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Introduction
The VMware App Volumes 2.11 Reviewer’s Guide is a comprehensive technical overview to help you evaluate VMware App Volumes™. App Volumes provides real-time application delivery and life-cycle management. IT can use App Volumes to quickly deliver applications and data to users without compromising the user experience.

Audience
This guide is for prospective IT administrators of App Volumes and media reviewers of the product. Knowledge of VMware vSphere® and View in VMware Horizon® 7 or VMware Horizon 6 is helpful.

What You Will Learn
This guide introduces you to App Volumes and how it fits into the VMware End-User-Computing vision. You learn about App Volumes architecture and components, including storage, network, and security. The installation and configuration sections present a basic App Volumes deployment. Exercises in the remaining sections allow you to evaluate some of the product’s key features.

Navigating This Document for App Volumes Use Cases
You can go directly to the App Volumes use cases and their accompanying exercises.

• Application Management with App Volumes
• User-Installed Applications with App Volumes
• ThinApp Integration
• App Volumes Deployment with Remote Desktop Hosted Applications

What Is App Volumes?
App Volumes is a real-time application delivery and life-cycle management tool. Enterprises use App Volumes to centrally manage applications that are deployed to desktops with virtual disks. You do not need to configure individual desktops or applications. App Volumes scales easily and cost effectively without compromising the end-user experience.

App Volumes and the VMware End-User-Computing Vision
App Volumes complements the VMware End-User-Computing portfolio by integrating with existing Horizon 7 components, such as View, VMware ThinApp®, and VMware User Environment Manager™. It also integrates with application and desktop solutions, such as Citrix XenApp and Citrix XenDesktop, and with Microsoft Remote Desktop Session Host (RDSH) environments.

JMP – Next-Generation Desktop and Application Delivery Platform
JMP (pronounced jump), which stands for Just-in-Time Management Platform, represents capabilities in VMware Horizon 7 Enterprise Edition that deliver Just-in-Time Desktops and Apps in a flexible, fast, and personalized manner. JMP is composed of the following VMware technologies:

• VMware Instant Clone Technology for fast desktop and RDSH provisioning
• VMware App Volumes for real-time application delivery
• VMware User Environment Manager for contextual policy management

JMP allows components of a desktop or RDSH server to be decoupled and managed independently in a centralized manner, yet reconstituted on demand to deliver a personalized user workspace when needed. JMP is supported with both on-premises and cloud-based Horizon 7 deployments, providing a unified and consistent management platform regardless of your deployment topology. The JMP approach provides several key benefits, including simplified desktop and RDSH image management, faster delivery and maintenance of applications, and elimination of the need to manage “full persistent” desktops.
The following table lists the desktop solutions that can integrate with App Volumes.

<table>
<thead>
<tr>
<th>DESKTOP SOLUTION</th>
<th>APP VOLUMES INTEGRATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>View in VMware Horizon 7</td>
<td>Attach AppStacks to virtual desktops to deliver applications to users.</td>
</tr>
<tr>
<td>VMware ThinApp</td>
<td>Put virtual packages into AppStacks and deliver them to any supported platform. You can combine native and virtual applications in an AppStack.</td>
</tr>
<tr>
<td>VMware User Environment Manager</td>
<td>Manage App Volumes–based application settings on a detailed level as easily as native application settings.</td>
</tr>
<tr>
<td>Microsoft RDSH</td>
<td>Deliver AppStack-based applications to multiple users who access the same desktop concurrently.</td>
</tr>
<tr>
<td>Citrix XenDesktop</td>
<td>Attach AppStacks to XenDesktop-based virtual desktops to deliver applications to users.</td>
</tr>
<tr>
<td>Citrix XenApp</td>
<td>Deliver AppStack-based applications from a XenApp server to users.</td>
</tr>
</tbody>
</table>

|Table 1: Desktop Solutions and App Volumes Integration|

**Key Benefits**

App Volumes provides the following benefits.

- Persistent desktop experience in a nonpersistent environment
- Multiple applications from a single AppStack
- Application isolation within AppStacks using ThinApp
- Real-time provisioning of applications to users and groups

**Packaging and Licensing**

App Volumes is available as part of the **Horizon 7 Enterprise Edition**, and as part of the **App Volumes Standard, Advanced and Enterprise Editions**.

App Volumes is licensed either for named users or for concurrent users, in both the Horizon 7 Enterprise Edition and the App Volumes Editions.

You can obtain a 60-day evaluation license from the **VMware App Volumes Product Evaluation Center**.
Architecture and Components

This section provides a general overview of how App Volumes works and describes its architecture and components.

How App Volumes Works

Applications are captured to VMDK files, called AppStacks, and provisioned to desktops through user, group, or computer assignment. Administrators manage this process with the App Volumes Manager, a Web-based interface that is integrated with Active Directory (AD) and vSphere.

Applications are presented to the operating system (OS) as if they were natively installed. Quickly providing users with applications that require no installation reduces infrastructure strain and overhead and simplifies application life-cycle management. When an application is no longer required, you can easily remove it.

Applications delivered by App Volumes follow users seamlessly across sessions and devices. Administrators can assign, update, or remove applications at the next user login or in real time. Writable volumes perform a similar function for the user’s application data, allowing users to access data across sessions and devices. Writable volumes complement VMware User Environment Manager solutions, which manage the data within the writable volumes at a more detailed level and provide rules to enforce policy based on certain conditions or events.

You can assign AppStacks to a user or group, as part of a desktop pool deployment, or to a computer for use with an RDSH server. When an AppStack is assigned to a user or group, it is attached at user login. When an AppStack is assigned to a computer, it is attached when the OS has finished loading and before any user has logged in.

App Volumes Architecture

App Volumes uses management servers configured to connect to deployed virtual desktops that run an App Volumes Agent. Administrators assign AppStacks and writable volumes located on shared storage to users, groups, and virtual machines (VMs).
Figure 1 shows the major components of a View environment in which App Volumes is deployed.

For VDI, View virtual machines run on ESXi. Each View virtual machine has the App Volumes Agent installed, and the agent communicates with the App Volumes Manager. AppStacks and writable volumes are attached to the View virtual machines.

For published applications, the RDSH server is a virtual machine running on ESXi, and it has the App Volumes Agent installed on it. As with VDI, the App Volumes Agent on the RDSH server virtual machine communicates with the App Volumes Manager, and AppStacks are attached to the RDSH server.
Storage Considerations
Storage that is assigned to App Volumes contains the VMDK files used by AppStack and writable volumes. The following are recommendations and considerations for AppStack storage.

• Use dedicated AppStack datastores to optimize storage for read-only traffic during application start and use.
• Disk operations and network traffic are increased as more users concurrently mount AppStacks at login and as the applications are started. Scaling infrastructure resources to meet this demand is recommended.
• When combining multiple applications into a single AppStack, it might be necessary to increase the size of the AppStack template from the default of 20 GB. (For more information, see Creating a Customized App Volumes AppStack Template VMDK.)

The following are recommendations for writable volume storage.

• Use RAID 10 to optimize storage for writable volumes.
• Use flash-based storage arrays for writable volumes, such as
  - VMware vSAN 6.0
  - EMC XtremIO
  - Pure Storage FlashArray

For more information, see the VMware App Volumes Reference Architecture.

Storage Groups
You can use storage groups to group datastores together. AppStack storage groups replicate AppStacks to multiple datastores for increased performance in concurrent user scenarios. Writable volume storage groups distribute volumes across datastores, which also improves performance.

When using storage groups for AppStacks, the App Volumes Manager optimizes the connection to the relevant AppStack based on the location and number of attachments across all the datastores in the group.
Figure 2 gives you a high-level view of how this affects storage.

![Diagram showing AppStack storage groups](image)

**Figure 2: High-Level View of AppStack Storage Groups**

When planning your storage infrastructure, determine how many copies of an AppStack are required for optimal performance. The number of copies determines the required number of datastores and storage arrays. Table 2 lists the recommended number of connections per AppStack depending on the storage type.

<table>
<thead>
<tr>
<th>STORAGE TYPE</th>
<th>VMFS</th>
<th>NFS</th>
<th>FLASH STORAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recommended maximum connections per AppStack</td>
<td>128</td>
<td>250</td>
<td>1,000</td>
</tr>
</tbody>
</table>

**Table 2: Recommended Number of Connections per AppStack**

You can use the following equation to determine how many AppStack copies are needed.

\[
\text{Number of users} / \text{Maximum connections per storage type} = \text{Number of AppStack copies}
\]

For example, if you assign an AppStack to 500 users in your organization and the storage type on which they are stored is VMFS, the calculation is:

\[
500 \text{ (Users)} / 128 \text{ (Maximum connections)} = 3.9 \text{ (AppStack copies)}
\]

To optimize performance in this scenario, you need four storage arrays and datastores. You place a single copy of the AppStack on a datastore within the storage group, and the App Volumes Manager replicates it to the other three datastores within the storage group.
Storage groups for AppStacks use the following automation options.

- **Automatic replication** – Replicate any AppStack placed on any datastore across all datastores.
- **Automatic import** – After replication, import AppStacks into the App Volumes Manager, ready for assignment from all datastores.

Storage groups for writable volumes use the following distribution strategies.

- **Spread** – Distribute writable volumes evenly across datastores.
- **Round-robin** – Sequentially distribute writable volumes to the least recently used datastore.

You can use the following two options to configure storage. These options operate independently. You can enable none, one, or both.

- **Mount Local** – Forces App Volumes to look at the datastore where the VM resides for local copies of AppStacks and writable volumes. If the VMDK exists on local storage, it is mounted. Local storage shortens the time to mount. Otherwise, App Volumes checks shared storage.
- **Mount on Host** – Allows App Volumes to issue a mount command directly to the VMware ESXi™ hosts instead of issuing the command through VMware vCenter Server®. App Volumes attaches AppStacks and writable volumes directly to the ESXi hosts. This option shortens the command path and time to mount.

**Note:** For these features to work, all ESXi hosts in the App Volumes infrastructure must use the same root-level user credentials.

For more information, see the *VMware App Volumes User Guide* and the *VMware App Volumes Reference Architecture*.

**Network Considerations**

The following table lists the network ports used by App Volumes. These ports are the defaults and can be customized.

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>NETWORK PORT</th>
</tr>
</thead>
<tbody>
<tr>
<td>App Volumes Web Console</td>
<td>80 (HTTP) / 443 (HTTPS)</td>
</tr>
<tr>
<td>App Volumes Agent to App Volumes Manager server communications</td>
<td>80 (HTTP) / 443 (HTTPS)</td>
</tr>
<tr>
<td>App Volumes Manager server to vCenter Server and ESXi hosts</td>
<td>443 (SOAP / hostd)</td>
</tr>
<tr>
<td>App Volumes Manager server to remote SQL Server</td>
<td>1433</td>
</tr>
<tr>
<td>App Volumes Manager server to Active Directory domain controller</td>
<td>389 (LDAP) / 636 (LDAPS)</td>
</tr>
</tbody>
</table>

**Table 3: App Volumes Network Ports**

If you are using network-attached storage (NAS), keep its traffic local to the vSphere ESXi hosts, and configure the environment to allow for the least amount of network hops between the ESXi hosts and the App Volumes desktop virtual machines.

Each ESXi host with virtual desktops running the App Volumes Agent must be able to communicate with and attach to the NAS device.
Security Considerations
To enhance security in your App Volumes environment, adhere to the following recommendations.

• Replace the default self-signed SSL certificate for App Volumes Manager with a certificate signed by a trusted certificate authority.
• Use a dedicated, read-only Active Directory service account during the App Volumes Manager configuration.
• Deploy ThinApp-packaged applications to leverage the security benefits of isolation modes.

App Volumes Components and Terminology
The major components of an App Volumes environment are as follows.

• **AppStack** – Read-only VMDK file containing one or more Windows applications.
• **Writable volume** – Optional read/write VMDK file for persistent application settings and user data between nonpersistent desktop sessions.
• **App Volumes Manager** – Software installed on a Windows server for the administration and configuration of App Volumes and the assignment of AppStacks and writable volumes.
• **App Volumes Agent** – Software installed on all desktops where users are assigned AppStacks and writable volumes.
• **Provisioning desktop** – A clean desktop VM that includes the OS, necessary updates and service packs, and core applications. The VM is used to create AppStacks.
• **App Volumes Manager console** – A Web console interface to the App Volumes Manager. The App Volumes Manager console is installed as part of the App Volumes Manager.
• **App Volumes database** – A Microsoft SQL Server database that contains configuration information for AppStacks, writable volumes, users, groups, computers, entitlements, and transactions.

App Volumes Benefits
App Volumes offers several benefits.

• **Flexible application delivery** – Deliver and upgrade applications to users or groups in seconds. Dynamically deliver applications without interrupting users, even if they are logged in.
• **Cost-optimized application delivery** – Provide more flexible delivery of applications to users, groups, and devices without changing the existing infrastructure, thereby reducing computing, network, and storage costs.
• **Seamless end-user experience** – Support fully customizable desktops with the option for end users to install their own applications on writable volumes. Users get a persistent user experience with nonpersistent desktops.
• **Application life-cycle management** – Manage the entire application life cycle from initial installation, through updates and upgrades, to seamless replacement. Save time with single-point application deployment and management.
• **Image management** – Manage a common base image while also providing applications outside of the image to specific users and groups in an easily customized and componentized fashion.
New Features
These App Volumes releases support the following new features and enhancements.

App Volumes 2.11
App Volumes 2.11 introduced a new feature and security change.

- **Support for Horizon 7 and 7.0.1** - You can deliver AppStacks and writable volumes to instant clones and linked clones hosted on Horizon 7 and 7.0.1 machines.
- **TLS 1.0 protocol communications disabled from App Volumes Agent** - All communications from the App Volumes Agent are done through TLS 1.1 and TLS 1.2. No configuration changes are needed because the agent communicates only through the newer TLS versions. However, the App Volumes Manager accepts communications through TLS 1.0 to support connections from earlier agents.

App Volumes 2.10
App Volumes 2.10 introduced several new features and enhancements.

- **Windows 10 support** - App Volumes provides support for both AppStacks and writable volumes on Windows 10 desktops.
  
  **Note:** App Volumes does not support applications written for the new Universal Windows Platform.

- **VMware vSphere vMotion® support** - vSphere vMotion is supported in a single vCenter Server environment where all VMware ESX® hosts are running version 6.0 Update 1 or version 5.5 Update 4. To enable vSphere vMotion, set the `AVM_PROTECT_VOLUMES` environment variable to 1 on the App Volumes Manager server. This setting provides protection against accidental deletion of VMDK files.
  
  **Note:** VMware vSphere Storage vMotion® is not supported.

- **Horizon 6 version 6.2 and vSphere 6 Update 1 support**

- **Storage and performance enhancements** - You can now mark a storage array as not attachable. App Volumes Manager ignores this storage array while mounting VMDKs. This feature is useful for simple backups because AppStacks automatically replicate when a datastore is visible to VMware vCenter Server™.

  This release supports up to 2,000 concurrent connections to App Volumes and also provides faster provisioning times for large applications, such as Microsoft Visual Studio and AutoCAD.

- **Ability to expand existing writable volumes** - Space is allocated immediately. Because the disks are thin provisioned, they expand only when you have reached the limit and need extra space. This change takes effect after the next user login.

- **App Volumes templates** set to `NODEFAULTDRIVELETTER` - New templates now have this setting to ensure that they are not automatically assigned a letter by the Windows MountVol utility.

App Volumes Hands-On Evaluation Exercises
This section guides you through installing App Volumes and preparing for the provisioning and deployment desktops. It includes various App Volumes use cases, such as:

- Creating, provisioning, and assigning an AppStack
- Testing user-installed applications (UIAs) in a writable volume
- Integrating App Volumes with ThinApp and RDSH applications

The exercises are taken from the HOL-MBL-1654 Application Delivery and Lifecycle lab and VMware EUC Hands-On Labs.

To perform the exercises, confirm that you meet the system requirements.
Operating System and Software Requirements

The following table lists operating system and software requirements.

<table>
<thead>
<tr>
<th>APP VOLUMES REQUIREMENTS</th>
<th>DETAILS</th>
</tr>
</thead>
<tbody>
<tr>
<td>App Volumes Manager</td>
<td>• Windows Server 2008 R2 or Windows Server 2012 R2</td>
</tr>
<tr>
<td></td>
<td>• Active Directory Domain, Windows Server 2008 functional level and later</td>
</tr>
<tr>
<td></td>
<td>• .NET Framework 3.5</td>
</tr>
<tr>
<td></td>
<td>• Any up-to-date Web browser</td>
</tr>
<tr>
<td>App Volumes database</td>
<td>• SQL Express 2008 R2 SP2 or 2012 SP1 supported for testing or non-production</td>
</tr>
<tr>
<td></td>
<td>• SQL 2008 R2 SP2 or 2012 SP1 Standard and later for production</td>
</tr>
<tr>
<td></td>
<td>• Remote database for production</td>
</tr>
<tr>
<td></td>
<td>• DB_Owner role for installation and operations</td>
</tr>
<tr>
<td>App Volumes Agent (includes provisioning desktops and target desktops)</td>
<td>• Windows 7 32-bit or 64-bit</td>
</tr>
<tr>
<td></td>
<td>• Windows 8.1</td>
</tr>
<tr>
<td></td>
<td>• Windows Server 2008 R2</td>
</tr>
<tr>
<td></td>
<td>• Windows Server 2012 R2</td>
</tr>
<tr>
<td>Hypervisor</td>
<td>• ESXi 5.5 and later with vCenter Server 5.5 and later</td>
</tr>
</tbody>
</table>

Table 4: App Volumes System Requirements

See the VMware App Volumes User Guide, the VMware App Volumes Deployment Considerations, and the VMware App Volumes Release Notes for details on:

- Hardware requirements
- Storage requirements
- Communication ports and protocols
- Current OS and software requirements
Data to Gather Prior to Exercises
As you work through the installation, note the following information so that you can reuse it later during the exercises.

<table>
<thead>
<tr>
<th>APP VOLUMES MANAGEMENT ACCOUNT INFORMATION1</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of account:</td>
<td></td>
</tr>
<tr>
<td>Password:</td>
<td></td>
</tr>
<tr>
<td>App Volumes Administrators Group</td>
<td></td>
</tr>
<tr>
<td>Fully qualified name of administrators group (domain/group):</td>
<td></td>
</tr>
<tr>
<td>App Volumes Manager Server Address</td>
<td></td>
</tr>
<tr>
<td>IP address or host name:</td>
<td></td>
</tr>
<tr>
<td>vCenter Server Information</td>
<td></td>
</tr>
<tr>
<td>IP address or host name:</td>
<td></td>
</tr>
<tr>
<td>Fully qualified name of account:2</td>
<td></td>
</tr>
<tr>
<td>Password:</td>
<td></td>
</tr>
</tbody>
</table>

1 App Volumes requires read-only access to the Active Directory domain. Therefore, the general App Volumes management account must be able to read and browse the entire AD domain to view memberships and items.
2 The vCenter Server administrator account requires administrative permissions at the data center level.

Download App Volumes Software
Download the licensed VMware App Volumes software or the evaluation version. The App Volumes installer is distributed as an ISO file. Mount the ISO on the server where you want to create the App Volumes component. You can also extract the ISO contents to a shared folder. This option allows you to install each component without mounting the ISO each time.

Upgrading from Prior Versions of App Volumes
Upgrading App Volumes from version 2.6 or later to version 2.11 is straightforward. See Upgrading VMware App Volumes Components in the VMware App Volumes User Guide.

If you are upgrading from App Volumes 2.5.x, you need to rebuild AppStacks. Forward compatibility is available only from App Volumes 2.6 and later.

Upgrading App Volumes components involves uninstalling the existing version and installing the newer version. AppStacks are preserved during this process.
New Installation and Configuration

For the purpose of these exercises, install only one App Volumes Manager and use MS SQL Express Server, which is included with App Volumes Manager.

There are several prerequisites.

• Windows Server 2012 R2 VM configured with 2 vCPU and 4 GB RAM.
• Active Directory account with read access to the domain.
• VMware vCenter Server administrator account. This account can be the same account as for Active Directory.
• App Volumes ISO installer. To download the trial evaluation, go to https://my.vmware.com/web/vmware/evalcenter?p=app-volumes.

Install the App Volumes Manager Server

You can either mount the App Volumes ISO to the Windows Server VM or extract the ISO contents to a shared folder accessible by the VM.

1. In the installation folder, double-click setup.exe
2. On the VMware App Volumes Installation Wizard page, click Next.
3. On the License Agreement page, select I accept the terms of the license agreement and click Next.
4. On the App Volumes Install Screen page, select Install App Volumes Manager and click Install.
5. Click Next.

SQL Server Express is installed automatically.

Figure 3: Selecting a Database Server
6. Keep the defaults and click **Next**.

7. Keep the default HTTP and HTTPS port values and click **Next**.

![Figure 4: Defining Network Ports](image-url)
8. Keep the defaults and click Next.

9. Click Install.

10. Click Finish.
App Volumes Configuration
After you have installed App Volumes Manager, you are ready to configure App Volumes, which includes licensing, Active Directory, vCenter Server, and ESXi.

1. Start a Web browser and connect to http://<appvolumesHostname>, where appvolumesHostname is the host name or IP address of the App Volumes Manager server.
2. Click Get Started.
   The default installation includes a 10-user license, which is sufficient for this evaluation.
3. On the License tab, click Next.
4. On the Active Directory tab, enter information for Active Directory Domain Name, Username, and Password. Click Next.

Figure 6: Entering Active Directory Information
5. On the Administrators tab, select the Active Directory group used to administer App Volumes. Click Next.

![Figure 7: Specifying App Volumes Administrators Group](image)

6. On the Machine Managers tab, configure details for a machine manager and click Save.
   a. **Type** – Select vCenter Server from the drop-down menu.
   b. **Host Name** – Enter the FQDN of the server.
   c. **Username** – Enter the user name for the service account that has administrative privileges within a vCenter Server.
   d. **Password** – Enter the password for the service account.

![Figure 8: Entering vCenter Server Machine Manager Details](image)
7. Confirm the machine manager details and click **Next**.
8. On the Storage tab, enter the default storage location details for your AppStacks and writable volumes, and then click **Next**.

![Figure 9: Configuring Storage Details](image)

9. In the Confirm Storage Settings dialog box, click **Set Defaults**.

![Figure 10: Confirming Storage Settings](image)
10. On the Upload Prepackaged Volumes page, select all the options and click **Upload**.

![Figure 11: Uploading Prepackaged Volumes](image)

11. On the Summary tab, click **Next**.

![Figure 12: Confirming Configuration Details in Summary Tab](image)

App Volumes is now configured.
Install the App Volumes Agent

Install the App Volumes Agent on your provisioning desktops and deployment desktops. If you do not already have a provisioned desktop or deployment desktops, see Create the Provisioning Desktop and Create Deployment Desktops.

1. In the Installation folder of the App Volumes installation media, double-click setup.exe. Click Next.
2. On the License Agreement page, select I accept the terms in the license agreement and click Next.
3. On the App Volumes Install Screen page, select Install App Volumes Agent and click Install. Click Next.
4. On the Server Configuration page, enter the address and port number of the App Volumes Manager. Click Next.
5. On the Ready to Install the Program page, click Install.
7. Restart your computer.

Requirements for Further App Volumes Exercises

For these App Volumes exercises, you need:

• A product to create VMs. You can use View or vCenter Server.
• Installation media for an application, such as Adobe Reader. Download two versions of this application. You use the later version in the Update exercise.

You create a master image and prepare the provisioning desktop and deployment desktops from this master image.

Create the Master Image

You use the master image to create the provisioning desktop and the deployment desktops. The master image must have the required OS, the necessary updates and service packs, and core applications common to all user desktops.

Note: If you are using deployment desktops in a View environment, do not install the App Volumes Agent on the master image.

1. Log in to your host from the vSphere Client and create a new VM.
2. Install a supported guest OS, such as Windows 7 SP1 or Windows 8.1. Install the necessary updates and service packs.
3. After the OS installation is complete, log in to the VM as a local administrator and power off the VM.
4. Take a snapshot.

Create the Provisioning Desktop

You use the provisioning desktop to put applications into AppStacks. You must install the App Volumes Agent on the provisioning desktop to connect to the App Volumes Manager.

Note: Revert the provisioning desktop to its clean snapshot before provisioning new AppStacks.

1. Clone the master image.
2. Install the App Volumes Agent on the clone. For more information, see Install the App Volumes Agent.
3. Restart the provisioning desktop and log in to it as a local administrator.
4. Power off the provisioning desktop.
5. Take a snapshot.

Your provisioning desktop is now ready for use with App Volumes. Note the name of the provisioning desktop for use in later exercises.
Create Deployment Desktops
You must install the AppVolumes Agent on the deployment desktops to connect to the AppVolumes Manager.

1. Clone the master image.
   - **Note**: If you are using the deployment desktops in a View environment, ensure that the AppVolumes Agent is not installed on the master image.
2. (Optional) If you are using the deployment desktops in a View environment, install the Horizon Agent on the cloned VM. For more information, see [Install View Agent on a Virtual Machine](#) in Setting Up Desktops and Application Pools in View.
3. Install the AppVolumes Agent on the cloned VM. For more information, see [Install the AppVolumes Agent](#).
4. Restart the VM, wait for the Windows logon screen to appear, and power off the VM.

Application Management with AppVolumes
After you have created your master image, provisioning desktop, and deployment desktops, you are ready to explore AppVolumes application management. The following exercises must be completed in the order presented.

Before beginning, download an application installer, such as Adobe Reader, which you will use in the provisioning process. Download two versions of the application. You use the later version in the Update exercise.

Create an AppStack
An AppStack contains applications to deliver to users. You use the AppVolumes Manager console to create AppStacks.

1. Start a Web browser and navigate to `http://<appvolumesHostname>`, where `<appvolumesHostname>` is the host name or IP address of the AppVolumes Manager server.
2. Log in as an administrator.
3. Click the **Volumes** tab.
4. On the AppStacks tab, click **Create AppStack**.
5. On the Create AppStack page, provide the following details.
   a. **Name** – Enter the AppStack name. For example, you can use the application name, “Adobe Reader.” Although we are naming the AppStack after one application, it is possible to install more than one application on an AppStack.
   b. **Storage** – Select a datastore.
   c. **Path** – Enter the path for the AppStack.
   d. **Template** – Select a template for the AppStack.
   e. **(Optional) Description** – Enter a description for the AppStack. For example, “Contains Adobe Reader.”
6. Click **Create**.

![Figure 13: Entering AppStack Details]

7. In the Confirm Create AppStack dialog box, select **Perform in the background** and click **Create**.
Provision the AppStack

Provisioning involves attaching the AppStack to the provisioning desktop and installing your required applications.

1. On the App Volumes Manager console, click the **Volumes** tab.
2. To view details about the newly created AppStack, click the plus sign next to the AppStack name.
3. Click **Provision**.

![Diagram showing steps to provision an AppStack](image-url)

**Figure 14: Begin AppStack Provisioning**
4. On the Provision AppStack page, enter the name of the provisioning VM you created in Create the Provisioning Desktop.

5. Click **Search**.

6. Select the VM.

7. Click **Provision**.

8. In the Confirm Start Provisioning dialog box, click **Start Provisioning**.
Install the Application
After you have selected your provisioning VM and started the provisioning process, you are ready to install Adobe Reader 10 and complete the process.

1. Log in to the provisioning desktop as an administrator either from a VM console or the vSphere Web Client.
   To access the vSphere Web Client, start a Web browser and navigate to https://<vCenterServerHostname>:port/vsphere-client, where vCenterServerHostname is the host name of the vCenter Server and port is the port number specified during installation. Bookmark this page so that you can return to it easily.

2. On the Home tab, click VMs and Templates.
3. Select the provisioning desktop.

![Figure 16: Starting a Remote Console](image)

5. Log in to the provisioning desktop.
6. If the following provisioning mode dialog box does not appear, reboot the VM.
   **Caution**: Do not click OK now. You must first finish installing all required applications.

![Figure 17: Provisioning Mode Dialog Box](image)

7. Install Adobe Reader.
8. Start Adobe Reader to confirm it has installed correctly.
9. Close Adobe Reader and reboot the VM.

Complete Provisioning
To complete the provisioning process, follow the next steps.
1. In the provisioning mode dialog box, click **OK**.

![Figure 18: Provisioning Mode Dialog Box](image1)

2. Click **Yes** to finish.
3. Click **OK** to reboot.
4. After the VM has rebooted, log in to the VM.
5. In the App Volumes dialog box, click **OK**.

![Figure 19: Provisioning Successful Dialog Box](image2)
6. To verify that the AppStack has been created, in the App Volumes Manager console, click the **Volumes** tab.

7. Click the plus sign next to the AppStack name to display its details. The assignment count is zero, and the AppStack is ready for assignment.

![Figure 20: Details of the Provisioned AppStack](image-url)
Assign the AppStack
After the AppStack has been provisioned, you can assign it to users.

1. In the App Volumes Manager console, click the **Volumes** tab.
2. Click the plus sign to display the AppStack details and click **Assign**.

![Figure 21: Assigning the AppStack](image)
3. On the Assign AppStack page, enter the user name you want to assign the AppStack to and click **Search**.
   **Note:** You can also assign the AppStack to a user group or an Active Directory Organizational Unit (OU).

4. Next to the user name, select the check box.

5. Click **Assign**.

6. In the Confirm Assign dialog box, select **Attach AppStacks on next login or reboot**. Click **Assign**.
Test the AppStack

To test the AppStack, log in to a deployment desktop as the user who was assigned the AppStack. If you are in a View environment, log in to a VDI desktop and skip to step 5.

1. To log in to a vSphere VM, access the vSphere Web Client using the bookmark previously created in your Web browser.
2. Log in as an administrator.
3. On the Home tab, click **VMs and Templates**.
4. In the left pane, select the VM and click **Launch Remote Console**.

![Figure 23: Starting a Remote Console](image)

5. Log in to the deployment desktop. After the user desktop loads, you see the Adobe Reader icon.
6. Start Adobe Reader to verify that it is working.

Figure 24: Starting Adobe Reader

7. Close Adobe Reader.
8. Reboot the VM.
Update the AppStack

An AppStack update involves creating a new AppStack based on the original AppStack. In this example, you update the Adobe Reader 10 AppStack with Adobe Reader 11.

1. On the App Volumes Manager console, click the **Volumes** tab.
2. Display the AppStack details and click **Update**.

![Figure 25: Updating the AppStack](image.png)
3. Enter a name for the updated AppStack. Do not change the storage or path options.
4. Click Create.

5. In the Confirm Update AppStack dialog box, select Perform in the background.
6. Click Update.
7. Wait for the AppStacks page to indicate that the updated AppStack is Unprovisioned.
   Note: The page does not refresh automatically. You need to click Rescan.
8. Display the AppStack details and click Provision.

Figure 26: Entering Updated Details for AppStack

Figure 27: Provisioning AppStack
9. In the Find Provisioning Computer text box, enter the name of the provisioning desktop and click **Search**.
10. Select the provisioning desktop.
11. Click **Provision**.

![Figure 28: Selecting Provisioning Machine and Confirming Details](image)

12. Click **Start Provisioning**.
Complete AppStack Provisioning
To complete the provisioning process, you access the VM console from the vSphere Web Client and install applications on the provisioning desktop.

1. If required, access the vSphere Web Client using the bookmark previously created in your Web browser.
2. Log in as an administrator.
3. On the left side of the Home tab, click **VMs and Templates**.
4. Select the provisioning desktop.
5. On the Summary tab, click **Launch Remote Console**.
6. Log in to the provisioning desktop.
7. If the following provisioning mode dialog box does not appear, reboot the VM. **Caution:** Do not click OK now. You must first finish installing all required applications.

![Figure 29: Provisioning Mode Dialog Box](image)

8. Install Adobe Reader 11.
9. Start Adobe Reader 11 to confirm that it has installed correctly.
10. To complete the provisioning process, click **OK** in the App Volumes provisioning mode dialog box.

![Figure 30: Provisioning Mode Dialog Box](image)
11. Click **Yes**.

![Figure 31: Installation Dialog Box](image1)

12. Click **OK** to reboot the VM.
13. After the VM has rebooted, log in to the provisioning desktop.
14. Click **OK** in the provisioning successful dialog box.

![Figure 32: Provisioning Successful Dialog Box](image2)
15. To verify the AppStack, in the App Volumes Manager console, click the **Volumes** tab.

16. Click the plus sign to display the AppStack details. The assignment count is zero, and the AppStack is ready for assignment.

Figure 33: Details of the Updated AppStack
Unassign the Original AppStack
Before assigning the updated AppStack, unassign the original AppStack.

1. In the App Volumes Manager console, click the Volumes tab.
2. Display the details of the original AppStack and click Unassign.

3. When the user name appears, select the box to the right of it and click Unassign.
4. Select **Detach AppStack on next logout or reboot** and click **Unassign.**

   The original AppStack now shows 0 assignments.

   ![Figure 36: Confirming Zero Assignments](image1)

5. Log in to the deployment desktop used in **Test the AppStack** and verify that the application is no longer available.

6. Log out of the deployment desktop.

**Assign the Updated AppStack**

After you have provisioned the updated AppStack, you can assign it to a user.

1. In the App Volumes Manager console, click the **Volumes** tab.
2. Click the plus sign to display the updated AppStack details and click **Assign.**

   ![Figure 37: Assigning Updated AppStack](image2)
3. On the Assign AppStack page, enter the user name that you want to assign the AppStack to and click **Search**.
4. Select the box next to the user name.
5. Click **Assign**.

![Assign AppStack: Adobe Reader 11](image)

**Figure 38:** Selecting User to Assign to Updated AppStack

6. In the Confirm Assign dialog box, select **Attach AppStacks on next login or reboot**, and then click **Assign**.
Test the Updated AppStack
After the AppStack has been assigned, log in to a deployment desktop to verify that the application is available.

If you are using a View environment, log in to your deployment desktop with the user who has been assigned the AppStack and skip to step 5.

1. Log in to a vSphere VM, and access the vSphere Web Client using the bookmark previously created in your Web browser.
2. Log in as an administrator.

3. On the left side of the Home tab, click **VMs and Templates**.
4. Select the VM in the left pane and click **Launch Remote Console**.
5. Log in to the deployment desktop. After the user desktop loads, you see the Adobe Reader 11 icon.
6. Start Adobe Reader 11 and verify that it is working.
7. Close Adobe Reader 11.
8. Reboot the VM.
User-Installed Applications with App Volumes

A user-installed application (UIA) is captured on a user-assigned writable volume. When a user is assigned a writable volume, the App Volumes Agent running on the user’s desktop redirects all installed applications and settings to the writable volume. It also presents all previously captured UIAs and settings to the user.

With writable volumes, local user profile configurations and application preferences follow AD users as they connect to different desktops and OS versions. This local user profile capability can complement and augment other enterprise profile solutions.

Available templates for writable volumes:

- **UIA only** – Saves a user’s changes to an application in a read-write container. You can use this template with a third-party profile solution or VMware User Environment Manager. For more information, see the blog post [VMware User Environment Manager with VMware App Volumes](https://www.vmware.com/en/home/tech/vmdk/vsphere-template-library.html).
- **UIA and user profile** – Captures a user’s changes to applications and local profile information. Use this template if a profile solution is not in place.

**Note**: Complete the following exercises in the order presented.

**Create a UIA Writable Volume**

The writable volume persists across user sessions, allowing the data to move across desktops with the user.

1. In the App Volumes Manager console, click the **Volumes** tab and then click the **Writables** tab.
2. Click **Create Writable**.

![Figure 40: Creating a Writable Volume](image-url)
3. In the Search Active Directory text box, enter a user name for the writable volume assignment. Click Search.
4. Select the box to the right of the user name.
5. Provide the following details:
   - Destination Storage – Select a datastore.
   - Destination Path – Keep the default path.
   - Source Template – Select template_uia_only.vmdk.
6. Select Prevent user login if the writable is in use on another computer.
7. Click Create.

8. Select Create volumes in the background and click Create.
Confirm User Has Writable Volume

Confirm that the writable volume has been created and assigned to the user.

1. In the App Volumes Manager console, click the Volumes tab and then click the Writables tab. The assigned writable volume has a status of Enabled.

2. To associate the writable volume with the OS of the user's deployment desktop, select the box to the right of the user name and click Edit.

3. Select the operating system.
4. Click Save.
5. To confirm the changes, click Save.
Verify Writable Volume Is Attached to a Deployment Desktop

If you are using a View environment, log in to your deployment desktop with the user who has been assigned the AppStack and skip to step 6.

1. To log in to a vSphere VM, access the vSphere Web Client using the bookmark previously created in your Web browser.
2. Log in as an administrator.
3. On the Home tab, click **VMs and Templates**.
4. Select the deployment desktop, and click **Launch Remote Console** on the Summary tab.

![Figure 44: Starting Remote Console for VM](image)
5. Log in to the deployment desktop.
6. After the user desktop loads, click **Start**, right-click **Computer**, and select **Manage**.

![Figure 45: Starting Computer Management](image1)

7. On the Computer Management page, click **Disk Management** to view the attached writable volume.

![Figure 46: Checking the Writable Volume in Computer Management](image2)

**Note**: You cannot see the attached writable volume in Windows Explorer.
Install and Validate an Application on the Deployment Desktop
In this exercise, you install Adobe Reader 10.

1. Download the Adobe Reader 10 installer.
2. Navigate to the location of the Adobe Reader 10 installer, right-click it, and select Run as Administrator.

3. Complete the installer wizard.
4. After you have installed Adobe Reader 10, start it to verify that it has installed correctly.

5. Log out of the deployment desktop.
6. Reboot the VM.
Confirm Application Availability from Another Deployment Desktop
Verify that the user can access Adobe Reader from another desktop.

1. From the vSphere Web Client, select a different deployment desktop and click **Launch Remote Console** on the Summary tab.

2. Log in to the deployment desktop.
3. After the user desktop loads, the Adobe Reader 10 icon appears.
4. Start Adobe Reader 10 and verify that it is working.
5. Close Adobe Reader 10.
6. Reboot the VM.

**ThinApp Integration**
App Volumes delivers applications to AD users, groups, and computers. Using App Volumes to deliver ThinApp packages provides the best of both worlds—real-time delivery of isolated applications alongside natively delivered applications. In addition to security, ThinApp isolation allows different versions of the same application to run at the same time.

The exercises in this section demonstrate how to deliver ThinApp packages with AppStacks. You must complete the exercises in the order presented.
Before beginning these exercises, do the following:

- Create an MSI-based ThinApp package – For more information, see ThinApp Packaging Process in the ThinApp Reviewer’s Guide.
- Provision an AppStack with the ThinApp package – Follow the steps in Create an AppStack. At the prompt to install applications, install your MSI-based package instead. For more information, see the blog post Using VMware App Volumes with ThinApp Packages.

Assign an AppStack with ThinApp Applications to User
You can assign a ThinApp-based AppStack to a user, group, computer, or OU. In this exercise, you assign the AppStack to a user.

1. In the App Volumes Manager console, click the Volumes tab.
2. Click the plus sign to display the AppStack details.
   - **Note**: To view the applications in the AppStack, click the arrow next to the application count.
3. Click Assign.

![Figure 50: Assigning ThinApp-Based AppStack](image)
4. Enter the user name in the search box and click **Search**.
5. When the user name appears, select the check box.
6. Click **Assign**.

7. In the Confirm Assign dialog box, select **Attach AppStacks on next login or reboot** and click **Assign**. The user now has access to the ThinApp package on this AppStack.
8. To verify that the AppStack has been assigned, click the **Volumes** tab.
9. Click the plus sign to display the AppStack details. The assignment count is 1.

![Image](image-url)
10. Click the assignment count and verify the user name.

Figure 52: Confirming AppStack Assignment

Test the ThinApp-Based AppStack
After the AppStack has been assigned to a user, you are ready to log in to a deployment desktop and verify that the user has access to the ThinApp applications.

1. From the vSphere Web Client, select the deployment desktop and click Launch Remote Console from the Summary tab.
2. Log in to the deployment desktop.
3. After the user desktop loads, you see the application icons that were previously installed on the ThinApp-based AppStack.
4. Start the applications to verify they are working. In this example, the ThinApp-based AppStack included IE6, IE7, Adobe Reader 7.1, Adobe Reader 8, Adobe Reader 9, Opera, Microsoft Office, and OpenOffice.
   
   **Note:** Using ThinApp is the only way to deliver different versions of Internet Explorer with App Volumes.
5. Close the applications.
6. Reboot the VM.
Unassign the ThinApp-Based AppStack
After you have tested the ThinApp-based AppStack, unassign it from the user.

1. On the App Volumes Manager console, click the **Volumes** tab.
2. Click the plus sign to display the AppStack details, and click **Unassign**.

3. When the user name appears, select the box and click **Unassign**.

![Figure 53: Unassigning the ThinApp-Based AppStack](image1)

![Figure 54: Unassigning a User](image2)
4. Select **Detach AppStack on next logout or reboot and** click **Unassign**.

5. Log out of the deployment desktop and log in again. Verify that the applications that are part of the ThinApp-based AppStack are no longer available.

For more information, see the blog posts:

- VMware App Volumes and VMware ThinApp Combined: The Perfect Mix
- Using VMware App Volumes with ThinApp packages

**App Volumes Deployment with RDSH Applications**

Microsoft Remote Desktop Session Host (RDSH) is a role in Remote Desktop Services (RDS) that enables remote users to share applications installed on server hosts in the data center and to share session-based desktops. App Volumes supports AppStack integration with Microsoft RDSH desktops and applications.

This section contains a number of exercises to demonstrate how App Volumes works with RDSH. You must perform the exercises in the order presented.

**Note**: App Volumes integrates with Citrix XenApp servers and Citrix XenDesktop to optimize management of Citrix XenApp published applications and Citrix XenDesktop applications. For more information, see:

- Implementation Considerations for VMware App Volumes in a Citrix XenApp Environment
- Implementation Considerations for VMware App Volumes in a Citrix XenDesktop Environment

**Prerequisites**

There are several prerequisites for using App Volumes with RDSH.

- Create an RDSH server farm in View. For more information, see *Creating Farms* in *Setting Up Desktop and Application Pools in View*.
- Create a restricted Remote Desktop Users group in Active Directory. For more information, see the View Installation guide.
- Create an AppStack for use with an RDSH server and provision it with one or more applications.

**Create an AppStack for Use with RDSH Servers**

When creating a dedicated AppStack for an RDSH server, consider the following.

- You cannot use an AppStack previously provisioned for a desktop OS.
- You must create the AppStack on an RDSH server with the same OS as the deployment RDSH server. For example, create the AppStack on a Windows 2012 R2 RDSH server for users connecting to a Windows 2012 R2 RDSH server.
- Before provisioning the AppStack, switch the RDSH server to installation mode (**RD-Install**).
- After you have installed the applications, switch the RDSH server back to execute mode (**RD-Execute**) before completing the provisioning.

For more information, see the VMware knowledge base article *Provisioning an App Volumes AppStack on a RDSH or Citrix XenApp server (2105428)*.
Connect an AppStack to an RDSH Server

The next steps detail how to connect an AppStack to an RDSH server.

1. Start a Web browser and navigate to http://<appvolumesHostname>, where appvolumesHostname is the host name or IP address of the App Volumes Manager server.
2. Log in as an administrator.
3. Click the Volumes tab.
4. Click the plus sign next to the AppStack you created for your RDSH server to display the AppStack details.
5. Click Assign.

Figure 55: Assigning the AppStack
6. Enter the name of the RDSH server in the search box and click **Search**.
7. When the host name appears, select the box to the right.
8. Click **Assign**.

![Assign AppStack Details](image)

9. In the Confirm Assign dialog box, select **Attach AppStacks on next login or reboot** and click **Assign**.

**Test the AppStack on a Remote Desktop**

After you have assigned the AppStack to an RDSH server, you are ready to test it. In this exercise, you start Horizon Client on a vSphere VM to connect to a remote desktop and confirm that the AppStack is available.

**Note**: Before following these steps, reboot the RDSH server to make sure that the AppStack is attached.

1. Log in to a vSphere VM using the bookmark previously created in your Web browser.
2. Log in as an administrator.
3. On the Home tab, click **VMs and Templates**.
4. Select the VM in the left pane and click **Launch Remote Console**.
5. Log in to the VM.
6. After the VM loads, start Horizon Client.
7. Double-click the entry for the RDSH server and log in.
8. Double-click the entry for the remote desktop session.
9. After the user desktop loads, you see the application icons that are part of the AppStack.
10. Start the applications and verify that they are working.
11. Close the applications and log out.
Create a View Application Pool
The View application pool has remote applications from the AppStack assigned to the RDSH server in the previous exercise.

1. To access the View Administrator console, start a Web browser and navigate to http://<viewHost>/admin.
2. Log in to the View Admin console as an administrator.
3. Click the arrow next to Catalog and select Application Pools.
4. Click Add to add a new application pool.

5. Select the applications to publish to View and click Next.
6. Select Entitle users after this wizard finishes and click Finish.
   The Add Entitlements wizard appears.
7. Click Add.
8. In the Find User or Group dialog box, enter the name of a group in the Name/User name text box.
9. Click **Find** and select the group.
10. Click **OK**.

![Image: Selecting Users for Entitlement]

**Figure 58: Selecting Users for Entitlement**

11. Confirm that your selected user or group is listed and click **OK**.
12. In the View Administrator Console, click **Application Pools** to see the applications.

**Test the View Application Pool**

After you have created the application pool for your RDSH desktops, you are ready to test it.

1. To start Horizon Client from a VM, follow steps 1–6 in **Test the AppStack on a Remote Desktop**.
2. Double-click the entry for the RDSH server and log in.
   Horizon Client shows the shortcuts for the applications you published.
3. Start the applications and verify that they are working.
4. Close the applications and log out.

**Remove the Application Pool and Unassign the AppStack**

First you remove the application pool and then unassign the AppStack from the RDSH server.

1. Start a Web browser and navigate to `http://{viewHostname}/admin`, where `viewHostname` is the host name of the View Connection Server.
2. Log in to the View Administrator console as an administrator.
3. Select **Catalog > Application Pools**.

4. Select the application pool you created and click **Delete**.

![Figure 59: Selecting the Application Pools to Delete](image)

5. Click **OK** to confirm the deletion.

6. Select **Catalog > Application Pools** to verify that the application pool is deleted.

**Unassign the AppStack from the AppVolumes Manager Console**

1. Start a Web browser and navigate to `http://<appvolumesHostname>`, where `<appvolumesHostname>` is the host name or IP address of the AppVolumes Manager server.

2. Log in as an administrator.

3. Click the **Volumes** tab.

4. Click the plus sign to display the RDSH AppStack details and click **Unassign**.

![Figure 60: Unassigning the RDSH AppStack](image)

5. When the user name appears, select the box to the right of it and click **Unassign**.

6. Select **Detach AppStack on next logout or reboot** and click **Unassign**.
7. In the AppStack details, verify that the assignment count is zero.

![Figure 61: Confirming Zero Assignment Count](image)
Summary
This guide introduced key benefits of using App Volumes 2.11 for real-time application delivery and life cycle management. It also provided an overview of App Volumes features, architecture, and components.

Exercises were provided to walk you through the basic installation and deployment process and initial configuration. Integration with external products, including ThinApp and Microsoft Remote Desktop Session Hosted applications, were described.

Additional Resources
For more information, see the following resources.
- VMware App Volumes product Web page
- VMware App Volumes product documentation
- VMware App Volumes Reference Architecture
- VMware App Volumes download
- VMware Horizon 7 documentation
- VMware vSphere 6 documentation
- VMware End-User-Computing Blog, filtered for App Volumes
- VMware App Volumes Hands-On Lab

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