end user is accessing is running in a secure data center, no data will leave that data center, unless the IT department has specifically configured a policy to allow end users to copy data to their local device. On the flip side, that also means that end users cannot copy data from their local device into the data center, ensuring that they cannot introduce malware or other malicious content.

When the end user connects to their remote session, the only data transmitted to their endpoint device are the screenshots of the application or desktop they are connected to. Keyboard keypresses and mouse movements are then sent back securely to the session. Think of it as picking your PC up, placing it in the data center, and then running very long cables back to your screen, keyboard, and mouse.

This process is the same regardless of whether you are running in your on-premises data center or a public cloud provider. The connection between the session and the endpoint device will be secured.

To enable end users to log in to their sessions, you can also deploy additional security solutions, such as two-factor authentication.

The final point is with the endpoint device. Because there is no data on the endpoint from the session, then if the device is lost or stolen, there is no risk of data falling into the wrong hands or getting lost.

Easy to Manage and Support

We have already touched on the fact that you can reduce the costs of management. But the question is, how?

Centralizing your desktops and applications by default means that you have also centralized the management. This is especially true if you have migrated to a cloud-based desktop solution because the only way to manage the solution is by using a centralized web portal.

So, now that you have all your desktops and applications virtualized and hosted in a data center, performing management tasks is much simpler and quicker. Updating operating system gold images, to add the latest patches and security updates, is much easier; you will need to only do this once and then roll this out across the environment. Being centralized means that your end user will receive these updates the very next time they connect. In some cloud-based solutions, this could even be managed for you with the service provider, ensuring that the operating systems are patched and up to date.

When it comes to support and troubleshooting issues, then this is also much simpler to undertake. You can shadow the user's desktop or application session to understand the issue, resulting in this task being a simple case of the desktop admins logging on to the same session as the end user. This also has the potential to proactively update the rest of the end-user environment. If you identify an issue, you can easily fix this and then update gold images, ensuring that the issue is quickly fixed before other end users report the same issue.

There is a long-running joke in IT where the support team tells the end user to "turn it off and then on again!" However, this really is the case with remote desktop and application sessions. As desktops will typically be non-persistent, when the end user logs out, then the virtual desktop they were using is automatically deleted. Then, when they log on again, they receive a brand-new virtual desktop that will not have the issue they reported. Their personal data and application will all be kept and delivered to the new virtual desktop.

It is the same for applications. The end user simply logs out of the current application session and then logs in again to start a new one.

Disaster Recovery (DR) and Business Continuity (BC)

As with the previous sections, by moving to delivering end-user computing services from a data center, DR and BC all become default parts of how the solution is architected and built.

When it comes to disaster recovery, the fact that the virtual desktops and applications are running on server infrastructure enables them to become highly available. Deploying standard virtualization techniques, such as vMotion, enables desktops and applications to be moved and restarted on different servers, and even different data centers, in the event of a data center failing or becoming unavailable. This enables you to deliver an always-on end-user environment, regardless of where it is being delivered from.

You would naturally employ all this protection technology, given the fact that if a server should fail, it could now affect hundreds of users, in comparison to a single physical desktop machine failing, which would only affect an individual end user.

The same can be said for BC. Rather than failing over an entire data center, individual virtual desktops and applications can be restarted on different servers, ensuring they are always available.

If we look at support again briefly, if the system administrators need to perform maintenance on a particular server, they can very quickly and easily move workloads onto another server, ensuring there is no disruption to the end users. It also means that maintenance windows can be scheduled during office hours, rather than having to wait for when the office is closed in the evening or at weekends. This also has an impact on cost, reducing the extra hours that administrators must spend working. This also reduces the cost of the pizza bill, when working out of hours!

Of course, moving to a cloud-based solution means that there is no maintenance on hardware required.

Scalability

Scalability, or elasticity, as it is sometimes referred to, allows you to scale up or down resources dynamically. This concept is ideal for delivering end-user services.

You can easily add additional desktop or application resources to cope with the demands of your business, whether that is on a seasonal basis, where you need to add temporary resources or to address your overall growth plans. You just need to ensure that your on-premises infrastructure can support the increase in capacity.

Additional capacity can be added to the centrally hosted infrastructure, allowing end users to very quickly be onboarded. This can further be expedited if the end user is using their own device, which we will cover in the next section.

When it comes to cloud-based solutions, you can then scale up and down, as and when required. You can also only pay for what you use. So, if you add additional resources and capacity for a six-month period, then you will only be billed for this period. This solution is perfect if you have an element of unpredictability within your organization, as you are not reliant on having to add infrastructure capacity.

Bring Your Own Device (BYOD)

Finally, end users can bring their own device. The benefits of this model are numerous and fit into some of the points already highlighted.

End users can be quickly onboarded, as they already have a device that they can use. You simply need to allocate them desktop and application access and resources, then point them to the appropriate login pages. They can either download a specific client to use the services or just use the browser on their device.

As the end user is now using their own personal device, your organization saves the cost of having to provide them with a company-owned device. And as it belongs to the end user, you then do not have to support it. You just need to make sure that it can run the remote sessions.

There is no security risk. Data from the remote session is not stored on the end user's personal device. They are merely accessing a remote session, hosted in the data center or the cloud. This is an ideal solution for contractors as you do not need to purchase hardware just for a few months of a project while also keeping control of data access.

Virtual Desktop Infrastructure (VDI)

Let us start by defining what exactly we mean when we talk about VDI solutions.

VDI is a solution, consisting of a virtual desktop machine, running a desktop operating system (Windows or Linux) that is running on a hypervisor, which, in turn, is running on server hardware. This is in a central data center on-premises, or a cloud-based data center, such as Amazon or Azure.

End users then connect to the virtual desktop machine over the network or over the Internet. The desktop of that virtual desktop machine is displayed on their local endpoint device, using a display protocol, enabling them to interact with the virtual desktop machine using their local keyboard and mouse. For the end user, the experience is that they have a *full* Windows or Linux desktop to use. It just happens to be a virtual desktop machine, running in the data center.

Although VDI is the common term used for this type of solution, it can also sometimes be referred to as a hosted virtual desktop or HVD, as the virtual desktop machine is being hosted on data center infrastructure.

The Architecture of VDI

In the previous section, we described, at a high level, what VDI is. In this section, we are going to take a closer look at what that looks like from a high-level architecture perspective and how it works.

Let us start with the end user. After all, we are talking about end-user computing, and so the end user should always be the focus.

To initiate the connection to the virtual desktop machine, from their endpoint device, the end user launches the client software for their chosen VDI vendor. In this case, as we are talking about VMware Horizon, this would be the Horizon Client software. Equally, they could just use their normal web browser.

The client software contains the details of the infrastructure hosting the end user's virtual desktop machine or applications, which the end user needs to connect to. In particular, the address details will point the end user to a connection broker. The job of the connection broker is to authenticate the end user against Active Directory and then manage the available resources that the end user is entitled to use and that are available. It is the connection broker that is the core component to any VDI solution, orchestrating resources and ensuring they are delivered to the end user.

Before the concept of the connection server came into being, you would only be able to connect to a machine on a 1:1 basis, just like we do today when managing individual servers when we simply connect directly to the desktop of the server using the Microsoft Remote Desktop Protocol (RDP).

Figure 1-1 illustrates the connection process.

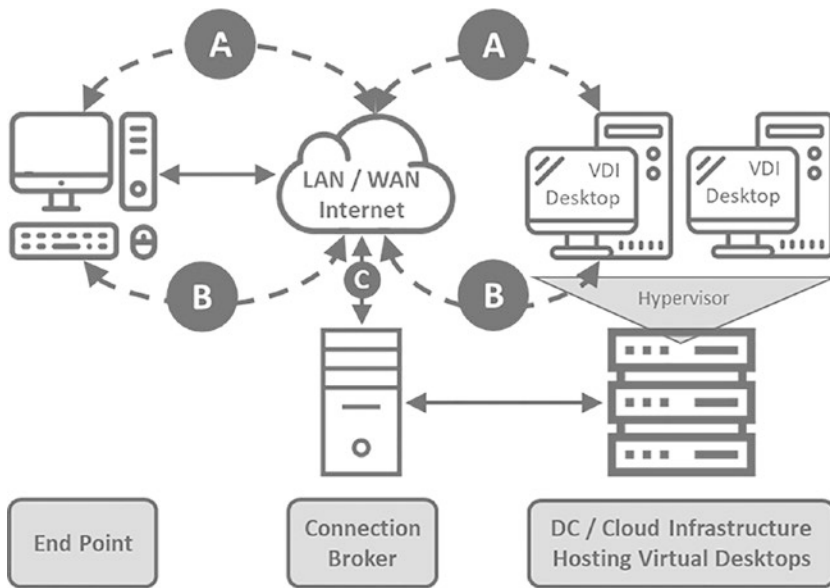


Figure 1-1. *The architecture of a VDI solution*

Once the end user has been authenticated, the Connection Server allocates a virtual desktop machine to that end user, based on what they are entitled to use. This is shown by the arrow labeled C in the previous diagram. This could be a ready built virtual desktop machine or a virtual desktop machine that is built on demand and configured dynamically to that specific end user. The connection server will orchestrate this communicating with the back-end infrastructure. In VMware terms, the connection server will communicate with your vCenter Server to create, build, and configure virtual desktop machines.

The screenshots of the virtual desktop machine are then sent over the LAN, WAN, or Internet, using a display protocol (A) that is optimized for delivering remote solutions, to the end user’s endpoint device, and then displayed in either the client software, or the browser, depending on how the end user connected. The end user then interacts with the virtual desktop, using their local keyboard and mouse, with the keystrokes and mouse movements sent back to the virtual desktop machine, over the LAN, WAN, or Internet, using the same display protocol (B). We will discuss the display protocols in more detail in Chapter 2.

Now that we have discussed the high-level role of a connection broker, and how the virtual desktop is delivered to the end user’s device, you will remember that one of the roles of the connection broker in delivering resources to the end users is to create, build, and configure virtual desktops on demand.

One of the early mistakes made in deploying VDI solutions that also impacted costs was the way in which the deployment was approached. Organizations deployed virtual desktops in the same way as they had with physical desktops. That meant that every end user was given their own dedicated virtual desktop, complete with a virtual hard disk of a similar size as the hard disk they had in their physical desktop. This resulted in terabytes of disk space being unnecessarily deployed.

The real big benefit that VDI enables is in the fact that you do not need to build a machine up front and dedicate to every end user in your organization. Virtual desktops can be created, built, and configured on demand, all from the same starting point. That starting point is a fresh clean copy of the gold image every time the end user logs in. Of course, there may well be a use case where an end user needs to have their own dedicated virtual desktop machine; however, those use cases will be few and far between.

VDI can deliver both use cases. A non-persistent virtual desktop model allows you to deploy the former. An end user does not own their virtual desktop, and a new desktop will be built or allocated to them each time they log in. Essentially, they receive a brand-new desktop every time they log in. When they have finished with the virtual desktop machine for that session, it then gets shut down and deleted. This also means that you do not need to create more virtual desktops than is required, which potentially means less infrastructure is required to host them. But what about their applications and user data? If the virtual desktop is deleted when they log out, do they lose their data?

The answer is of course they do not. This is where other solutions come into play within a virtual desktop solution. These ecosystem solutions are designed to manage applications and end-user data and settings to ensure that although the end user receives a newly created virtual desktop machine when they log in, as far as they are concerned, it looks and feels like it is the same virtual desktop each time. That means all their applications, files, settings, and any personalization are delivered at the same time.

This model is often referred to as the composite desktop model. The component parts of the desktop are abstracted from each other, so the OS, the apps, and the user data are treated and managed as separate entities. The following diagram illustrates the composite desktop model: