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Introduction
The Reviewer’s Guide for VMware App Volumes 2.13.1 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®, VMware vCenter Server®, Microsoft SQL Server, 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
- App Volumes for real-time application delivery
- 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. 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.

Table 1 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>VMware Horizon Apps</td>
<td>Deliver AppStack-based applications to multiple desktops and RDSH servers.</td>
</tr>
<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, groups, computers, and organizational units (OU)

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

For more information, see App Volumes Editions in the VMware Workspace™ ONE™ and VMware Horizon Packaging and Licensing guide.
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 or VHD 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 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, group, or OU 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 a 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 VMware 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 AppStacks 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.

For more information, see *Best Practices for an App Volumes Deployment in Production* in the *VMware App Volumes Deployment Considerations* guide and 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.

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. Exceeding these recommendations can impact on performance.

<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>750</td>
<td>750</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 datastores from one or more storage arrays. 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 ESXi hosts instead of issuing the command through 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</td>
<td>80 (HTTP) / 443 (HTTPS)</td>
</tr>
<tr>
<td>communications</td>
<td></td>
</tr>
<tr>
<td>App Volumes Manager server to vCenter Server and ESXi</td>
<td>443 (SOAP / hostd)</td>
</tr>
<tr>
<td>hosts</td>
<td></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</td>
<td>389 (LDAP) / 636 (LDAPS)</td>
</tr>
<tr>
<td>controller</td>
<td></td>
</tr>
<tr>
<td>App Volumes Manager to App Volumes Manager</td>
<td>5985 (PowerShell Web Services)</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. For more information, see the blog post Replacing the Self-Signed Certificate in VMware App Volumes 2.12.

• 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 2.13.x

App Volumes 2.13.1 introduced bug fixes for LDAP-related upgrade issues. App Volumes 2.13 introduced several new features and enhancements.

• **Concurrent computer-based and user-based AppStack assignments for VDI** – Computer-assigned AppStacks are attached at computer startup, and user-assigned AppStacks are attached at login. Assigning AppStacks concurrently improves performance for applications with large registry operations, such as Microsoft Visual Studio, and can also improve login times.

  **Note:** Support for concurrent computer-based and user-based AppStacks applies only to VDI. You can attach only computer-based AppStacks to RDSH servers.

• **Limiting AppStack attachments** – You can limit the number of active AppStack attachments and configure each AppStack with a maximum number of concurrent assignments to meet compliance with software licensing.

• **Simplified troubleshooting** – Use the new Troubleshooting tab on the App Volumes Manager to create archives of server logs and configuration files, and download these files to troubleshoot App Volumes. This option simplifies log collection and streamlines troubleshooting efforts.

• **Updated Microsoft OS support** – App Volumes supports Windows Server 2016 on the App Volumes Manager and the App Volumes Agent on servers configured for RDSH or VDI.

App Volumes 2.12.x

App Volumes 2.12.1 introduced two new features.

• **Improved upgrade process** – You can upgrade from App Volumes 2.12 to the latest version without uninstalling the existing 2.12 installation. Configuration and settings are preserved.

  **Note:** If you are using App Volumes 2.11 or earlier, you must uninstall that version before installing App Volumes 2.12.1.

• **Writable volumes exclusions** – You can exclude specific file paths or registry keys from being overwritten. This prevents the specified file paths or registry keys from persisting across sessions.
App Volumes 2.12 introduced several new features and enhancements.

• **Integration with Active Directory**
  - App Volumes 2.12 supports multiple Active Directory domains with one-way and two-way trusts. You can also add multiple domains without using a trust—use an account with read privileges to the domain.
  - You can move an Active Directory user to another OU or rename an Active Directory user without impacting AppStack or writable volume assignments. In previous versions, if an AD user object was moved or renamed, administrators had to recreate AppStack assignments and writable volumes.

• **Security enhancements**
  - You can replace the self-signed certificate on the App Volumes Manager with a trusted SSL certificate from a Certificate Authority (CA).
  - You can securely connect to the vCenter Server using an SSL certificate. In the App Volumes Manager console, accept the vCenter Server certificate when creating a Machine Manager.
    **Note:** The vCenter Server should have a domain SSL certificate.

• **Expanded Windows 10 support**
  - Microsoft Windows 10 CB and LTSB (version 1607)
  - Microsoft Windows 10 CB for Business (version 1607)
  - Windows 10 Anniversary Update (version 1607)
  - Windows 10 Creators Update (version 1703)

• **Support for Office 365 (Office 2016)** – You can deliver Office 365 (Office 2016) applications through AppStacks.
App Volumes Hands-On Evaluation Exercises
This section guides you through installing App Volumes and preparing for the provisioning and deployment of 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

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 2016&lt;br&gt;• Windows Server 2008 R2 or Windows Server 2012 R2&lt;br&gt;• Active Directory Domain, Windows Server 2008 functional level and later&lt;br&gt;• .NET Framework 3.5&lt;br&gt;• Any up-to-date web browser</td>
</tr>
<tr>
<td>App Volumes database</td>
<td>• SQL Server 2016&lt;br&gt;• SQL Express 2008 R2 SP2 or 2012 SP1 supported for testing or non-production&lt;br&gt;• SQL 2008 R2 SP2 or 2012 SP1 Standard and later for production&lt;br&gt;• Remote database for production&lt;br&gt;• 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&lt;br&gt;• Windows 8.1&lt;br&gt;• Windows Server 2008 R2&lt;br&gt;• Windows Server 2012 R2&lt;br&gt;• Windows Server 2016</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 INFORMATION(^1)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of account:</td>
<td></td>
</tr>
<tr>
<td>Password:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>App Volumes Administrators Group</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Fully qualified name of administrators group (domain/group):</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>App Volumes Manager Server Address</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>IP address or host name:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>vCenter Server Information</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>IP address or host name:</td>
<td></td>
</tr>
</tbody>
</table>

| Fully qualified name of account:\(^2\)       |   |
| Password:                                    |   |

---

\(^1\) 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.
**Downloading 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 2.13.1 is straightforward. See *Upgrading VMware App Volumes Components* in the **VMware App Volumes User Guide**.

For App Volumes 2.11 and earlier, upgrading App Volumes components involves uninstalling the existing version and installing the newer version. AppStacks are preserved during this process.

You can upgrade from App Volumes 2.12 to the latest version without uninstalling your existing installation. Configuration and settings are preserved.

**Note:** Prior to any upgrade, back up critical components, such as AppStacks, writable volumes, and the SQL database. You can download the **App Volumes Backup Utility Fling**, to back up AppStacks and writable volumes.

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

![App Volumes Manager](image)

- **HTTP Port**: 80
- **HTTPS Port**: 443

- Allow connections over HTTP (insecure)
- These ports will be allowed through the Windows Firewall
- Allow TLS v1.0 protocol (Not Recommended)

[Image of App Volumes Manager]
8. Keep the defaults, and click **Next**.

9. Click **Install**.

10. Click **Finish**.
Configure App Volumes
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.
3. On the License tab, click Next.
4. On the AD Domains tab, enter the following information.
   a. **Active Directory Domain Name** – Enter the fully qualified AD domain name.
   b. **Username** – Enter the user name.
   c. **Password** – Enter the password.
   d. **Security** – From the drop-down menu, select LDAP over TLS. Use LDAP for a proof-of-concept environment, but it is recommended to use LDAPS for a production environment.
5. Click **Register**, and then click **Next**.

6. On the Admin Roles tab, enter the Active Directory group used to administer App Volumes, click **Assign**, and then click **Next**.

![App Volumes by vmware](image)

**Administrator Roles**

Define the Active Directory groups responsible for administering this App Volumes Manager.

Important information:
- Only users in these groups will be able to log in to the Manager.

- **Role:** Administrator
- **Search Domain:** All
- **Search Groups:**

7. 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.
8. Confirm the machine manager details, and click **Next**.

9. On the Storage tab, enter the default storage location details for your AppStacks and writable volumes, and then click **Next**.

```
8. Confirm the machine manager details, and click **Next**.
9. On the Storage tab, enter the default storage location details for your AppStacks and writable volumes, and then click **Next**.
```

![Image of AppVolumes interface](image-url)

Configure storage options for AppStacks and Writable Volumes.

**Important Information:**
- Use storage that is accessible to all virtual machine host servers.
- Local host storage may be used, but volumes will only be attached for VMs on that host.

**AppStacks**
- **Default Storage Location:** Choose a storage location:
- **Default Storage Path:** `cloudvolumes/apps`
- **Templates Path:** `cloudvolumes/apps_templates`

**Writable Volumes**
- **Default Storage Location:** Choose a storage location:
- **Default Storage Path:** `cloudvolumes/writable`
- **Templates Path:** `cloudvolumes/writable_templates`
10. In the Confirm Storage Settings dialog box, click **Set Defaults**.

```
Confirm Storage Settings

Default storage location for AppStacks:
`t3600-01-Beta-VDI-2-2 at cloudvolumes213GA/apps`

Default storage path for Writable Volumes:
`t3600-01-Beta-VDI-2-2 at cloudvolumes213GA/writable`

- Import volumes in the background
- Import volumes immediately
```

11. On the Upload Prepackaged Volumes page, enter the following details, and click **Upload**.
   a. **ESX Host** – Select an ESX host with access to the selected datastore.
   b. **ESX Password** – Enter the ESX password.
   c. **Volumes** – Select all the options.

```
Upload Prepackaged Volumes

Upload the volumes packaged with this Manager to the selected datastore.
Credentials for an ESX host with access to the selected datastore are needed to convert the uploaded volumes to thin format.

- Storage: `vc-desktops.betamweuc.com: [t3600-01-Beta-VDI-2-2]`
- ESX Host: `Choose a host:`
- ESX Username: `root`
- ESX Password: 
- Volumes: `apps_templates/template_workstation.vmdk`
  - `writable_templates/template_uA_only_workstation.vmdk`
  - `writable_templates/template_uA_plus_profile_workstation.vmdk`

```

12. On the Summary tab, click **Next**.
   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.
4. On the Server Configuration page, enter the address and port number of the App Volumes Manager. Ensure that Disable Certificate Validation with App Volumes Manager is not selected. Click Next.

![Server Configuration](image)

5. On the Ready to Install the Program page, click Install.
7. Restart your computer.
Preparing for Further App Volumes Exercises
The next sections detail how to create desktops for the remaining App Volumes exercises.

Create the Master Image
To create the master image, you need a product to create VMs. You can use View or vCenter Server. 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. Run the VMware OS Optimization Tool on the provisioning desktop, and select the App Volumes provisioning template.
   For details, see the VMware blog post [VMware OS Optimization Tool – New App Volumes Packaging Machine Template](#) and the [VMware Windows Operating System Optimization Tool Guide](#).
3. Install the App Volumes Agent on the clone. For more information, see [Install the App Volumes Agent](#).
4. Restart the provisioning desktop, and log in to it as a local administrator.
5. Power off the provisioning desktop.
6. 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 App Volumes Agent on the deployment desktops to connect to the App Volumes Manager.

1. Clone the master image.
   **Note:** If you are using the deployment desktops in a View environment, ensure that the App Volumes 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 [Installing Horizon Agent on a Virtual Machine](#) in [Setting Up Virtual Desktops in Horizon 7](#).
3. Install the App Volumes Agent on the cloned VM. For more information, see [Install the App Volumes Agent](#).
4. Restart the VM, wait for the Windows logon screen to appear, and power off the VM.
Application Management with App Volumes

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

Before beginning, download an application installer, such as Notepad++, 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 App Volumes Manager console to create AppStacks.

1. Start a web browser and navigate to https://<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. On the AppStacks tab, click Create AppStack.
5. On the Create AppStack page, provide the following information.
   a. Name – Enter the AppStack name. For example, you can use the application name, “Notepad++.” Although we are naming the AppStack after one application, you can 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 Notepad++.”
6. Click Create.

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**.

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**.

![Provision AppStack: Notepad++](image)

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 Notepad++ and complete the process. In this exercise, you install Notepad++ version 7.3.3.

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. In the search text box, enter the provisioning VM name.

3. Select the VM from the list.
4. Click the launch remote console icon.

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.

7. Install Notepad++.

8. Start Notepad++ to confirm that it has installed correctly.

9. Close Notepad++, and reboot the VM.
Complete Provisioning
To complete the provisioning process, follow these steps.

1. In the provisioning mode dialog box, click **OK**.

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**.
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.
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**.

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 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 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. In the search text box, enter the VM name.
4. Select the VM name from the list.
5. Click the launch remote console icon.

6. Log in to the deployment desktop. After the user desktop loads, you see the Notepad++ icon.
7. Start Notepad++ to verify that it is working.

9. 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 Notepad++ AppStack with Notepad++ version 7.5.1.

1. On the App Volumes Manager console, click the Volumes tab.
2. Display the AppStack details, and click Update.
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: If the page does not refresh automatically, click **Rescan**.
8. Display the AppStack details, and click **Provision**.
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**.

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. In the search text box, enter the provisioning VM name.
4. Select the VM name from the list.
5. Click the launch remote console icon.
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.
8. Install Notepad++ 7.5.1.
9. Start Notepad++ to confirm that it has installed correctly.
10. To complete the provisioning process, click OK in the App Volumes provisioning mode dialog box.
11. Click **Yes**.

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.
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.
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.

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**.

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**.

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 6.

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. In the search text box, enter the VM name.
4. Select the VM name from the list.
5. Click the launch remote console icon.
6. Log in to the deployment desktop. After the user desktop loads, you see the Notepad++ 7.5.1 icon.
7. Start Notepad++ and verify that it is working.
9. 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](#).
- **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**.
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 information:
   - **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. Select **Delay writable creation for group/OU members until they login**.
   **Note:** It is important to select this option when creating user-writable volumes for a large group or OU. If this option is not selected, a series of create requests are sent to vCenter Server, which can degrade performance.

8. Click **Create**.

9. Select **Create volumes immediately**, 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. Click the plus sign to display the writable volume details.

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. In the search text box, enter the VM name.
4. Select the VM name from the list.
5. Click the launch remote console icon.
6. Log in to the deployment desktop.
7. After the user desktop loads, right-click the start icon, and select **Computer Management**.

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

*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 Notepad++ 7.5.1.

1. Download the Notepad++ 7.5.1 installer.
2. Navigate to the location of the Notepad++ 7.5.1 installer, right-click it, and select Run as Administrator.
3. Complete the installer wizard.
4. After you have installed Notepad++ 7.5.1, 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 Notepad++ from another desktop.

1. From the vSphere Web Client, select a different deployment desktop and click the Launch Remote Console icon.

2. Log in to the deployment desktop.
3. After the user desktop loads, the Notepad++ icon appears.
4. Start Notepad++ and verify that it is working.
5. Close Notepad++.
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.
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.
10. Click the assignment count, and verify the user name.
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, enter the VM name in the search text box.
2. Select the VM name from the list.
3. Click the launch remote console icon.
4. Log in to the deployment desktop.
5. After the user desktop loads, you see the application icons that were previously installed on the ThinApp-based AppStack.
6. Start the applications to verify they are working.
7. Close the applications.
8. 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**.

![Unassign AppStack: ThinApp Packages](image)

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) 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 Published Desktops and Applications in Horizon 7.
- 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

You can assign AppStacks to AD user- or computer-based objects, such as users, computers, groups, and OUs. When assigning AppStacks to RDSH servers, only computer-based assignments are supported. For this use case, we recommend assigning AppStacks to OUs, because it streamlines the assignment process for large RDSH farms. If you are creating instant-clone farms with VMware Horizon, an OU assignment is required.

The next steps detail how to connect an AppStack to a single RDSH server using a computer-based assignment. If you are using a full-clone RDSH farm, this process suffices for the purpose of this evaluation. If you are using an instant-clone farm, assign the AppStack to the OU where the RDSH server's computer object resides rather than directly to the RDSH server object.

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.
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: Office2016_RDSH](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. Enter the VM name in the search text box.
4. Select the VM name from the list.
5. Click the launch remote console icon.
6. Log in to the VM.
7. After the VM loads, start Horizon Client.
8. Double-click the entry for the RDSH server and log in.
9. Double-click the entry for the remote desktop session.
10. After the user desktop loads, you see the application icons that are part of the AppStack.
11. Start the applications and verify that they are working.
12. 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**.

![Find User or Group dialog box](image)

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 to 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.
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 App Volumes Manager Console

1. Start a web browser and navigate to https://<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 to display the RDSH AppStack details, and click **Unassign**.

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.
Summary
This guide introduced key benefits of using App Volumes 2.13.1 for real-time application delivery and life-cycle management. It also provided an overview of App Volumes features, architecture, and components.

Exercises walked you through the basic installation and deployment process and initial configuration. Integration with external products, including ThinApp and Microsoft RDSH applications, were described.

Additional Resources
For more information, see the following resources.
- VMware App Volumes Product Web Page
- VMware App Volumes Documentation
- VMware App Volumes Reference Architecture
- VMware App Volumes 2.x Database Best Practices
- 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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