



Implementation Considerations for VMware App Volumes in a Citrix XenApp Environment

WHITE PAPER

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Introduction

VMware App Volumes™ is a transformative virtualization solution that enables IT administrators to simplify application delivery and management in a Citrix XenApp environment. This paper discusses how App Volumes works and how it fits in with a XenApp implementation, while helping IT administrators to further their organization's thinking about how to best utilize App Volumes in a current XenApp implementation.

To begin evaluating App Volumes for use in a Citrix XenApp environment, [download a free trial](#) of App Volumes.

What Is App Volumes and How Does It Work?

App Volumes is a solution aimed at addressing the need for organizations to manage applications efficiently, effectively, and at scale. In the traditional application model, applications, data files, and settings are closely connected to the operating system. Because of this close connection, all changes made to an application might need to be replicated on multiple unique servers throughout the organization, often requiring vast IT resources to do so. This is not the case with App Volumes.

With App Volumes, application containers are independent of the operating system, and an agent is the interface between the application container and the operating system. When applications are disconnected from the operating system, a single application or set of applications can be shared to many different virtual machines or servers in a one-to-many relationship.

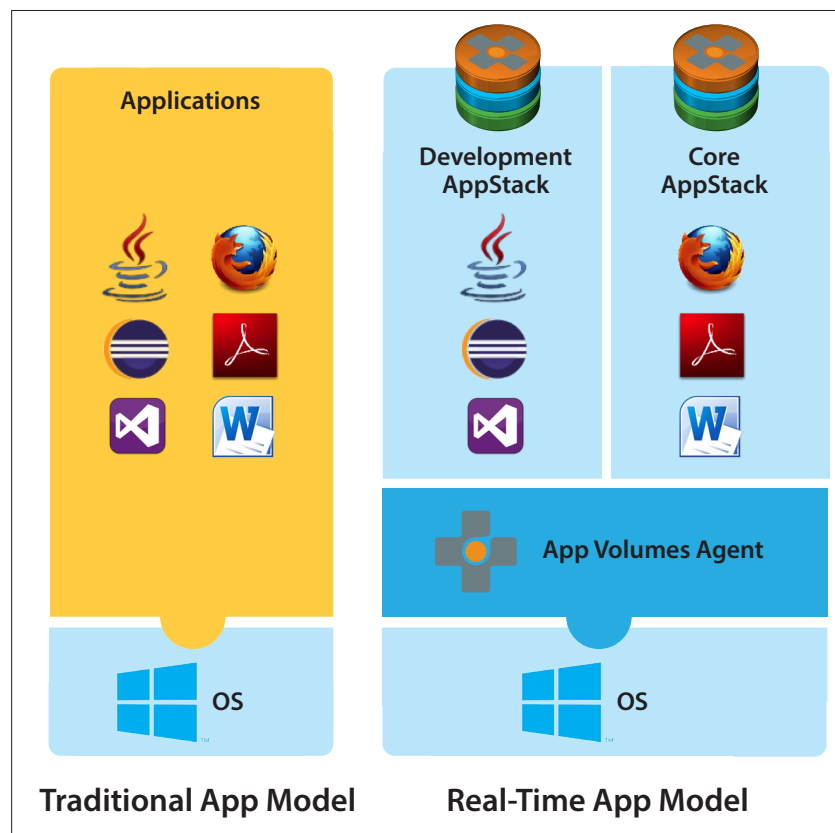


Figure 1: Traditional and Real-Time Application Models

Opportunities Provided by App Volumes

This division between application and operating system allows for two important opportunities for application delivery:

- App Volumes application containers (AppStacks) can be used to provide exactly the applications required for specific functional groups within the organization, as the perfect fit for a precise business need. With operating system and applications kept separate, provisioning to users or groups can occur in seconds rather than minutes or hours.
- A large number of generic servers or virtual desktops with an identical core base image can be flexibly provisioned with an attached container of exactly the applications required by any group, and in real time.

This flexibility in a real-time model allows businesses to scale quickly. App Volumes provides the ability to make dynamic changes to applications in separate containers, as the enterprise requires them. With App Volumes handling all of the application work, IT can more easily scale out when deploying more servers or virtual machines, which contain no applications or only core applications that everyone needs.

How Application Containers Work

App Volumes application containers, known as AppStacks, are created by the organization to follow the logic of business, providing business units with the specific applications they need. Applications in AppStacks are managed in a central location. Following a one-to-many delivery scheme, multiple different AppStacks can be attached to a given server or virtual machine, provisioning that machine with the applications required by a specific group of users. As users access the server or virtual machine, they seamlessly access the applications within the attached AppStacks.

How App Volumes Benefits a XenApp Environment

App Volumes provides clear benefits in a Citrix XenApp environment. XenApp is an application presentation solution. App Volumes is a dynamic, rapid application delivery and management system.

With the combined solution, App Volumes AppStacks are attached to XenApp servers and deliver applications to XenApp servers in the background, invisible to end users. Applications on App Volumes AppStacks function as if natively installed on the XenApp servers. Applications run on the XenApp servers and are remoted and presented to the user with standard XenApp protocols. The user accesses XenApp-presented applications from a typical Citrix endpoint. In summary, App Volumes delivers the applications to the XenApp servers, and XenApp presents applications to users in the standard way, without end-user awareness of App Volumes.

App Volumes solves a number of significant problems for traditional XenApp implementations and saves time for IT staff. Following are the key ways that App Volumes helps a XenApp implementation.

Generic Operating System Image

App Volumes enables the creation of XenApp servers from a generic core operating system image, an image that does not have any applications specific to any business group on it. App Volumes handles the applications separately from the XenApp servers in AppStacks. Applications are provisioned to XenApp servers by attaching AppStacks to those servers, as the enterprise requires. By taking the generic operating system image and utilizing App Volumes to inject the necessary applications into it with AppStacks, that single generic XenApp server image quickly becomes a Finance server, a Development server, or a Human Resources server.

With App Volumes in your XenApp environment, each XenApp server is built identically. Servers become flexible, reusable, replaceable building blocks. Each time a XenApp server is taken offline due to planned maintenance or a catastrophic event, applications can be quickly delivered via AppStack to a different server. With AppStacks attached, replacement servers take over the load for those removed. App Volumes provides the flexibility with which to handle otherwise time-consuming challenges of a XenApp environment.

App Volumes also allows for high levels of application customization. By using the same single generic image to build each XenApp server, attached sets of applications are easily altered to follow changing business requirements. Changes can quickly be made regarding which servers are running what applications on a given day. Now businesses with hundreds of XenApp servers are positioned to become more agile.

Minimized Application Updates

With App Volumes, IT staff members no longer need to perform redundant application installations and updates on multiple XenApp servers. They install and update the applications only on the single App Volumes AppStack. XenApp servers publish that one shared repository of applications to users. Multiple XenApp servers can share one AppStack.

IT can quickly build out an implementation horizontally without risk of error because application updates are made a single time, in a single location, on one AppStack. In a traditional XenApp implementation, the work necessary to update and test applications on each of hundreds of servers could take hours. With App Volumes in the environment, IT tests and adjusts the application once on the AppStack, and all of the updates are successfully delivered to the servers the first time.

As soon as the XenApp servers are rebooted, they utilize the updated AppStack. All updated applications contained in the AppStack are available to all users, immediately.

Reduced XenApp Server Maintenance with Applications Offloaded

By using App Volumes AppStacks for applications, the XenApp server image is focused on XenApp and the operating system. The nearly constant application maintenance on multiple XenApp server images is eliminated. With App Volumes as part of the solution, only one XenApp server image requires updating—for the operating system or XenApp itself. IT resources formerly devoted to application maintenance on XenApp servers become available to address other needs.

Storage Reduction from Fewer XenApp Server Images

In a traditional Citrix model, Citrix Provisioning Services (PVS) is utilized to manage OS images, with VMware vSphere® managing storage. Each XenApp server is built from a template customized for the use case it supports and requires its own operating system with the necessary applications installed on it. By adding App Volumes to the XenApp environment, the operating system and the applications can be decoupled. App Volumes allows IT to store separate application files and deliver them across many XenApp servers.

IT then manages the operating system as part of a generic RDSH server image that supports all use cases. When there is a major operating system or XenApp update, IT needs to update only the single server image and deploy that image to the XenApp servers. Applications on AppStacks are dealt with completely separately from the OS.

Without the need for space for each redundant operating system across every template, and the multiple application installations on the XenApp servers, the enterprise can experience storage savings.

Note: App Volumes also works if the XenApp server is virtualized with Microsoft Hyper-V or is a physical server. In this case, storage impact might be different.

Updating XenApp Versions Is Easier

How does App Volumes improve a XenApp environment when updating XenApp itself? In a traditional XenApp implementation, to migrate to a new version of XenApp, IT must reinstall each application on every server. With App Volumes in a XenApp environment, migration to a new XenApp version can occur more quickly because applications are offloaded to AppStacks. IT needs to update only the generic XenApp server image to the next XenApp version and deploy it to the RDSH servers. There is no need to touch the applications—App Volumes attaches the necessary AppStacks, and the applications are published as usual through the updated version of the XenApp server.

Sometimes updates to XenApp require updates to the server operating system, which might necessitate recapturing applications. With App Volumes, applications need to be updated or managed only a single time for the AppStack, rather than reinstalled on every XenApp server.

Application Conflicts Handled More Efficiently

Application conflicts in a XenApp environment have traditionally been resolved by adding additional XenApp servers to separate conflicting applications. For some organizations this has resulted in large, ungainly groupings of servers. App Volumes and VMware ThinApp® work well together to solve the problem of application conflicts. ThinApp packages isolate potentially conflicting applications from each other, which allows IT to place these packaged applications next to one another within a single AppStack. With App Volumes and ThinApp together, there is no need to handle conflicting applications by placing these applications on separate XenApp servers. For more information about using ThinApp in a XenApp environment, read the white paper [Integrating VMware ThinApp with Citrix XenApp](#).

App Volumes Components in a XenApp Environment

App Volumes enhances the existing infrastructure without requiring any substantial changes. The components of App Volumes in a XenApp environment include the App Volumes Manager, the App Volumes Agent, and the AppStack volumes, in addition to the XenApp servers.


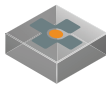


	App Volumes Manager – A Windows Server system used as the App Volumes Manager console for administration and configuration of App Volumes and assignment of AppStacks. App Volumes Manager is also used as a broker for the App Volumes Agents, for automated assignment of applications.
	App Volumes Agent – App Volumes software installed on all XenApp servers that receive AppStack volumes assignment. The App Volumes Agent runs as a service and utilizes a filter driver to handle application calls and file system redirects to AppStack VMDKs.
	AppStack Volume – A read-only volume containing any number of Windows applications. Multiple AppStacks can be mapped to an individual XenApp server. An individual AppStack can also be mapped to more than one XenApp server.
	XenApp Server – The XenApp server can be a physical server or a virtual server managed by VMware vSphere or Microsoft Hyper-V. In a XenApp environment, AppStacks are attached to the XenApp server for application execution. Because applications are located in the attached AppStacks, the XenApp server becomes a flexible, reusable building block.

Table 1: App Volumes and XenApp Components

App Volumes Manager

The App Volumes Manager can be installed on a Windows Server 2008 or 2012 system and is a Web console for managing all administration related to App Volumes AppStacks. It polls VMware vCenter™ to learn which hypervisor hosts are available, which hosts can be seen by the others, and which datastores are available to each host. The App Volumes Manager is used to create standard AppStacks, to import and manage AppStacks, to examine the applications within each AppStack, to define the attachments currently in process, and to identify, provision, or revoke current AppStack assignments.

AppStack Volumes

AppStacks themselves are logical entities on the datastore. In a vSphere environment, AppStacks are formatted as read-only VMDK files and are attached to the XenApp servers as standard virtual disks with a typical VMDK disk-attach process. The only difference between App Volumes VMDK files and any other VMDK file is that they are designed to merge file and registry information for the AppStack applications seamlessly into the host operating system so all AppStack applications appear as natively installed. The AppStack is delivered to one or many XenApp servers for end users to access. AppStack volumes work in a similar manner with hypervisors other than VMware vSphere.

App Volumes Agent

The App Volumes Agent is installed on each XenApp server and connects applications properly to the operating system on the XenApp server, as directed by the App Volumes Manager. On a more technical level, the Agent's job is to look at each virtual machine disk that is attached to each XenApp server (virtual machine), and to identify if that disk is an App Volumes AppStack. If it is an AppStack, then the App Volumes Agent delivers the application to the operating system by applying the registry and file system changes, creating shortcuts, registering protocols and objects, and merging everything about the application that exists within that AppStack into the operating system, combining it to look like one big **C:** drive. AppStacks remain attached at all times, until the server is rebooted or powered off. When detaching an AppStack, the Agent unmerges the settings and unregisters the apps in the correct sequence, separating everything and pulling the extra volume out of Windows so Windows no longer sees it, and the machine no longer has that VMDK attached.

Endpoints Receiving XenApp-Presented Applications

Endpoints in a combined XenApp and App Volumes environment remain exactly as they have been set up within the XenApp implementation (desktop, thin client, or mobile device). End users are presented with the applications on a local device. They do not know that App Volumes is involved in the XenApp environment. In the background, App Volumes delivers the applications to the XenApp server(s) where they run for each user.

App Volumes Writable Volumes

App Volumes writable volumes are not pertinent to a XenApp implementation. A writable volume is created solely for use in a one-to-one, rather than one-to-many, environment—that is, a writable volume is assigned to only one user, whereas an AppStack can be assigned to many XenApp servers. XenApp in turn assigns the AppStack-stored applications to many users. To learn more about writable volumes in a VDI deployment, read the [VMware App Volumes Deployment Guide](#).

AppStack Delivery to XenApp Servers

In the traditional XenApp environment, a user logging in accesses the XenApp server group through either a Web access point or directly through Citrix Receiver on the endpoint. From there, the user is able to launch a published application. With App Volumes, the user experience is the same, however, the back-end components differ.

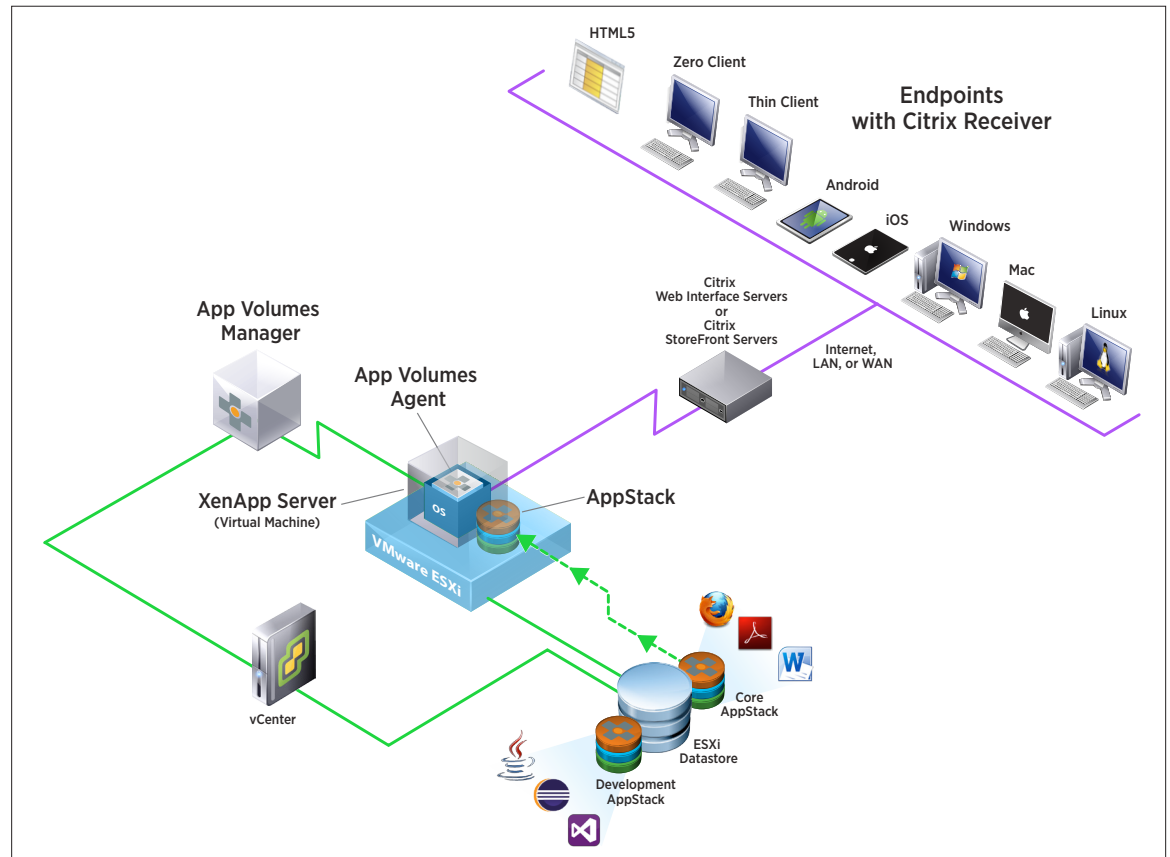
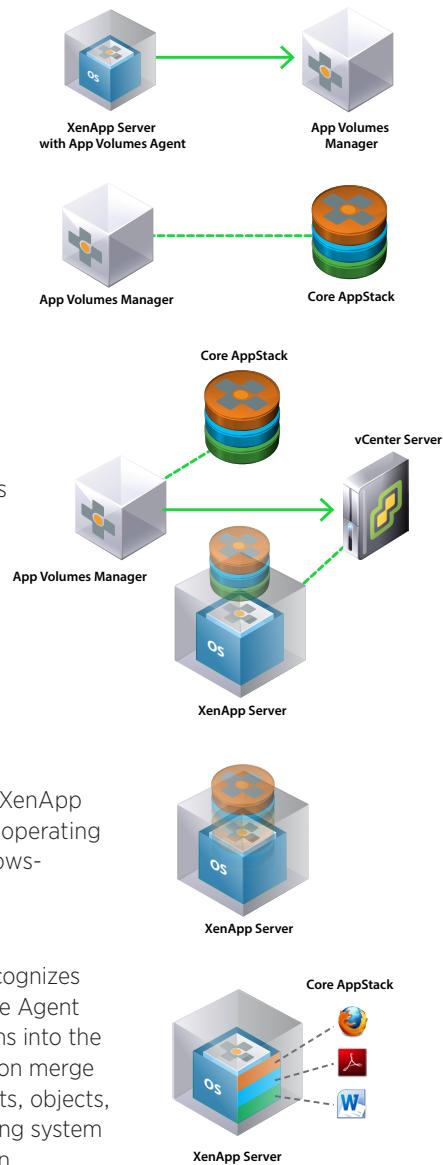


Figure 2: Typical Architecture of App Volumes Within a XenApp Implementation

Figure 2 shows user endpoints logging in to a XenApp server. The purple lines indicate that user login to XenApp remains the same in a combined solution as with XenApp alone. The XenApp server is a virtual machine managed by VMware ESXi™ and vCenter. Installed on the XenApp server are the OS, the XenApp software, Microsoft Remote Desktop Services, and the App Volumes Agent. By the time the user logs in to XenApp to launch an application, the AppStacks assigned to that server have already been attached by App Volumes, and the applications are integrated with the XenApp server operating system and ready to be used. For details on App Volumes delivery of applications to the XenApp server, see Figure 3.

In a typical architecture, App Volumes integrates with the XenApp servers to deliver the AppStack application containers as follows:

1. The App Volumes Agent on each XenApp server starts upon boot and communicates with the App Volumes Manager.
2. The App Volumes Manager determines which AppStacks are assigned to the XenApp server.
3. After determining which AppStacks should be assigned to the XenApp server, the App Volumes Manager sends any AppStack VMDK mount commands to vCenter and vSphere. VMware vCenter applies the AppStack VMDKs to the XenApp server.
4. After the AppStack VMDK is mounted on the XenApp server by vCenter and vSphere, the Windows operating system starts the mount process of the Windows-compatible volume within the VMDK.
5. The App Volumes Agent takes over when it recognizes that the VMDK contains App Volumes data. The Agent merges, or registers, the AppStacks applications into the Windows operating system. After the application merge with Windows is complete, application shortcuts, objects, and registry entries are available to the operating system and user for proper execution of the application.



After the XenApp server boot, there is a one-time step where the IT administrator must create Citrix XenApp published applications for the RDSH servers that have these AppStacks assigned. The administrator assigns the XenApp published applications to the end users via Active Directory group or user assignment within XenApp administrative consoles.

Figure 3: App Volumes Delivery of Applications to the XenApp Server

All of these steps for App Volumes delivery of applications to a XenApp server are unknown to the user. The user has no knowledge at all that App Volumes is involved in the Citrix environment.

Frequently Asked Questions About App Volumes in a XenApp Implementation

Q. What is the best approach to containerizing applications into AppStacks?

A. When using App Volumes for application delivery, AppStacks can be configured in several ways:

- An individual AppStack for each application
- An AppStack for each group of applications
- A single AppStack for all applications together

Grouping is done solely to simplify the delivery process and to ensure that application compatibilities are maintained between applications that work together, for example, Microsoft Office and Microsoft Office plug-ins.

This significantly eases the burden of managing the delivery of applications to many XenApp servers by allowing XenApp administrators to move AppStacks as needed to any server or set of servers for load balancing and planned downtimes. It also allows for all XenApp servers to be identically configured in a logical manner with only the base tools and settings deemed necessary for everyone.

For details about designing AppStacks, read the paper [VMware App Volumes Technical FAQ](#).

Q. What steps should be followed in order to decrease from many PVS XenApp server images to one or only a few images?

A. It is easiest to begin by defining how the users of the current systems are grouped. Are users of a particular group of XenApp servers using this silo for geographical reasons or because of roles and job functions? Are some silos established to isolate conflicting applications? Then use App Volumes in conjunction with ThinApp to isolate possibly conflicting applications.

Note: Always start with a clean XenApp server image and add any base applications that every user of these systems will have, for example, the latest version of Microsoft Office, the latest Adobe Reader, and the most up-to-date file compression utility.

- Consider that IT already has some reason for grouping applications together as they have in the existing structure. IT administrators might choose to keep those applications together that were grouped previously, if they fit together logically.
- Remember that
 - App Volumes makes XenApp servers easy to manage, highly modular, and customizable. With App Volumes, all XenApp servers can be replicated for use in a different situation from one easy-to-maintain, generic, base operating system configuration.
 - Servers can be returned to the generic state by detaching their AppStacks. This allows servers to be very flexible. An organization can very quickly increase or decrease the number of servers supporting a specific business unit.

Q. What do I need to know to utilize App Volumes in a very large environment?

A. App Volumes has been scaled for use in very large environments. For details about how App Volumes, starting in version 2.6, spreads out IOPS to multiple locations with the use of storage groups, read [VMware App Volumes v2.6.0 Release Notes](#) and the blog post [VMware App Volumes – What About Performance?](#).

Q. How do I integrate App Volumes with vSphere?

A. Adding App Volumes to the data center with vSphere is relatively easy. The vSphere and vCenter installation stays the same as it always was. By adding App Volumes to the environment, IT alters only the storage required for AppStacks.

Q. What questions should we discuss as an organization before adding App Volumes to our XenApp environment?

A. Discuss the following questions:

- Of the App Volumes benefits explained in this paper, which efficiencies do we want to accomplish with application delivery?
- Do we currently have an application inventory?
- How do we want to group applications together?
- Do we use any application virtualization solutions today such as Microsoft App-V or ThinApp? If not, do we want to consider it?
- How can we improve our current process for testing, installing, and updating applications by using App Volumes?
- How many XenApp servers do we have and how frequently do we need to deploy new applications to them? How can we change this process with App Volumes?
- How can App Volumes improve the process of adding or changing the number of XenApp servers in our environment?

If you want to move forward with the combined solutions of XenApp and App Volumes, contact your VMware representative or [VMware Professional Services](#).

Q. What is the recommended order of installation when utilizing App Volumes in a XenApp environment?

A. To prevent conflicts, install in the following order:

1. VMware Tools™
2. Citrix XenApp
3. App Volumes Agent

Reboot after each installation.

Q. Will App Volumes fit in my XenApp environment if I already use Microsoft App-V or Microsoft SCCM?

A. Yes. App-V is an application isolation system. App Volumes does not perform application isolation and does not require the complex packaging of App-V. App Volumes is a better solution for a high-speed, focused deployment system.

SCCM is an installation system that was not designed to move at the speed of App Volumes. SCCM will continue to work well in a legacy environment while IT optimizes the virtual desktop or XenApp infrastructure with App Volumes.

Summary

This paper shows how VMware App Volumes can help optimize a Citrix XenApp environment. It discusses many of the benefits of utilizing App Volumes, explains how App Volumes works, and offers points to consider during the planning steps of an App Volumes integration into a XenApp environment.

Using App Volumes and XenApp together gives organizations the agility to modify an existing application infrastructure quickly and efficiently. By separating applications from the operating system, App Volumes allows IT to build generic XenApp servers and attach AppStacks to provide applications targeted to the users. With real-time, centralized application management of App Volumes AppStacks, delivery and management of applications is simplified in a XenApp environment.

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Additional Resources

VMware App Volumes

- [VMware App Volumes \(formerly CloudVolumes\)](#)
- [VMware App Volumes Deployment Guide](#)
- [VMware App Volumes Technical FAQ](#)
- [Horizon 6 Storage Considerations](#)
- [App Volumes Helps OGL Reduce Storage Requirements by 7X across our Citrix Environment](#)
- [VMware App Volumes – What About Performance?](#)

VMware ThinApp

- [VMware ThinApp](#)
- [VMware ThinApp Technical Resources](#)
- [Enhanced Management and Performance of VMware ThinApp Virtual Applications with CloudVolumes Shared VMDKs](#)

VMware App Volumes and VMware ThinApp Combined

App Volumes partners well with VMware ThinApp to minimize application conflict. For more information, read

- [VMware App Volumes and VMware ThinApp Combined: The Perfect Mix](#)
- [Using VMware App Volumes with ThinApp Packages](#)

XenApp on VMware vSphere

App Volumes partners well with VMware vSphere for server virtualization. To learn more, read

- [VMware vSphere](#)
- [Citrix XenApp on VMware Best Practices Guide](#)

VMware User Environment Manager

App Volumes works well with VMware User Environment Manager™ to manage the end-user experience and policy settings. To learn more, read

- [VMware User Environment Manager](#)

