



Enhanced Management and Performance of VMware® ThinApp® Virtual Applications with CloudVolumes Shared VMDKs

WHITE PAPER

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Introduction

Large numbers of organizations throughout the world use [VMware® ThinApp®](#) to deliver virtualized applications to end users in centralized virtual desktop infrastructure (VDI) and RDSH-based environments. [CloudVolumes ThinApp Edition](#) complements ThinApp by enhancing the ease of management, speed of deployment, and responsiveness of applications, all while leveraging existing storage infrastructure.

With CloudVolumes ThinApp Edition, you can utilize any VMware vSphere® datastore and make individual ThinApp packages instantly available to users logging in to their virtual desktops, in real time or on demand.

How CloudVolumes Works

CloudVolumes has broad applicability beyond enhancing ThinApp; let us first look at the general use of the product. CloudVolumes enables desktop applications, server applications, files, and data shared across multiple virtual machines to be placed into virtual volumes (VMDK files) and makes these volumes dynamically attachable to all virtual machines. Once attached, the contents of these volumes instantaneously appear as if part of the virtual machine. The applications contained in the volumes appear and function as if they were natively installed. These volumes can be placed on any class of storage that vSphere supports (SAN accessed via Fibre Channel or iSCSI, NFS, locally attached storage, and so on).

CloudVolumes is not inline in the storage path; instead, it operates as a broker—attaching or detaching volumes from virtual machines at boot, in real time while a user is logged in, or at user login. Reads and writes from the virtualized applications are sent directly from the virtual machine (where the multiple volumes appear as one local disk) to the underlying storage.

Now, let us look at how CloudVolumes works specifically with ThinApp. [CloudVolumes ThinApp Edition](#) allows you to place ThinApp packages into a read-only, shared virtual disk (a CloudVolumes-ThinApp VMDK) that can be located on any vSphere datastore. This CloudVolumes-ThinApp VMDK can then be dynamically attached to any user's virtual desktop based on Active Directory user and group entitlements. A single CloudVolumes-ThinApp VMDK can be attached to all virtual desktops at once, avoiding the need for streaming or deploying duplicate local copies of ThinApp packages. The result is significant storage savings, reduced network traffic, and easier application management.

The CloudVolumes solution uses the storage you already have to leverage the efficiency of ThinApp application virtualization. You can utilize CloudVolumes ThinApp Edition along with your existing ThinApp packages to completely remove I/O traffic from the network and improve application launch times, yet still maintain isolation between the applications and the operating system. CloudVolumes is synergistic with the read-only nature of ThinApp application packages. The CloudVolumes turnkey solution provides better application management and more predictable performance, while removing the network as a limiting factor, which allows you to leverage high-speed, enterprise-class storage.

Streaming and Local Deployment Modes for ThinApp Packages

In standard usage, VMware ThinApp has the unique advantage of allowing you to determine whether to use streaming or local deployment mode, or to adopt a hybrid approach that lets you stream a set of ThinApp virtual applications from a central location while deploying other ThinApp packages locally. (The same virtualized application packages can be used for either mode.)

Most IT organizations choose to utilize the streaming deployment mode of ThinApp because it is a one-to-many model that leverages centralized file-share resources and requires no disk space on the endpoints. For organizations in security-sensitive environments, VMware ThinApp is the only major application virtualization solution that provides a no-agent, no-residue application-delivery mechanism. While this is an efficient model, it requires some method to register ThinApp packages on target systems. To effectively use streaming mode, IT must design and manage the centralized storage for both redundancy and load. At the same time, network congestion caused by hundreds or even thousands of users launching and re-launching these applications over the network must be factored into the network design.

On the other hand, local deployment mode can be used to create a distributed local-deployment model. In this model, ThinApp packages are copied to each individual virtual desktop. This eliminates the need for centralized storage and also reduces network load, but this requires additional local storage on each virtual desktop for the ThinApp packages.

Using CloudVolumes ThinApp Edition in a Virtual Desktop Infrastructure

With CloudVolumes ThinApp Edition in a virtual desktop infrastructure, you get the advantages of both streaming and local deployment modes for ThinApp packages. ThinApp virtual applications can be placed on a shared virtual disk (VMDK) on any available storage that vSphere supports, including local storage, SSD, NAS, or SAN. This arrangement permits thousands of virtual desktops to share a common ThinApp package without the need to stream or copy the package locally.

Figure 1 shows how CloudVolumes ThinApp Edition complements a VMware Horizon View™ virtual desktop environment.

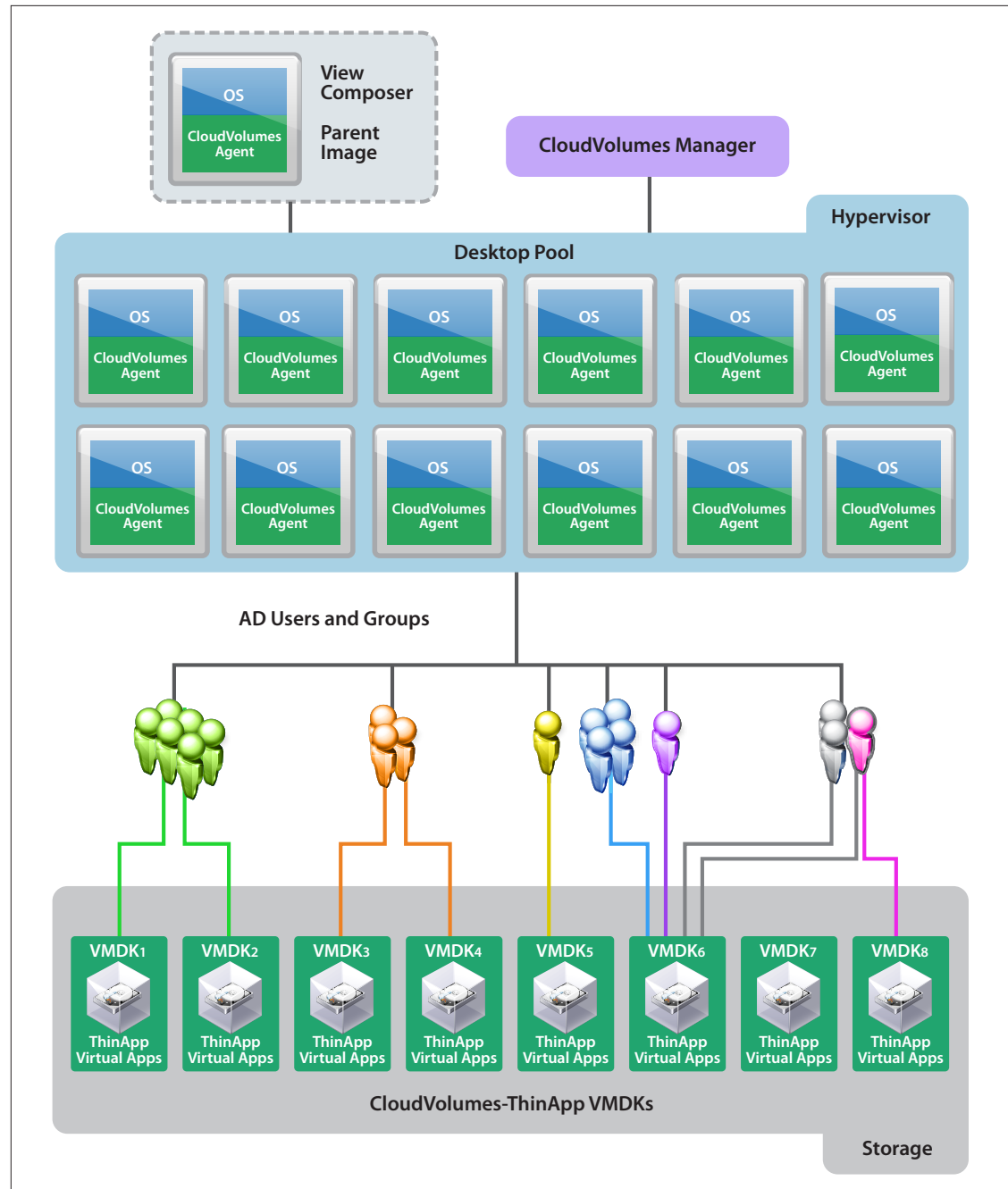


Figure 1: ThinApp Packages in CloudVolumes Shared VMDKs, Shared with Many Virtual Machines at Once

CloudVolumes ThinApp Edition has two parts: the CloudVolumes Manager administrative UI and the CloudVolumes Agent. The CloudVolumes Manager is a stateless Web service installed into one or more virtual machines. It gets its configuration information from a SQL Server database. Multiple Web servers can be used for high availability or load balancing, provided they point to the same SQL Server database. The CloudVolumes Manager is configured to work with VMware vCenter™, as well as with Microsoft Active Directory. In a Horizon View environment with ThinApp packages, the CloudVolumes Manager maintains the associations between shared CloudVolumes-ThinApp VMDKs and specific users or groups in Active Directory. The CloudVolumes Manager communicates with VMware vCenter to attach or detach the CloudVolumes-ThinApp VMDKs on user login and logout. The VMDKs containing the ThinApp packages assigned to a user are attached, in real time, to a virtual desktop as the user logs in to the virtual desktop. When the user logs out of their virtual desktop, the VMDKs are automatically detached. If multiple users are entitled to a ThinApp package located in a CloudVolumes-ThinApp VMDK, that same VMDK is concurrently attached to each virtual desktop. The SQL database stores both configuration and auditing records (login activity, changes to entitlement, use of ThinApp packages, and so on).

The vSphere hypervisor manages Horizon View virtual desktops and desktop pools. CloudVolumes Agent is installed into the base image of the desktop pool so that all virtual desktops in the pool are automatically capable of receiving ThinApp packages from CloudVolumes shared VMDKs. CloudVolumes Agent is comprised of a Windows service and a Windows mini-filter driver and has an on-disk footprint of less than one megabyte. The function of CloudVolumes Agent is to

- Notify the CloudVolumes Manager whenever a user logs in to or out of a virtual desktop
- Automatically register the ThinApp packages contained in the VMDK (using **ThinReg** to update the Start Menu and file associations) after the VMDKs are attached to the virtual desktop by the CloudVolumes Manager

This entire process is transparent to the user and typically completes within seconds of a login, and well before the user even sees their desktop. Users are unaware that the CloudVolumes Agent is installed onto the desktop, and continue to interact with ThinApp virtualized applications in the same way they do without CloudVolumes.

The VMDKs containing ThinApp packages can be automatically generated from a script that synchronizes with the existing ThinApp repository on a CIFS share. This script copies ThinApp packages into a shared VMDK. For more on scripting with CloudVolumes ThinApp Edition, see [Scripting and Automation with CloudVolumes](#).

Caching of CloudVolumes-ThinApp VMDKs within VMware vSphere

Because CloudVolumes-ThinApp VMDKs are read-only, they can be shared across multiple virtual machines concurrently. As a result, they are ideal candidates for hypervisor-based read caching.

Normally, when the ThinApp packages are located on a CIFS file share or in a VMDK on shared storage (such as an EMC storage array or a NetApp filer), running the ThinApp application requires the vSphere hypervisor to read in the ThinApp package from its remote location across the network or through Fibre Channel. Having to send all read I/O from the vSphere hypervisor to the remote storage location adds latency.

Caching solutions check a local cache (either RAM or a local disk of the vSphere machine) for the data a virtual machine is trying to read from the VMDK. If the data is located in the cache, then the read requests can be satisfied within the vSphere machine itself, and the read requests never reach the back-end storage. If the data is not located in the cache, it is read once and then cached locally within the hypervisor-based cache.

Because the CloudVolumes-ThinApp VMDKs are shared across all virtual machines and are read-only, after a ThinApp package is used once, it is served from the local cache for any other access across all virtual machines located on that same vSphere server. This not only improves the performance and responsiveness of the ThinApp applications, but also improves the overall latency of the back-end storage by eliminating all the read I/O previously generated by the ThinApp application.

Managing CloudVolumes-ThinApp VMDKs

Figure 2 shows the AppStacks window of the CloudVolumes Manager UI, which can be used to create or update the CloudVolumes-ThinApp VMDKs and track their usage. An AppStack is a CloudVolumes-ThinApp VMDK that can contain one or multiple ThinApp packages.

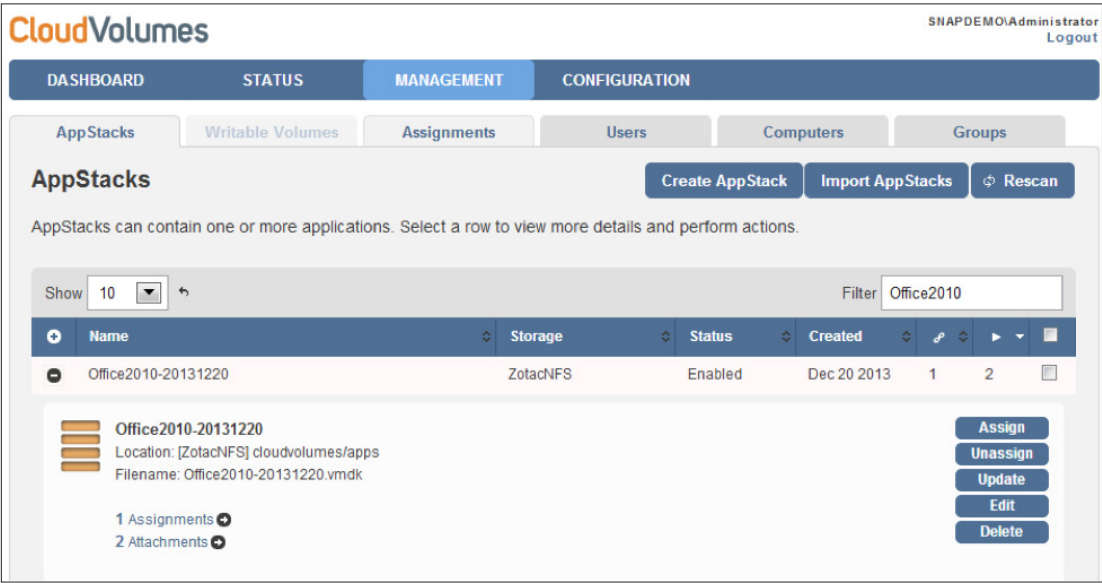


Figure 2: CloudVolumes AppStacks Window Showing a Single CloudVolumes-ThinApp VMDK

Figure 3 shows the window of the CloudVolumes Manager UI where you can view the CloudVolumes-ThinApp VMDKs that are currently in use, and the virtual machines the VMDKs are attached (mounted) to.

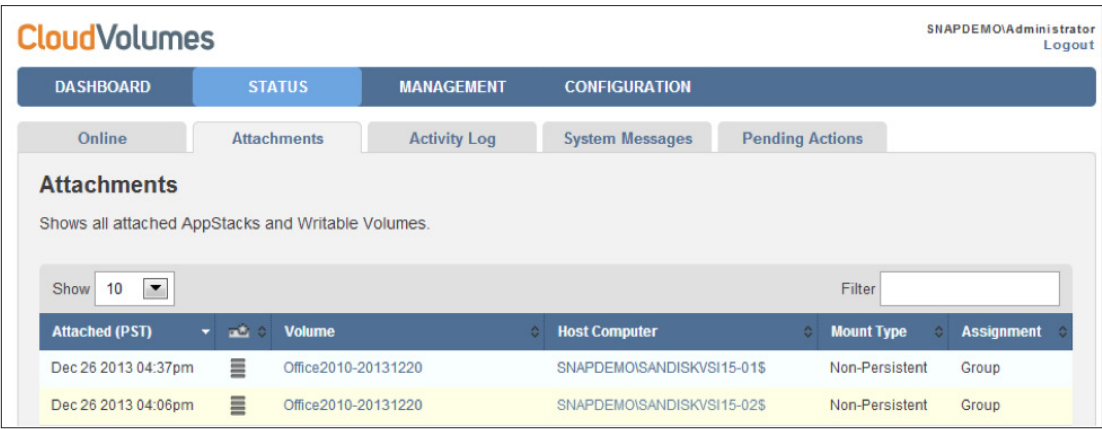


Figure 3: CloudVolumes Attachments Window Showing Where CloudVolumes-ThinApp VMDKs Are Currently Used

Figure 4 shows the window of the CloudVolumes Manager UI where you can view historical usage data for auditing a given user or CloudVolumes-ThinApp VMDK.

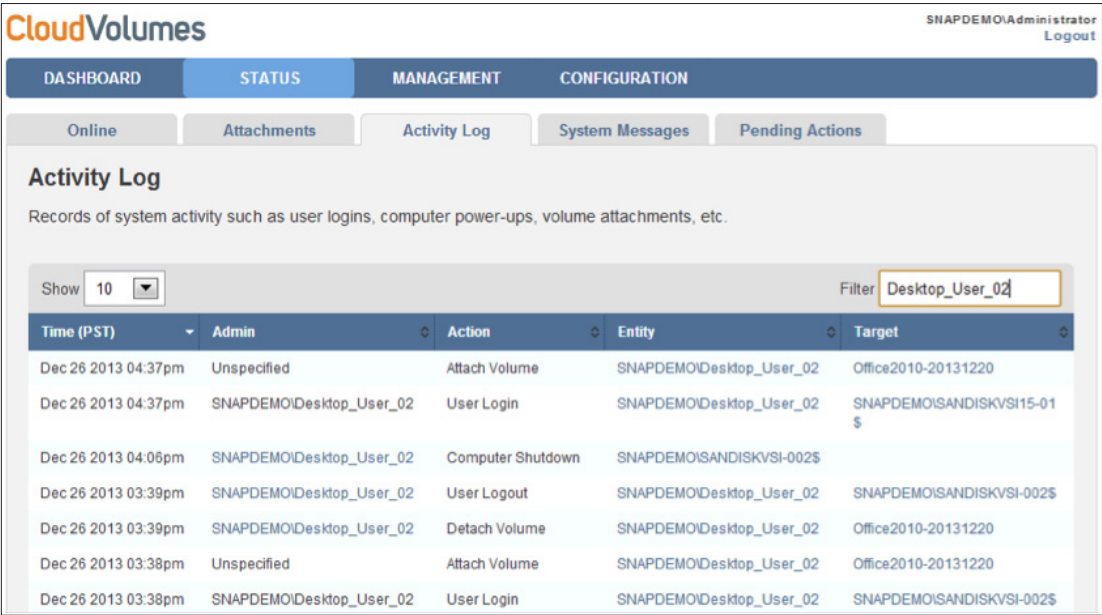


Figure 4: CloudVolumes Activity Log with Searchable Auditing Records

Figure 5 shows how a CloudVolumes-ThinApp VMDK can be entitled (assigned) to one or more Active Directory users, computers, or groups.

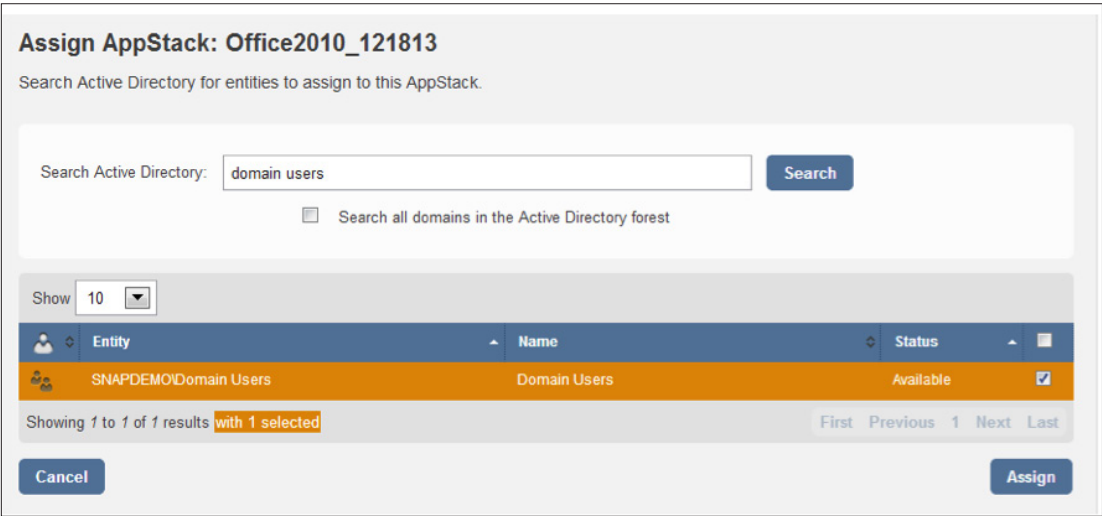


Figure 5: Assigning a CloudVolumes-ThinApp VMDK to All Domain Users

Testing of CloudVolumes ThinApp Edition

The Reference Architecture Workload Code (RAWC) was used to test VMware ThinApp with a CloudVolumes solution in a VMware Horizon View Lab. RAWC simulated a workload where ThinApp virtual applications (Microsoft Office applications and Adobe Reader) were launched every 15 seconds for more than 1.5 hours to establish a true average launch time for the applications over a variety of storage and virtual machine configurations.

We tested launch times and network utilization.

For testing, we used the following product versions:

- Horizon View 5.3 with 64-bit Windows 7 desktops
- ThinApp 5.0
- CloudVolumes ThinApp Edition
- VMware vCenter 5.5 and ESXi 5.1.0, build 716946

Accelerated Launch-Time Performance with CloudVolumes VMDKs

Figure 6 shows a comparison of average launch times for virtualized Microsoft Word 2010 from a remote CIFS share versus from storage controlled by CloudVolumes ThinApp Edition. (In both cases, the ThinApp package resides remotely from the virtual machine on the same EMC VNX storage appliance.)

Virtual application launch time was significantly slower from the CIFS share than from the CloudVolumes-ThinApp VMDK. In addition, the launch time increased drastically with more virtual desktops accessing the application from the CIFS share, while launch time increased very little with more desktops accessing the virtual application from the CloudVolumes-ThinApp VMDK. This reduced application launch time with CloudVolumes enables you to scale your Horizon View environment with little impact to application performance.

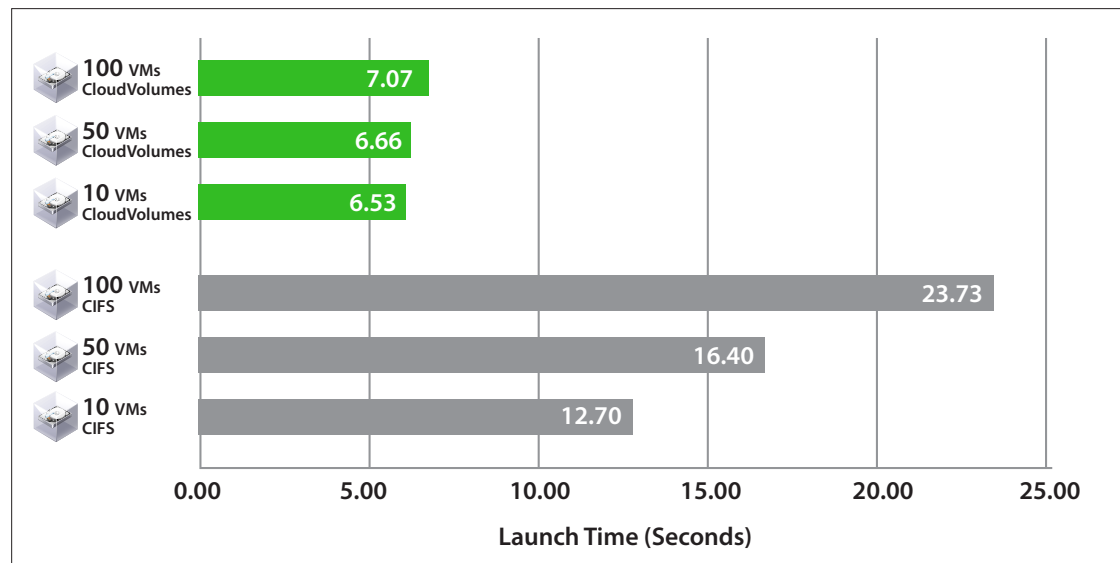


Figure 6: Microsoft Word 2010 ThinApp Virtual Application Launch Time from a CIFS Share Compared to a CloudVolumes-ThinApp VMDK

Also, when the ThinApp package is located in a CloudVolumes-ThinApp VMDK shared by multiple machines (leveraging CloudVolumes to do the dynamic attachment), and the ThinApp package has already been launched from another virtual machine, higher responsiveness is observed than when the ThinApp package is located within each virtual machine's C: drive (the virtual machine's own VMDK), as shown in Figure 7. This is true even when both the virtual machine's own VMDK and the CloudVolumes-ThinApp VMDK are located on the same storage.

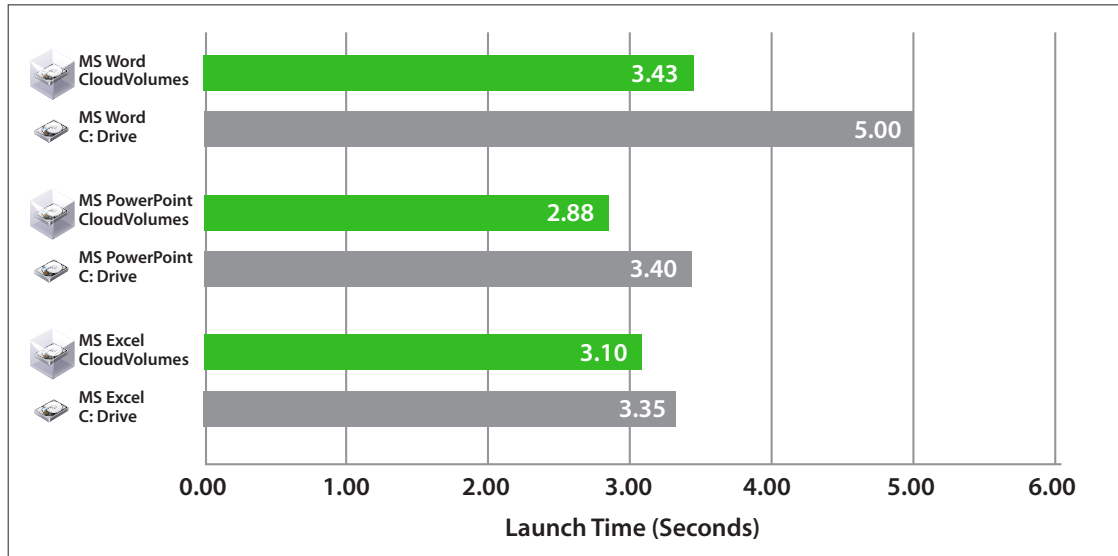


Figure 7: Launch Time of ThinApp Packages from the Virtual Machine's C: Drive VMDK Compared to a Shared CloudVolumes-ThinApp VMDK

Network Utilization Savings with CloudVolumes

Often organizations with tens of thousands of virtual desktops prefer to deploy ThinApp packages locally to the base image to avoid the network congestion created when thousands of desktops stream an application like Microsoft Outlook over the network at the same time in the morning. A major benefit of combining ThinApp packages with CloudVolumes ThinApp Edition is that this solution requires neither network streaming of the application into each virtual machine, nor local deployment of the ThinApp package.

The following graphs illustrate specific tests that compare network utilization when the ThinApp package is streamed to the virtual machine from a CIFS share versus stored on a shared VMDK attached at the hypervisor level by the CloudVolumes Manager at user login.

When the test was performed with the ThinApp packages streamed from a CIFS share to one virtual machine, the average data receive rate was 362KBps, as shown in Figure 8.

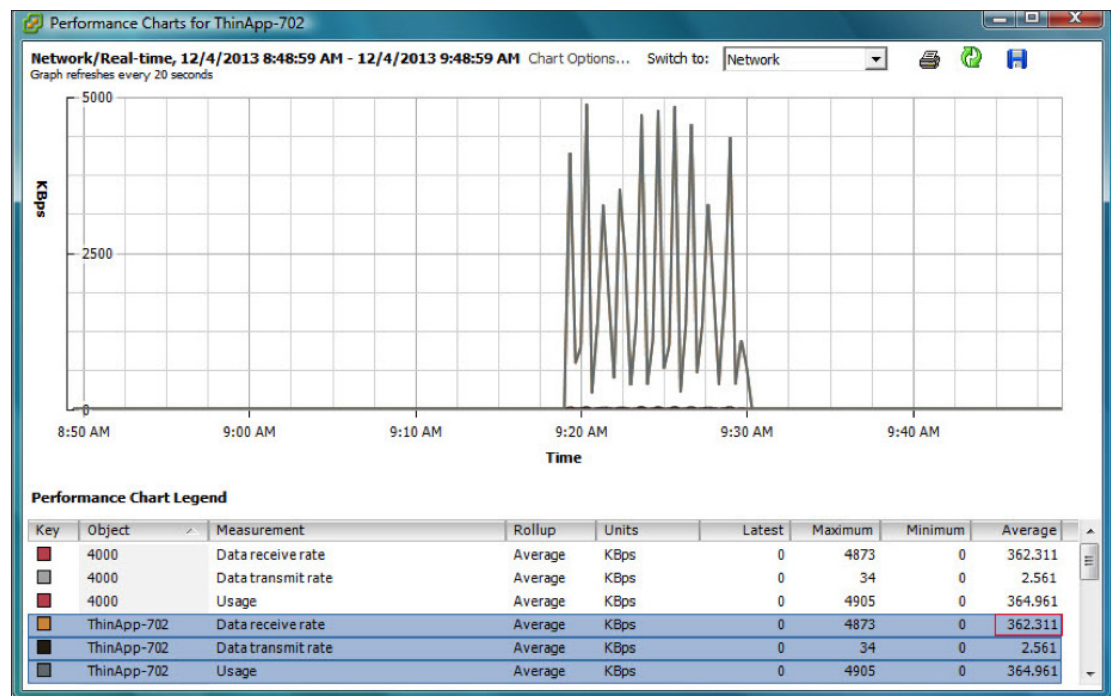


Figure 8: Network Usage Loading a Streaming ThinApp Package from a CIFS Share after User Login

With the ThinApp packages instead located on a CloudVolumes-ThinApp VMDK, the average data receive rate was less than 0.1 KBps, as shown in Figure 9.

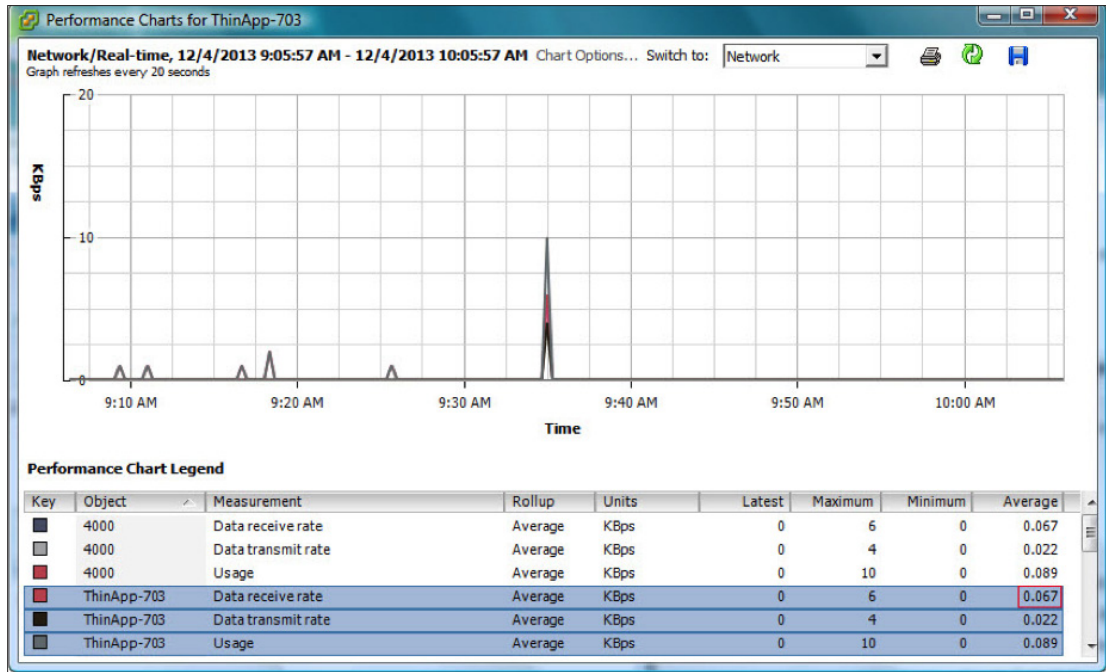


Figure 9: Network Usage Loading a ThinApp Package from a CloudVolumes-ThinApp VMDK after User Login

CloudVolumes Writable Volumes for a Persistent Look-and-Feel with Nonpersistent Pooled Desktops

CloudVolumes ThinApp Edition also provides a mechanism for making nonpersistent virtual desktops appear to end users as persistent desktops (a “hybrid persistence” model). A CloudVolumes *writable volume* can be combined with Horizon View nonpersistent desktop pools to store both user-installed applications and customizations that a user adds to the ThinApp sandbox. The writable volume is a VMDK which is unique to each user and which is attached at login along with the shared CloudVolumes-ThinApp VMDKs.

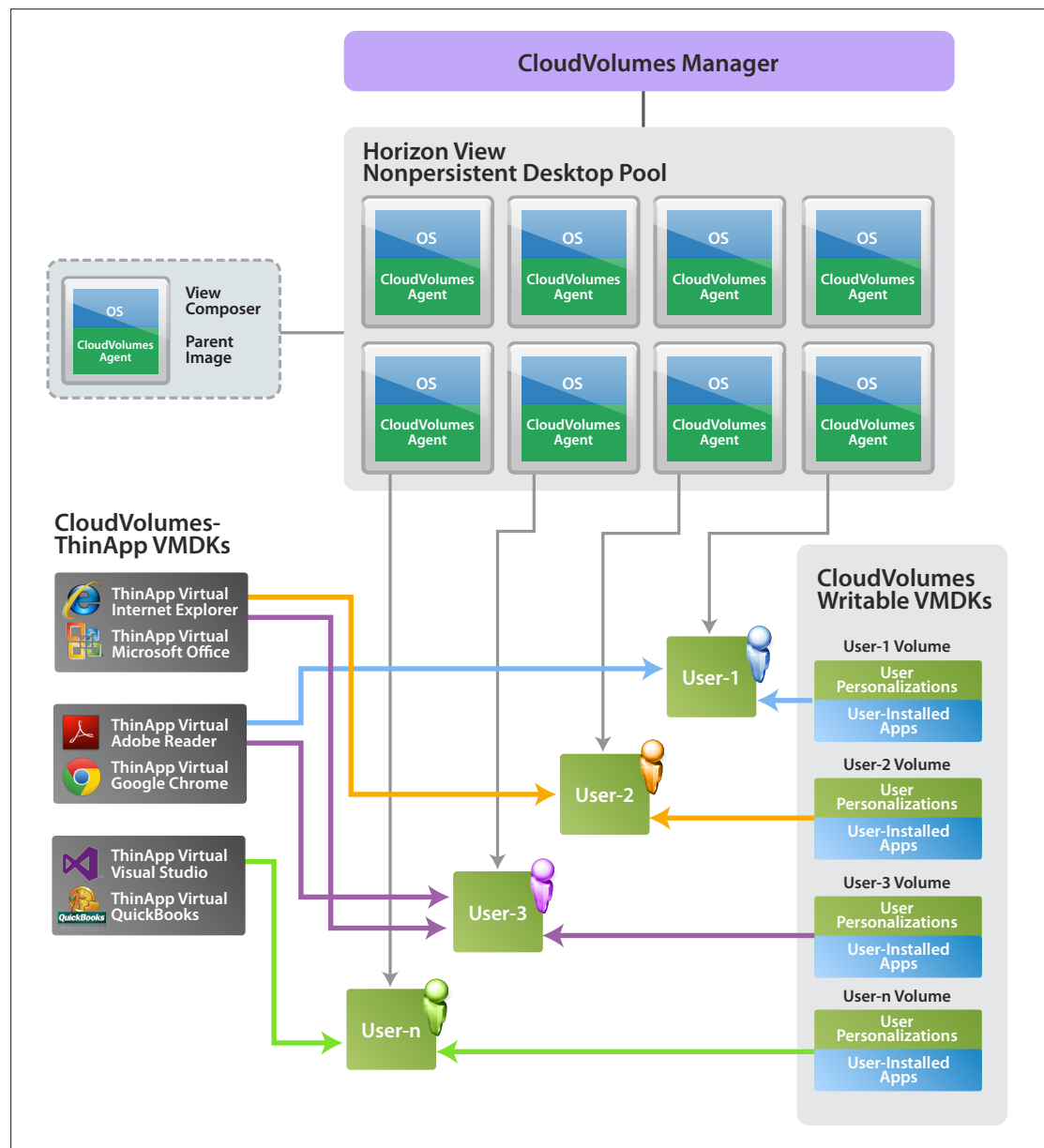


Figure 10: Writable VMDKs for Nonpersistent Desktop Pools Provide a Persistent Look and Feel

Figure 10 shows users accessing nonpersistent pooled desktops, with CloudVolumes-ThinApp VMDKs attached at login for ThinApp packages, and writable CloudVolumes VMDKs attached for personalizations and user-installed applications. Each user has a single associated writable VMDK, and each user can have more than one attached CloudVolumes-ThinApp VMDK.

Pooled nonpersistent desktops paired with the persistent look-and-feel provided by a CloudVolumes writable volume significantly reduces the ongoing cost of VDI management and storage. You maintain only a single OS image and a single copy of applications, but users still have all the flexibility and capability of a persistent desktop—they can have administrator rights, install their own applications, and customize their applications and settings. You can leverage the cost savings of Horizon View nonpersistent desktop pools, while giving each user the unique desktop experience they expect.

For a 1,000-user VDI environment, instead of having 1,000 persistent desktops, you need to create only as many nonpersistent desktops as there are concurrent users. If no more than 100 out of the 1,000 users are ever logged in at the same time (peak concurrency of 100), then only 100 desktops are needed to support all 1,000 users. Boot storms are eliminated because the pool of 100 desktops can be booted up in stages prior to the time when users start logging in. When users start logging in, they are instantly logged in to any available desktop.

If one vSphere hypervisor server is required to handle 100 concurrent Horizon View virtual desktop sessions, and 1,000 users need the capabilities of a persistent desktop, only one vSphere server is needed for a Horizon View nonpersistent pool of 100 desktops if you use a CloudVolumes writable volume to create the illusion of persistent desktops.

By contrast, any solution requiring one desktop per named user (even if some users are logged out), would require at least two vSphere servers because there is a limit of 512 virtual machines registered to named users per VMware vSphere hypervisor. CloudVolumes provides considerable savings in hardware (both storage and servers) because the requirements are based on the number of concurrent users rather than the total number of users.

Scripting and Automation with CloudVolumes

Everything in the CloudVolumes Manager UI is also available through a command-line interface or by leveraging the Web-based SDK (a RESTful API). Therefore, it is easy to integrate these capabilities into an existing orchestration process.

For example, you can use a batch script that checks a CIFS share for new or removed ThinApp packages and automatically adds them to a CloudVolumes-ThinApp VMDK.

Summary

CloudVolumes ThinApp Edition gives IT the best of both ThinApp deployment worlds—better performance than local deployment mode coupled with the ease of management of streaming mode—while allowing for the broader use of nonpersistent desktop pools.

CloudVolumes places ThinApp packages into shared read-only VMDKs which are utilized by end users natively from their virtual desktops as if the ThinApp packages were part of the C: drive. No network traffic is generated, as I/O follows the vSphere storage stack and can be managed dynamically through the CloudVolumes administrative interface. IT organizations can further optimize the environment by placing the CloudVolumes VMDKs with ThinApp packages onto high-speed locally attached SSDs optimized for read access. This places ThinApp virtual applications into cost-effective, high-performance storage containers, without expensive SAN IOPS. This elegant solution empowers IT to provide scalable growth and performance, significant storage savings, and simpler application management while end users benefit from better performance than with locally deployed ThinApp packages.

CloudVolumes ThinApp Edition

- Deploys ThinApp packages from shared VMDKs on any datastore that VMware vSphere supports
- Manages a single virtual disk containing ThinApp packages which can be shared across all users
- Automatically creates file associations and shortcuts at login for all ThinApp packages the user is entitled to
- Increases user density per VMware vSphere host and decreases the amount of hardware required to support end users
- Significantly reduces network usage for ThinApp packages
- Increases performance and responsiveness of ThinApp packages

Additional Resources

[CloudVolumes ThinApp Edition](#)

[VMware ThinApp](#)

[VMware ThinApp Streaming Execution Mode](#)

[Application Registration with VMware ThinApp](#)

[VMware ThinApp Reference Architecture](#)

[Demo videos of CloudVolumes](#)

[CloudVolumes Desktop Edition](#)

[CloudVolumes Server Edition](#)

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