Deploy applications faster and save precious storage space and time

by adding VMware App Volumes to your virtual desktop environment

Choosing a virtual desktop infrastructure (VDI) typically requires you to make tradeoffs. Persistent desktops are more expensive but offer greater flexibility and a better experience for users. Non-persistent desktops are economical but provide users with fewer options. Each approach can be appropriate depending on your end users' needs, and adding VMware App Volumes can help you in either case.

We performed hands-on testing in our datacenter to explore the value of implementing App Volumes. We discovered that using App Volumes in both persistent and non-persistent Citrix XenDesktop environments let us deploy applications more quickly and required less physical storage space than the same setup without App Volumes. We also found that App Volumes includes features that can make life easier for end users and IT admins.

As we will show, leveraging VMware App Volumes in persistent and non persistent VDI environments can save your company money across the board.

VDI time and cost savings with App Volumes
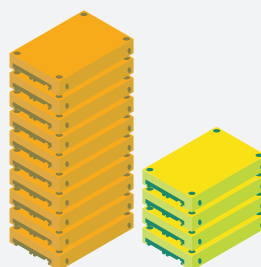
Condense up to
3 days of work into

46
minutes

Up to 96% time savings

Cut storage needs
by more than

half

Up to 60% space savings

Save up to

453
steps

Up to 90% fewer steps

Persistence is a virtue—sometimes!

Persistent desktops offer many advantages, but their expense is not always justified. Companies deploying virtual desktop infrastructures need to choose the approach that best fits the specific needs of its employees.

Organizations provide **persistent desktops** when the people using the computers require the greatest functionality and flexibility. End users log into their desktops, or virtual machines (VMs), from any location and access their own applications, files, and personal preferences just as they could using their own laptop or desktop computer.

With persistent deployments in VDI environments such as Citrix XenDesktop or VMware Horizon,[1] each end user receives a designated amount of disk space to host their VM. That disk space grows as they add applications and files.

Many organizations opt to furnish more economical **non-persistent desktops**, where one or more pools of VMs are created for end users. This option requires much less storage space than persistent deployments because end users share a common disk image. When a non-persistent virtual machine reboots, it loses any changes the end user has made to the desktop.
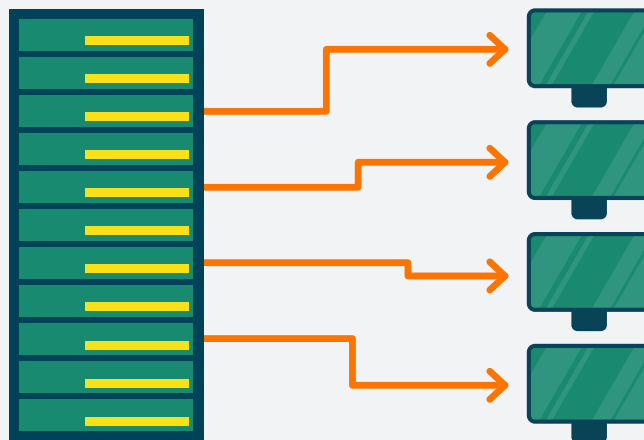
With non-persistent deployments, VDI environments such as Citrix XenDesktop or VMware Horizon serve all end users the same desktop environment, which reduces the total amount of storage needed. The desktop is easier to patch, too, because the common disk image is the only part that gets patched.

VMware App Volumes streamlines delivery and maintenance of applications and reduces the amount of storage space required—in both persistent and non-persistent environments. Because App Volumes is able to stream applications directly to users in real time, administrators could convert persistent environments into non-persistent environments without losing the user experience of those persistent deployments.[2] This flexibility eases the administrative burden on IT and makes sure users only get the apps they need.

IT admins

IT admins in persistent and non-persistent environments save time and steps when installing applications.

End users

Users in non-persistent environments can start working more quickly and have an experience closer to persistent.[2]

Storage space usage in persistent and non-persistent environments goes down with App Volumes.

What about PC Lifecycle management tools?

In some companies, VDI admins use legacy management tools to help deploy applications. While we did not perform testing using such tools, it is possible that replacing them with App Volumes would bring savings.

Benefits of using App Volumes in persistent environments

In a persistent VDI deployment, every end user has a dedicated VM that they can access from any number of devices and locations. When they start a work session—whether at the office, at home, or on the road—their applications and files are all available the same way they would be if they were using a full-featured laptop or desktop system.

Meet Susan and Juan, two IT administrators who support persistent VDI environments. Juan's company has invested in App Volumes, but Susan must perform all of her VDI support tasks manually.

Juan uses App Volumes

Juan works for a small healthcare facility. His company chose a persistent infrastructure so that medical staff could load their virtual desktops from any enabled terminal.

Because they also chose to use App Volumes, Juan can roll out new applications to staff more quickly than he would otherwise be able to. Using App Volumes Manager to quickly assign individual AppStacks lets Juan keep everybody happy, optimize storage use, and delay costly storage upgrades. If the company decides to move from persistent desktops to non-persistent desktops at some point, Juan can make the switch without rebuilding his AppStacks or redeploying applications.

Susan installs applications one at a time

Susan works for a large law firm. Her company chose a persistent infrastructure because lawyers have specific application and confidentiality requirements, and they expect a full-featured experience.
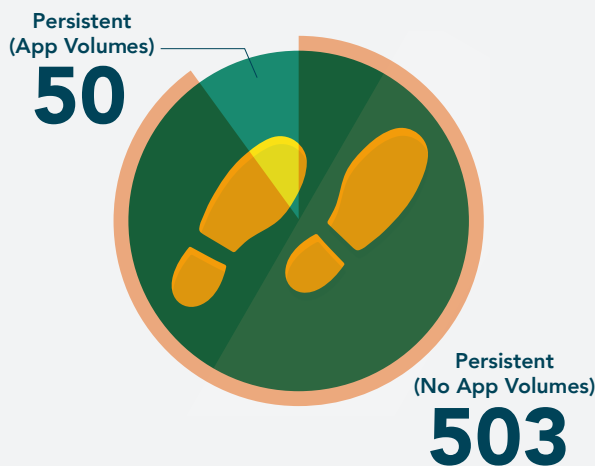
Without App Volumes, she has to install new applications for her associates one at a time. This means logging into each virtual machine as an admin and installing the applications that each person needs. This process can be time-consuming, and Susan often falls behind and forces the attorneys to wait.

In the Principled Technologies datacenter, we measured the benefits Susan could expect to see if she were to implement App Volumes at her firm. We set up a Citrix XenDesktop environment and deployed a pool of 25 persistent virtual desktops two ways: first using only Citrix XenDesktop and then leveraging VMware App Volumes 2.10. We then deployed applications to those desktops.
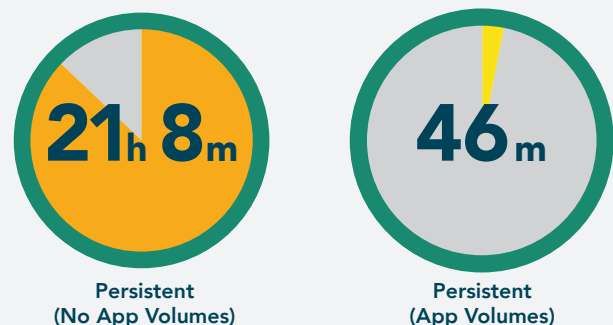
With App Volumes, installing applications to the 25 persistent desktops required 50 steps and took less than an hour. Without App Volumes, doing this job needed a whopping 503 steps and over 21 hours—almost three full work days!

It's easy to see how adding App Volumes could boost the firm's productivity and make Susan's life easier.

Number of admin steps required to install applications for 25 end users

Persistent (App Volumes)
50

Persistent (No App Volumes)
503

Amount of admin time to install applications for 25 end users

21h 8m

Persistent (No App Volumes)

46m

Persistent (App Volumes)

Use less disk space for storage

Storage space is valuable. Any opportunity to reduce the amount of disk space your employees' VDI profiles require is a direct benefit to your bottom line. You have less hardware to purchase, maintain, and house; more time until you need to buy more storage; and the ability to support more end users with a given amount of storage. App Volumes reduces the amount of storage your persistent and non-persistent deployments use. It does this through one-to-many provisioning, abstracting applications into packages that IT can stream to end users in real time. It also offers writeable volumes,[3] which lets IT give users the ability to install their own apps, which are then available to them each time they log in.

Benefits of using App Volumes in non-persistent environments

569.5GB

225.6GB

Persistent
(No App Volumes)

Persistent
(App Volumes)

Let's return to Juan and Susan and imagine that they've both changed jobs. Susan manages a VDI deployment at a call center and Juan does the same at a training facility. Both companies use non-persistent desktops. This time, Susan is the fortunate one who gets to work with App Volumes.

With non-persistent desktops, every time someone logs into their virtual desktop, the system assigns a fresh image. This is great from the perspective of resource usage, because the system doesn't need to fill up valuable disk space remembering things such as personal preferences, nor does it need to allocate space just in case a worker might need it in the future. While the person using the desktop has fewer means of customization, the desktop environments are always consistent, which ensures that the employee's workflow is the same across any device.
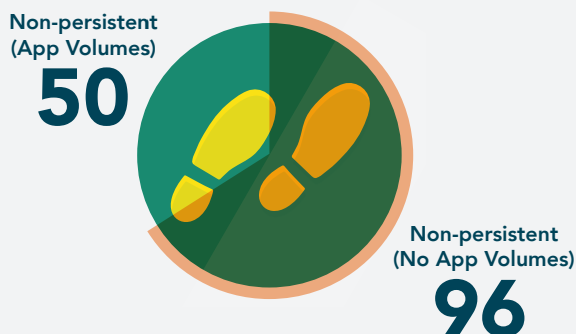
Because Susan uses App Volumes, she gets one of the best features of persistent deployments in non-persistent deployments: she can assign each employee their own individual applications.

Without App Volumes, Juan's non-persistent deployment must rely on a single master image. When he wants to make changes for his employees, he modifies that master image, which affects everyone—it's an all-or-nothing situation. With App Volumes, Susan can choose which users get the specific applications they want and stream those apps in real time to their virtual desktops.

We measured the kind of benefits Juan could expect to see if the training center adopted App Volumes. We deployed a pool of 25 non-persistent virtual desktops using only Citrix XenDesktop, and then we added App Volumes 2.10. As we saw in our persistent environment, using App Volumes streamlined the process of installing applications and reduced disk space usage. With App Volumes, our 25 non-persistent desktops used 206.3 GB, 9 percent less space than the 226.7 GB they used without App Volumes.

Number of admin steps required to install applications for 25 end users

Non-persistent
(App Volumes)
50

Non-persistent
(No App Volumes)
96

Amount of admin time to install applications for 25 end users

2h**55**m

46m

Non-persistent
(No App Volumes)

Non-persistent
(App Volumes)
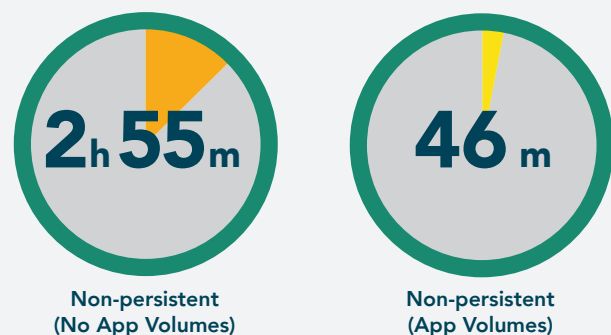
Conclusion

IT administrator time and disk storage space can both be significant expenses for companies implementing a virtual desktop infrastructure. A proven application and user management solution can optimize your use of both of these resources and make life easier for IT admins and end users alike.

We set up a Citrix XenDesktop environment with both persistent and non-persistent virtual desktops. We then deployed applications to all of these desktops with and without VMware App Volumes. Using App Volumes shortened application deployment time by as much as 96 percent and the one-to-many provisioning in App Volumes cut the amount of physical storage space we needed by up to 60 percent.

Whether your company uses persistent or non-persistent desktops, implementing VMware App Volumes in your VDI environment can give IT admins like Juan and Susan more time and help whittle storage space down to size.

How does App Volumes work?

For years, IT admins have been using App Volumes to manage workloads by using a single copy of an application, or stack of applications, while keeping the data and settings specific to the desktop or individual. One-to-many provisioning greatly reduces storage and operational costs. Decoupling operating system images and applications reduces the number of images IT must manage and dramatically decreases repetitive application maintenance tasks.

The workflow looks like this:

1. Install App Volumes Manager in your environment.
2. Install App Volumes Agent on clean image.
3. Create AppStack in App Volumes Manager and select provisioning host.
4. Install application(s) while the App Volumes Agent records the steps.
5. Complete provisioning in App Volumes Manager.
6. Deliver AppStacks to individuals or machines.

Some of the features App Volumes offers

- Support for both user-based and machine based assignment.
- Flexible delivery options. Admins can attach applications to specific users, machines, or groups, to make sure that users get only the apps they need. Some other VDI application delivery platforms take an "all or nothing" approach.
- App Volumes Manager, which makes isolating applications easy. An AppStack can consist of any number of applications. Administrators can choose how to group and deliver the applications their users need.
- According to VMware, App Volumes can work with end user installed apps via writable volumes, and IT admins can couple them with VMware User Environment Manager (UEM) to make apps and user environment settings available in real time.[3]

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1   In addition to Citrix XenDesktop, App Volumes supports VMware Horizon and Microsoft Remote Desktop Services (RDS) environments. PT did not test this feature. We base the statement on VMware material available at https://www.vmware.com/pdf/app-volumes-29-users-guide.pdf

2   PT did not test this feature. We base the statement on VMware material available at https://www.vmware.com/files/pdf/techpaper/vmware-horizon-view-app-volumes-deployment-guide.pdf

3   PT did not test this feature. We base the statement on VMware material available at https://www.vmware.com/files/pdf/techpaper/vmware-app-volumes-technical-faq.pdf

On May 10, 2016, we finalized the hardware and software configurations we tested. Updates for current and recently released hardware and software appear often, so unavoidably these configurations may not represent the latest versions available when this report appears.

Appendix A – System information

The table below provides detailed configuration information for the enclosure under test.

Server enclosure configuration information	Cisco UCS 5108
IO modules	
Vendor and model number	Cisco® UCS 2208XP
I/O module firmware revision	2.2(5a)
Number of modules	2
Occupied bays	1, 2
Power supplies	
Vendor and model number	200-240VAC PSU for UCS 5108 Blade Server Chassis
Number of power supplies	4
Wattage of each (W)	2,500
Cooling fans	
Vendor and model number	Cisco N20-FAN5
Number of fans	8

The table below provides detailed configuration information for the storage solution.

Storage configuration information	Dell EqualLogic PS6100
Controller firmware revision	7.0.0 R3
Number of storage controllers	2
Number of storage shelves	1
Number of drives per shelf	24
Drive vendor and model number	Seagate ST93000653SS
Drive size (GB)	300
Drive information (speed, interface, type)	15K, 12Gb SAS, HDD

The table below provides detailed configuration information for the server under test.

Server configuration information	Cisco UCS B200 M3
BIOS name and version	Cisco S5500 2.2(5b)B
Operating system name and version/build number	VMware ESXi 5.5
Date of last OS updates/patches applied	04/01/16
Power management policy	Performance
Processor	
Number of processors	2
Vendor and model	Intel® Xeon® E5-2690
Core count (per processor)	8
Core frequency (GHz)	2.9
Stepping	6
Memory module(s)	
Total memory in system (GB)	256
Number of memory modules	16
Vendor and model	Cisco UCS-MR-1x162RY-A
Size (GB)	16
Type	PC3-12800
Speed (MHz)	1,600
Speed running in the server (MHz)	1,600
Storage controller	
Vendor and model	LSI™ MegaRAID SAS 2004 ROMB
Firmware version	4.37.00
Driver version	20.12.1.-0206
Local storage	
Number of drives	2
Drive vendor and model	Seagate® A03-D146GA2
Drive size (GB)	140
Drive information (speed, interface, type)	10k, 6Gb SAS, HDD
Network adapter	
Vendor and model	Cisco UCS VIC 1240
Number and type of ports	2 x 20GbE and 20Gb Fibre Channel
Driver version	4.0(5bS2)

Appendix B – How we tested

The table below presents the infrastructure layout we used to configure the Citrix® XenDesktop® environment.

VM name	Hosted OS	Role (s)	Server	Memory	# of vCPUs
DC1	Microsoft® Windows® 2012 R2 x64 Enterprise	AD Domain controller VSI Share, DHCP, DNS, NTP	Infrastructure	8 GB	4
LIC	Windows 2012 R2 x64 Enterprise	XenDesktop License Server	Infrastructure	8 GB	4
PVS	Windows 2012 R2 x64 Enterprise	XenDesktop Provisioning Services, Delivery Controller, Studio, Director, StoreFront	Infrastructure	8 GB	4
APPV	Windows 2012 R2 x64 Enterprise	VMware App Volumes	Infrastructure	8 GB	4
vCenter	Windows 2012 R2 x64 Enterprise	VMware Virtual Center, SQL server	Infrastructure	8 GB	4
Windows 7 Master	Windows 7 x64 Enterprise	XenDesktop master image	Servers under test	4 GB	2
Windows 8 Master	Windows 8 x64 Enterprise	XenDesktop master image	Servers under test	4 GB	2
Windows 10 Master	Windows 10 x64 Enterprise	XenDesktop master image	Servers under test	4 GB	2

We used generic NAS for the infrastructure VMs and a Dell EqualLogic PS6210X array, cabled to a 10GbE switch to provide storage for the servers under test. We configured the Dell EqualLogic PS6210X array in a single-member group with the RAID policy set at RAID 6. The PS6210X array contained 24 SAS disks with one disk reserved as a spare. Using the default storage pool, we created one 2TB iSCSI volume that hosted the XenDesktop master images, provisioning store, and VMware App Volume stacks.

Installing VMware ESXi 6.0 on the infrastructure servers and servers under test

1. Attach the installation media.
2. Boot the server.
3. At the VMware Installer screen, press Enter.
4. At the EULA screen, press F11 to Accept and Continue.
5. Under Storage Devices, select the appropriate virtual disk, and press Enter.
6. Select US as the keyboard layout, and press Enter.
7. Enter the root password twice, and press Enter.
8. Press F11 to start installation.
9. After the server reboots, press F2, and enter root credentials.
10. Select Configure Management Network, and press Enter.
11. Select the appropriate network adapter, and select OK.
12. Log into the server using the VMware vSphere client.
13. Select the Configuration tab, and click Networking.
14. Click Add Networking…
15. Create the Mgmt_Net network for management.
16. Click Add Networking…
17. Create the PRIV_NET network for private traffic.
18. Click Add Networking…
19. Create the Storage-Net network for storage traffic.
20. Select the configuration tab, and click Storage.
21. Click Add Storage, and add the necessary datastores to all available servers.
22. Click the Configuration tab, and select Time configuration to configure server time.
23. Click DNS and Routing, and confirm the settings.

Creating a Windows Server 2012 R2 VM template for deployment

1. Add the infrastructure server to an existing VMware vCenter server's inventory.
2. In the VMware vSphere client, under Basic Tasks, select Create a new virtual machine.
3. Choose Custom, and click Next.
4. Assign the name `template vm` to the virtual machine, and click Next.
5. Select infrastructure as the host, and click Next.
6. Select the appropriate storage, and click Next.
7. Select Virtual Machine Version 11, and click Next.
8. Select Windows, select Microsoft Windows Server® 2012 (64-bit), and click Next.
9. For CPUs, select four virtual processor socket and one core per virtual socket, and click Next.
10. Choose 8 GB RAM, and click Next.
11. Click 1 for the number of NICs, select VMXNET3, connect to the PRIV-NET network, and click Next.
12. Leave the default virtual storage controller, and click Next.
13. Choose to create a new virtual disk, and click Next.
14. Make the OS virtual disk size 120 GB, choose thin-provisioned lazy zeroed, specify external storage, and click Next.
15. Keep the default virtual device node (0:0), and click Next.
16. Click Finish.
17. Right-click the VM, and choose Edit Settings.
18. Click the Resources tab, and click Memory.
19. Select Reserve all guest memory, and click OK.
20. Connect the VM virtual CD-ROM to the Microsoft Windows Server 2012 R2 installation disk.
21. Start the VM.

Installing Microsoft Windows Server 2012 R2 Datacenter Edition

1. When prompted to boot from DVD, press any key.
2. When the installation screen appears, click My language is English (United States).
3. Leave language, time/currency format and input method as default, and click Next.
4. Click Install now.
5. When the installation prompts you, enter the product key.
6. Select Windows Server 2012 R2 Datacenter (Server with a GUI), and click Next.
7. Check I accept the license terms, and click Next.
8. Click Custom: Install Windows only (advanced).
9. Select Drive 0 Unallocated Space, and click Next, at which point Windows begins automatically, and restarts automatically after completing.
10. When the Settings page appears, fill in the Password and Reenter Password fields with the same password.
11. Log in with the password you set up previously.
12. Install VMware Tools. For more information, see https://kb.vmware.com/selfservice/microsites/search.do?language=en_US&cmd=displayKC&externalId=1018377.
13. Reboot the server.

Configuring Windows Update

1. In the left pane of the Server Manager window, click Local Server.
2. In the main frame, next to Windows Update, click Not configured.
3. In the Windows Update window, in the main pane, click Let me choose my settings.
4. Under Important updates, select Never check for updates (not recommended), and click OK.
5. In the left pane, click Check for updates, and install all available updates.
6. Close the Windows Update window.
7. Reboot the server when required.

Converting VM into a template

1. Right-click the `template vm`, and select Template.
2. Select Convert to template.

Deploying Active Directory (DC1), vCenter (vCenter), XenDesktop Licensing Server (LIC), Provisioning (PVS) and App Volumes (AppV) VMs.

1. Select Inventory→VMs and Templates.
2. Right-click the `template vm` and select Deploy Virtual Machine from this Template…
3. Under the name field, enter the appropriate VM name and select the infrastructure server as the inventory and host location. Click Next.
4. Select the appropriate storage destination, and click Next.
5. Select Power on this virtual machine after creation.

6. Select Customize using an existing customization specification, and select one. Click Next.
7. Click Finish.
8. After the server reboots, log in using administrator credentials.
9. Click Start→Control Panel→Network Connections→ View network status and tasks→Change adapter settings.
10. Right-click the PRIV-NET NIC, and select Properties.
11. Double click Internet Protocol Version 4 (TCP/IPv4)
12. Select Use the following IP address and set the appropriate IP address, Subnet mask, Default gateway and DNS server.
13. Click OK twice.
14. Repeat steps 1 through 13 to deploy the all other VMs.

Installing Active Directory Domain Services and DNS on DC1

1. Log into `DC1` VM as `test\administrator`
2. Open Server Manager.
3. On the Welcome screen, click manage, and click Add roles and features.
4. At the initial Before you begin screen, click Next three times.
5. At the Server Roles screen, select Active Directory Domain Services.
6. On the pop-up window, click Add Features.
7. Click Next three times.
8. Verify the desired role is being installed, and click Install.
9. Once installation has finished, close the Add roles and features wizard.
10. In Server Manager, click the flag at the top, and select the Promote this server to a domain controller link.
11. Select Add a new forest, enter a root domain name of `test.local` and click Next.
12. On the Domain Controller Options window, enter a password, and click Next.
13. On the DNS Options screen, click Next.
14. On the Additional Options screen, click Next.
15. On the Review Options screen, click Next.
16. On the Prerequisites screen, verify all prerequisites have passed, and click Install.
17. Once Active Directory Domain Services finishes installing, click Finish, and restart the system.

Configuring the Windows time service on DC1

To ensure reliable time, we pointed our Active Directory server to a physical NTP server.
1. Open a command prompt.
2. Type the following:
   ```
   W32tm /config /syncfromflags:manual /manualpeerlist:"<ip address of a NTP server>"
   W32tm /config /reliable:yes
   W32tm /config /update
   W32tm /resync
   Net stop w32time
   Net start w32time
   ```

Setting up DHCP services on DC1

1. Open Server Manager.
2. Select Manage, and click Add Roles and Features.
3. Click Next twice.
4. Select DHCP Server, and click Next.
5. At the Introduction to DHCP Server screen, click Next.
6. At the Specify IPv4 DNS Settings screen, type `test.local` for the parent domain.
7. Type the preferred DNS server IPv4 address, and click Next.
8. At the Specify IPv4 WINS Server Settings screen, select WINS is not required for applications on the network, and click Next.
9. At the Add or Edit DHCP Scopes screen, click Add.
10. At the Add Scope screen, enter the Name DHCP Scope name.
11. In the next box, set the following values, and click OK.
    - Start IP address=`172.0.0.20`
    - End IP address=`172.0.3.200`
    - Subnet mask=`255.255.252.0`
12. Check the Activate This Scope box.
13. At the Add or Edit DHCP Scopes screen, click Next.
14. Click the Enable DHCP v6 Stateless Mode radio button, and click Next.

15. Leave the default IPv6 DNS Settings, and click Next.
16. At the Authorize DHCP server dialog box, select Use current credentials.
17. At the Confirm Installation Selections screen, click Next. If the installation is set up correctly, a screen displays saying that DHCP server install succeeded.
18. Click Close.
19. Click Start→Run and type `DHCPmgmt.msc`
20. DHCP→AD01.vdi.com→IPv4→Server Options.
21. Right-click Server Options, and select Configure options.
22. Activate option 66 Boot Server Host Name:
    - String value= `<ip of the Provisioning server>`
23. Activate option 67 Boot file Name:
    - String value= `ARDBP32.BIN`
24. Click OK.

Installing VMware vCenter 6.0
1. Log into `vCenter` VM as `test\administrator`
2. From the VMware vCenter 6 install media, click Autorun.
3. Click Run.
4. Select vCenter Server for Windows, and click Install.
5. At the Install wizard welcome screen, click Next.
6. Accept the End User License Agreement, and click Next.
7. Select embedded deployment as the deployment type, and click Next.
8. Verify the system FQDN, and click Next.
9. Select Create a new vCenter Single Sign-On domain.
10. Enter and confirm the password you wish to use, and click Next.
11. Select Use Windows Local System Account and the service account, and click Next.
12. Select Use embedded database (vPostgres), and Click Next.
13. At the Configure Ports screen, click Next.
14. Accept the default installation path, and click Next.
15. Click Install.
16. Using the vSphere web client, log into the vCenter server using the credentials previously provided.
17. Right-click the root of vCenter, and click New Data center.
18. Name the new datacenter `datacenter`
19. Add the servers under test and infrastructure servers to the datacenter.

Installing and configuring Microsoft SQL 2008 R2 on License Server VM
1. Log into `LIC` VM as `test\administrator`
2. Insert the installation media, and click OK to install .NET framework.
3. Wait for the SQL Installer to launch. On the left menu, click Installation.
4. Click New installation or add features to an existing installation. Click OK.
5. Enter the Product Key, and click Next.
6. Check the I accept the license terms checkbox, and click Next.
7. Click Install to install the Setup Support Files (required).
8. Resolve any issues displayed in the setup wizard, and click Next.
9. At the Setup Role screen, select SQL Server Feature Installation, and click Next.
10. Select Database Engine Services, Full-Text Search, Client tools Backwards Compatibility, Management Tools Basic and Complete, and click Next twice.
11. Accept instance configuration defaults, and click Next.
12. Accept defaults for disk space requirements, and click Next.
13. Click Use the same account for all SQL Server services, select NT Authority\System, and click OK. Click Next.
14. Select Mixed Mode, and enter a password for the SA account. Click Add Current User, and click Next.
15. Accept defaults for error reporting, and click Next.
16. Review installation configuration rules check, and click Next.
17. To begin the installation, click Install.
18. At the completion screen, click Close.
19. Run Windows Update to receive all updates and security patches.

Setting up an ODBC Data Source Name on License Server VM
1. Log into `LIC` VM as `test\administrator`
2. Select Start, Run, and type `odbcad32.exe`. Press Enter.
3. Click the system DSN tab.
4. Click Add.
5. Click SQL Server Native Client 10.0, and click Finish.
6. In the Create a New Data Source to SQL Server text box, type the connection name `LIC`
7. For Server, select SQL, and click Next.
8. Change authentication to With SQL Server authentication using a login ID and password entered by the user, type sa as the Login ID, use the password you defined in SQL server setup for the SA account, and click Next.
9. Accept defaults settings and click Next.
10. Click Finish.
11. Click Test Data Source… to confirm correct configuration.
12. Click OK to create the ODBC connection.

Installing Citrix XenDesktop

Installing and configuring Citrix XenDesktop License Server
1. Log into `LIC` VM as `test\administrator`
2. Mount XenDesktop installation media, and click Start on XenDesktop option.
3. Select Citrix License Server.
4. Select I have read, understand, and accept the terms of the license agreement, and click Next.
5. At Core Components screen, click Next.
6. Under Firewall, select Automatically configure firewall rules, and click Next.
7. Click Install.
8. Click Finish.

Installing and configuring Citrix XenDesktop 7.8 Delivery Controller
1. Log into `PVS` VM as `test\administrator`
2. Mount XenDesktop installation media, and click Start on XenDesktop option.
3. Click Delivery Controller.
4. Select I have read, understand, and accept the terms of the license agreement, and click Next.
5. Select Delivery Controller, Studio, Director, StoreFront, and click Next.
6. Under Features, select Install SQL server 2012 SP2 Express, and click Next.
7. Under Firewall, select Automatically configure firewall rules, and click Next.
8. Click Install.
9. When completed, click Finish.
10. Open Citrix Studio.
11. Click Deliver applications and desktops to your users.
12. Select A fully configured, production-ready Site, and click Next.
13. Choose Create and set up databases from Studio and Enter the Database name and enter location for the Site, Monitoring and Logging database, and click Next.
14. Enter License server address, and click Connect. Select appropriate license, and click Next.
15. Connect to vCenter server, and enter credentials. Click Next
16. Select Network, give it a resource name, and click Next.
17. Select Storage, and click Next.
18. On the Additional Features screen, click Next.
19. Click Finish.

Creating the master image and host provisioning image

Creating Windows 7, Windows 8 and Windows 10 Master VMs
1. Add the infrastructure server to an existing VMware vCenter server's inventory.
2. In the VMware vSphere client, under Basic Tasks, select Create a new virtual machine.
3. Choose Custom, and click Next.
4. Assign the appropriate name to the virtual machine, and click Next.
5. Select infrastructure as the host, and click Next.
6. Select the appropriate storage, and click Next.

7. Select Virtual Machine Version 11, and click Next.
8. Select Windows, select the appropriate version of Microsoft Windows, and click Next.
9. For CPUs, select two virtual processor socket and one core per virtual socket, and click Next.
10. Choose 4 GB RAM, and click Next.
11. Click 1 for the number of NICs, select E1000, connect to the PRIV-NET network, and click Next.
12. Leave the default virtual storage controller, and click Next.
13. Choose to create a new virtual disk, and click Next.
14. Make the OS virtual disk size 40 GB, choose thin-provisioned lazy zeroed, specify external storage, and click Next.
15. Keep the default virtual device node (0:0), and click Next.
16. Click Finish.
17. Connect the VM virtual CD-ROM to the Microsoft Windows installation disk.
18. Start the VM.

Installing Windows 7 Enterprise (X64) on Windows 7 master VM
1. When the installation prompts you, press any key to begin setup.
2. Enter your language preferences, and click Next.
3. Click Install.
4. Accept the license terms, and click Next.
5. Select Custom, and select the drive that will contain the OS.
6. Click Install.
7. Type user for the username, and click Next.
8. Enter no password, and click Next.
9. At the system protection screen, select Use recommended settings, and click Next.
10. Enter your time zone, and click Next.
11. Select the Work Network setting, and click Next.
12. Install VMware Tools. For more information, see https://kb.vmware.com/selfservice/microsites/search.do?language=en_US&cmd=displayKC&externalId=1018377.
13. Reboot.
14. Connect the machine to the Internet, and install all available Windows updates. Restart as necessary.
15. Join the domain, and restart the VM.

Installing Windows 8 master VM
1. Leave the default Language, Time and currency format, and keyboard input method, and click Next.
2. Click Install Now.
3. Check I accept the license terms, and click Next.
4. Click Custom: Install Windows only (advanced).
5. Select the drive for installation, and click Next.
6. When installation completes, enter a PC name and click Next.
7. Click Use Express settings.
8. Click Create a new account.
9. Click Sign in without a Microsoft account.
10. Enter a user name and password, and click Finish.
11. Install VMware Tools. For more information, see https://kb.vmware.com/selfservice/microsites/search.do?language=en_US&cmd=displayKC&externalId=1018377.
12. Reboot.
13. Connect the machine to the Internet, and install all available Windows updates. Restart as necessary.
14. Join the domain, and restart the VM.

Installing Windows 10 master VM
1. Leave the default Language, Time and currency format, and keyboard input method, and click Next.
2. Click Install Now.
3. Check I accept the license terms, and click Next.
4. Click Custom: Install Windows only (advanced).
5. Select the drive for installation, and click Next.
6. When installation completes, click Use Express settings.
7. Select Join a Domain, and click Next.
8. Enter a username and password, and click Next.
9. Install VMware Tools. For more information, see https://kb.vmware.com/selfservice/microsites/search.do?language=en_US&cmd=displayKC&externalId=1018377.

10. Reboot.
11. Connect the machine to the Internet, and install all available Windows updates. Restart as necessary.
12. Join the domain, and restart the VM.

Installing Virtual Delivery Agent (VDA) on Windows 7, Windows 8 and Windows 10 Master VMs

1. Mount XenDesktop installation media and click Start on XenDesktop option.
2. Click Virtual Delivery Agent for Windows Desktops OS.
3. Select Create a Master Image, and click Next.
4. On the Core Components screen, click Next.
5. Provide XenDesktop Controller address, and click Test connection.
6. Click Add, and click Next.
7. Select All features, and click Next.
8. Under Firewall, select Automatically configure firewall rules, and click Next.
9. Click Install.
10. When completed, click Finish to restart the VM.

Configuring Citrix Provisioning Services

Installing and Configuring Citrix Provisioning Services 7.8

1. Mount Provisioning service installation media, and click Console Installation.
2. Click Install.
3. On the Welcome screen, click Next.
4. Select I accept the terms in the license agreement, and click Next.
5. Enter User Name and Organization, and click Next.
6. On the destination folder screen, click Next.
7. Click Install.
8. Click Finish.
9. Mount Provisioning service installation media, and click Server Installation.
10. On the prompt screen, click Yes.
11. On the Welcome screen, click Next.
12. Select I accept the terms in the license agreement, and click Next.
13. Enter user name and organization, and click Next.
14. On the destination folder screen, click Next.
15. Click Install.
16. Click Finish.
17. On the Welcome screen, click Next.
18. At DHCP services screen, select The service that runs on another computer. Click Next.
19. At PXE services screen, select The service that runs on this computer. Click Next.
20. Select Create farm, and click Next.
21. Enter Database Server details, and click Next.
22. Provide New Farm information, and click Next.
23. Select the vDisk destination folder, and click Next.
24. Enter License Server details, and click Next.
25. Select Specified user account and enter credentials. Click Next.
26. Keep the default number of days between password updates, and click Next.
27. Keep the default primary interface and communication ports, and click Next.
28. Select Use the Provisioning Services TFTP service, and click Next.
29. Leave the stream service at defaults, and click Next.
30. Click Finish, and click Done.

Installing Citrix Provisioning Services Target Device 7.8 on Windows 7, Windows 8 and Windows 10 Master VMs and creating master vDisks

1. Mount Provisioning service installation media, and click Target Device Installation.
2. Click Install.
3. On the Welcome screen, click Next.
4. Select I accept the terms in the license agreement, and click Next.
5. Enter user name and organization, and click Next.
6. On the destination folder screen, click Next.

7. Select Complete as the Setup type.
8. Click Next.
9. Click Install.
10. Click Finish.
11. Upon completion, select Launch Imaging Wizard, and click Finish.
12. On the Welcome screen, click Next.
13. Enter Provisioning Services site server information, and select use my Windows Credentials. Click Next.
14. Select Create new vDisk, and click Next.
15. Enter Target Device name, and click Next.
16. Enter vDisk name, and click Next.
17. For Microsoft Volume Licensing, click None, and click Next.
18. Select Optimize hard drive for provisioning services before imaging, and click Next.
19. Click Create.
20. Upon completion click Continue.
21. Click No to Reboot the VM and shut down instead.
22. In vCenter, right-click the VM, and click Edit settings.
23. Click Options tab→Boot options, check the box to force BIOS Setup, and click OK.
24. Power on VM.
25. In the VM BIOS, tab to the Boot menu, and change the boot order to:
    a. Network boot from VMware E1000
    b. Hard Drive
    c. Removable Devices
    d. CD-ROM Drive
26. Tab to Exit, and select Exit Saving Changes.
    When the VM boots, it will boot from PXE and Provisioning services will stream the vDisk to the device.
27. Log in as `test\administrator`.
    Provisioning services will now copy the VM OS to the vDisk.
28. Click Finish.
29. Shut down VM.
30. Right-click the VM, and select Template→Covert to template.
31. Open Provisioning Services→Farm→Sites→Site→vDisk Pool, and right- click the appropriate vDisk.
32. Change the Access mode from private image to standard image.
33. Change the cache type to Cache on device hard drive.
34. Click OK.
35. On Farm→Sites→Site→Device Collections, select the appropriate collection, and right-click the appropriate target device.
36. Change the Boot from option to vDisk.
37. Click Ok.

Deploying a XenDesktop non persistent pool with the XenDesktop Setup wizard

1. Open the Provisioning services console→Farm→sites→site, right-click, and select XenDesktop Setup Wizard.
2. When the Setup wizard appears, click Next.
3. Enter the XenDesktop Controller address, and click Next.
4. Select the XenDesktop Host Resources, and click Next. When the credentials prompt appears, enter the credentials for the host resources, and click OK.
5. Select the Windows 7, 8, or 10 virtual machine template, and click Next.
6. Select the standard-mode vDisk that corresponds with the virtual machine template, and click Next.
7. Leave Create a new catalog selected, and enter a Catalog name describing the non-persistent pool, and click Next.
8. Leave Windows Desktop Operating System selected, and click Next.
9. Change the logon connection type to "A fresh new (random) desktop each time," and click Next.
10. Enter the number of virtual machines to create (5, 5, or 15), and leave the default vCPU, Memory, and Local write cache disk, and click Next.
11. Leave Create new accounts selected, and click Next.
12. Expand the domain tree, and select the Citrix domain users group. Change the account naming scheme to describe the deployment pool, and click Next.
13. Review the deployment summary, and click Finish.
14. Repeat steps 1 through 13 as necessary until you have deployed the following:
    - 5 Windows 7 VMs
    - 5 Windows 8 VMs
    - 15 Windows 10 VMs

Deploying a XenDesktop Persistent pool with the XenDesktop Setup wizard

1. Open the Provisioning services console→Farm→sites→site, right-click, and select XenDesktop Setup Wizard.
2. When the Setup wizard appears, click Next.
3. Enter the XenDesktop Controller address, and click Next.
4. Select the XenDesktop Host Resources, and click Next. When the credentials prompt appears, enter the credentials for the host resources, and click OK.
5. Select the Windows 7, 8, or 10 virtual machine template, and click Next.
6. Select the standard-mode vDisk that corresponds with the virtual machine template, and click Next.
7. Leave Create a new catalog selected, and enter a catalog name describing the non-persistent pool, and click Next.
8. Leave Windows Desktop Operating System selected, and click Next.
9. Leave the logon connection type set to "The same (static) desktop," with the default "Save changes and store them on a separate personal vDisk" option selected, and click Next.
10. Enter the number of virtual machines to create (5, 5, or 15), and leave the default vCPU, Memory, and Local write cache disk. Change the Personal vDisk size to 40 GB, and click Next.
11. Leave Create new accounts selected, and click Next.
12. Expand the domain tree, and select the Citrix domain users group. Change the account naming scheme to describe the deployment pool, and click Next.
13. Review the deployment summary, and click Finish.
14. Repeat steps 1 through 13 as necessary until you have deployed the following:
    - 5 Windows 7 VMs
    - 5 Windows 8 VMs
    - 15 Windows 10 VMs

Creating a delivery group

1. Open the Citrix Desktop Studio, expand the Citrix Studio site, select the Delivery Groups tree item, and click Create Delivery Group.
2. At the welcome page, click Next.
3. Select the machine catalog for the delivery group, enter the number of machines (5, 5, or 15), and click Next.
4. Leave the default Delivery Type (Desktops) selected, and click Next.
5. Select Restrict use of this Delivery Group to the following users, and click Add… Enter the appropriate VDI users, check names, and click OK. Click Next.
6. At the Desktop Assignment Rules page, click Add, and enter a display name that corresponds to the delivery group. Leave the default assignment rule (Allow everyone with access to this Delivery Group to have a desktop assigned), and click OK. Click Next.
7. Enter a Delivery Group name that corresponds with the deployment type (persistent, non-persistent) and app installation type (with App Volumes, or without App Volumes), and click Finish.
8. Repeat steps 1 through 7 as necessary until you have deployed a delivery group for each of the the following:
    a. Windows 7
    b. Windows 8
    c. Windows 10

Installing and configuring App Volumes

Installing VMware App Volumes Manager

1. Mount App Volumes media, and run the App Volumes setup.
2. Click Next to continue the installation.
3. Accept the license agreement, and click Next.
4. Select Install App Volumes Manager, and click Install. When the installation is complete, click Next.
5. Leave "Install local SQL Server Express Database" selected, and click Next.
6. When SQL Server Express is finished installing, leave the default database options, and click Next.
7. Leave the default network ports, and click Next.
8. Leave the default features to be installed selected, and click Next.
9. Click Install.
10. Click Finish.
11. Connect to the App Volumes Manager Web interface by opening a Web browser and going to http://<servername>, or by double-clicking the App Volumes Manager icon on the server's desktop.
12. Click Get Started.
13. At the License screen, click Edit to upload a license file. Click Browse, locate the license file, and click Upload.
14. Enter the Active Directory domain name, controller host name, and credentials, and click Next.
15. Select the App Volumes Administrators Group, and click Next.
16. Enter the Hypervisor host name (for our test, we used our infrastructure vCenter) and credentials, and click Next.
17. Select the default storage location for AppStacks, and leave the default storage path and template path. Select the default storage location for Writable Volumes, and click Next. Click Set Defaults to confirm settings.

18. Leave Import volumes in the background selected, and click Next.
19. Select the datastore and the host that will be used for uploading the prepackaged template volumes, and provide credentials for the host to complete the upload. Click Upload to continue.

Installing applications for 25 users on a non-persistent XenDesktop environment without VMware App Volumes

1. From Citrix Studio, select all active delivery groups, right-click, and select Turn On Maintenance Mode. Click Yes to confirm.
2. From the VMware vSphere Client, select the user machines from the hypervisor host, and power off the virtual machines. Click Yes to confirm.
3. When the virtual machines have shut down, select the first master template (Windows 7), right-click, and select Convert to Virtual Machine.
4. When the Convert Template to Virtual Machine wizard opens, select the appropriate cluster, and click Next.
5. At the Resource Pool page, select the appropriate resource pool, and click Next.
6. At the Ready to Complete page, click Finish.
7. Select the second master template (Windows 8), right-click, and select Convert to Virtual Machine.
8. When the Convert Template to Virtual Machine wizard opens, select the appropriate cluster, and click Next.
9. At the Resource Pool page, select the appropriate resource pool, and click Next.
10. At the Ready to Complete page, click Finish.
11. Select the third master template (Windows 10), right-click, and select Convert to Virtual Machine.
12. When the Convert Template to Virtual Machine wizard opens, select the appropriate cluster, and click Next.
13. At the Resource Pool page, select the appropriate resource pool, and click Next.
14. At the Ready to Complete page, click Finish.
15. From the Citrix Provisioning Services Console, navigate to the vDisk Pool tree item, right-click the first master vDisk (Windows 7), and select Manage Locks.
16. When the Manage vDisk Locks screen appears, ensure all locks are selected, and click Remove Locks. Click Close.
17. Right-click the first master vDisk, and select Properties.
18. Change the Access mode to Private Image (single device, read/write access). Click OK.
19. From the VMware vSphere Client, select the newly converted Windows 7 master virtual machine, and power on the virtual machine. Open a console to the virtual machine.
20. Log into Windows 7 as the domain administrator.
21. Navigate to the network share that hosts the installation media. Open the Office 2010 installer.
22. Click Install Now.
23. When the installation is complete, click Close.
24. Open the Google Chrome installer. The installation media will be downloaded and installed automatically.
25. When the installation is complete, close the Chrome browser window.
26. Open the Mozilla Firefox installer.
27. Leave the Standard setup selected, and click Next.
28. Click Install.
29. When the installation is complete, uncheck Launch Firefox now, and click Finish.
30. Open the Skype installer.
31. Click I agree – next.
32. Leave the Skype Click to Call setting selected, and click Continue.
33. Leave the default Bing and MSN options selected, and click Continue.
34. When the installation is complete, close the Skype Sign in window.
35. Open the Visual Studio installer.
36. Leave the default installation location, and the Default installation type. Click Install.
37. The installation media will be downloaded and installed automatically. When the installation is complete, click Restart Now.
38. The Citrix Personal vDisk agent will prompt to update the vDisk inventory. Click Update Inventory to begin the update process. When the process is complete, ensure the virtual machine is powered off.
39. From the VMware vSphere Client, select the modified Windows 7 master virtual machine, right-click, and select Template → Convert to Template.
40. From the Citrix Provisioning Services Console vDisk Pool, right-click the Windows 7 master vDisk, and select Properties.
41. Change the Access mode to Standard Image. Click OK.
42. Right-click the second master vDisk (Windows 8), and select Manage Locks.
43. When the Manage vDisk Locks screen appears, ensure all locks are selected, and click Remove Locks. Click Close.
44. Right-click the first master vDisk, and select Properties.
45. Change the Access mode to Private Image (single device, read/write access). Click OK.
46. From the VMware vSphere Client, select the converted Windows 8 master virtual machine, and power on the virtual machine. Open a console to the virtual machine.
47. Log into Windows 8 as the domain administrator.
48. Navigate to the network share that hosts the installation media. Open the Office 2010 installer.
49. Click Install Now.

50. When the installation is complete, click Close.
51. Open the Google Chrome installer.
    The installation media will be downloaded and installed automatically.
52. When the installation is complete, close the Chrome browser window.
53. Open the Mozilla Firefox installer.
54. Leave the Standard setup selected, and click Next.
55. Click Install.
56. When the installation is complete, uncheck Launch Firefox now, and click Finish.
57. Open the Skype installer.
58. Click I agree – next.
59. Leave the Skype Click to Call setting selected, and click Continue.
60. Leave the default Bing and MSN options selected, and click Continue.
61. When the installation is complete, close the Skype Sign in window.
62. Open the Visual Studio installer.
63. Leave the default installation location, and the Default installation type. Click Install.
    The installation media will be downloaded and installed automatically.
64. When the installation is complete, click Restart Now.
65. When the Citrix Personal vDisk agent prompts you to update the vDisk inventory, click Update Inventory to begin the update process. When the process is complete, ensure the virtual machine is powered off.
66. From the VMware vSphere Client, select the modified Windows 8 master virtual machine, right-click, and select Template → Convert to Template.
67. From the Citrix Provisioning Services Console vDisk Pool, right-click the Windows 8 master vDisk, and select Properties.
68. Change the Access mode to Standard Image. Click OK.
69. Right-click the third master vDisk (Windows 10), and select Manage Locks.
70. When the Manage vDisk Locks screen appears, ensure all locks are selected, and click Remove Locks. Click Close.
71. Right-click the first master vDisk, and select Properties.
72. Change the Access mode to Private Image (single device, read/write access). Click OK.
73. From the VMware vSphere Client, select the converted Windows 10 master virtual machine, and power on the virtual machine. Open a console to the virtual machine.
74. Log into Windows 10 as the domain administrator.
75. Navigate to the network share that hosts the installation media. Open the Office 2013 installer.
76. Check to accept the license agreement, and click Install Now.
77. When the installation is complete, click Close.
78. Open the Google Chrome installer.
    The installation media will be downloaded and installed automatically.
79. When the installation is complete, close the Chrome browser window.
80. Open the Mozilla Firefox installer.
81. Leave the Standard setup selected, and click Next.
82. Click Install.
83. When the installation is complete, uncheck Launch Firefox now, and click Finish.
84. Open the Skype installer.
85. Click I agree – next.
86. Leave the Skype Click to Call setting selected, and click Continue.
87. Leave the default Bing and MSN options selected, and click Continue.
88. When the installation is complete, close the Skype Sign in window.
89. Open the Visual Studio installer.
90. Leave the default installation location, and the default installation type, and click Install.
    The installation media will be downloaded and installed automatically.
91. When the installation is complete, click Restart Now.
92. The Citrix Personal vDisk agent will prompt you to update the vDisk inventory. Click Update Inventory to begin the update process. When the process is complete, ensure the virtual machine is powered off.
93. From the VMware vSphere Client, select the modified Windows 8 master virtual machine, right-click, and select Template → Convert to Template.
94. From the Citrix Provisioning Services Console vDisk Pool, right-click the Windows 8 master vDisk, and select Properties.
95. Change the Access mode to Standard Image. Click OK.
96. From Citrix Studio, select the delivery groups, and click Turn Off Maintenance Mode. The user's virtual machines will power on automatically.

Installing applications for 25 users on a persistent XenDesktop environment without VMware App Volumes
1. From Citrix Studio, select all active delivery groups, right-click, and select Turn On Maintenance Mode. Click Yes to confirm.
2. From the VMware vSphere Client, select the user machines from the hypervisor host, and power off the virtual machines. Click Yes to confirm.

3. When the virtual machines have shut down, select the first user machine, and power on the virtual machine. Open a console connection.

4. When the virtual machine powers on, log in as the domain administrator.

5. Navigate to the network share that hosts the installation media. Open the Office 2010 installer.

6. Check to accept the license agreement, and click Install Now.

7. When the installation is complete, click Close.

8. Open the Google Chrome installer.

9. The installation media will be downloaded and installed automatically. When the installation is complete, close the Chrome browser window.

10. Open the Mozilla Firefox installer.

11. Leave the Standard setup selected, and click Next.

12. Click Install.

13. When the installation is complete, uncheck Launch Firefox now, and click Finish.

14. Open the Skype installer.

15. Click I agree – next.

16. Leave the Skype Click to Call setting selected, and click Continue.

17. Leave the default Bing and MSN options selected, and click Continue.

18. When the installation is complete, close the Skype Sign in window.

19. Open the Visual Studio installer.

20. Leave the default installation location, and the Default installation type. Click Install.

21. The installation media will be downloaded and installed automatically. When the installation is complete, click Restart Now.

22. Once the machine has restarted, shut down the user machine.

Repeat steps 3 through 22 as follows:[4]

- 4 times for the Windows 7 users
- 5 times for the Windows 8 users
- 15 times for the Windows 10 users (for a total of 480 additional steps).

23. From Citrix Studio, select the delivery groups, and click Turn Off Maintenance Mode. The user's virtual machines will power on automatically.

Note: For our App Volumes testing, we used three AppStacks to divide our applications into productivity groups as follows:

- AppStack 1: Firefox and Chrome
- AppStack 2: Microsoft Office Suite and Skype
- AppStack 3: Microsoft Visual Studio.

Installing applications for 25 users on a non-persistent or persistent XenDesktop environment with VMware App Volumes

1. From the VMware vSphere Client, power on the provisioning host virtual machine, and open a console connection to the server.

2. When the virtual machine powers on, log in as the domain administrator.

3. From the App Volumes Manager, navigate to the Volumes tab.

4. Click Create AppStack.

5. Enter a Name for the first AppStack describing the applications (Browser Stack), and ensure the default Storage and Path locations are correct. Select the template, and click Create. Leave Perform in Background selected, and click Create again.

6. When the provisioning host selection screen appears, enter the name of the provisioning server, and click Search. Check the relevant provisioning server, and click Provision.

7. Click Start Provisioning.

8. From the console connection to the provisioning server, ensure that the provisioning mode dialog window is open on the desktop, navigate to the network share that hosts the installation media, and open the Google Chrome installer.

9. The installation media will be downloaded and installed automatically. When the installation is complete, close the Chrome browser window.

10. Open the Mozilla Firefox installer.

11. Leave the Standard setup selected, and click Next.

12. Click Install.

13. When the installation is complete, uncheck Launch Firefox now, and click Finish.

14. From the VMware App Volumes provisioning mode dialog box, click OK to finish creation of the first AppStack, click Yes to confirm and the machine will reboot.

15. When the machine reboots, log in, and click OK at the provisioning successful dialog.

16. From the App Volumes Manager, click Complete, and click Complete Provisioning to confirm.

17. Click Create AppStack.

18. Enter a Name for the second AppStack describing the applications (Office and Skype Stack), and ensure the default Storage and Path locations are correct. Select the template, and click Create. Leave Perform in Background selected, and click Create again.

19. When the provisioning host selection screen appears, enter the name of the provisioning server, and click Search. Check the relevant provisioning server, and click Provision.

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4 Repeating these steps as indicated equals a total of 528 additional steps.

20. Click Start Provisioning.
21. From the console connection to the provisioning server, ensure that the provisioning mode dialog window is open on the desktop, and navigate to the network share that hosts the installation media. Open the Office 2010 installer.
22. Click Install Now.
23. When the installation is complete, click Close.
24. Open the Skype installer.
25. Click I agree – next.
26. Leave the Skype Click to Call setting selected, and click Continue.
27. Leave the default Bing and MSN options selected, and click Continue.
28. When the installation is complete, close the Skype Sign in window.
29. From the VMware App Volumes provisioning mode dialog box, click OK to finish creation of the second AppStack, click Yes to confirm and the machine will reboot.
30. When the machine reboots, log in, and click OK at the provisioning successful dialog.
31. From the App Volumes Manager, click Complete, and click Complete Provisioning to confirm.
32. Click Create AppStack.
33. Enter a Name for the third AppStack describing the applications (Visual Studio Stack), and ensure the default Storage and Path locations are correct. Select the template, and click Create. Leave Perform in Background selected, and click Create again.
34. When the Provisioning host selection screen appears, enter the name of the provisioning server, and click Search. Check the relevant provisioning server, and click Provision.
35. Click Start Provisioning.
36. From the console connection to the provisioning server, ensure that the provisioning mode dialog window is open on the desktop, navigate to the network share that hosts the installation media. Open the Visual Studio installer.
37. Leave the default installation location, and the Default installation type. Click Install.
38. The installation media will be downloaded and installed automatically. When the installation is complete, click Restart Now.
39. From the VMware App Volumes provisioning mode dialog box, click OK to finish creation of the third AppStack, click Yes to confirm and the machine will reboot.
40. When the machine reboots, log in, and click OK at the provisioning successful dialog.
41. From the App Volumes Manager, click Complete, and click Complete Provisioning to confirm.
42. Once the three AppStacks have been created, ensure all AppStacks are listed as Enabled in the Status column. Select the first AppStack, and click Assign.
43. Type in the range of active directory users to receive the AppStacks, and click Search. Select all 25 users, and click Assign.
44. Change the assignment preference to Attach AppStacks immediately, and click Assign.
45. Select the second AppStack, and click Assign.
46. Type in the range of active directory users to receive the AppStacks, and click Search. Select all 25 users, and click Assign.
47. Change the assignment preference to Attach AppStacks immediately, and click Assign.
48. Select the third AppStack, and click Assign.
49. Type in the range of active directory users to receive the AppStacks, and click Search. Select all 25 users, and click Assign.
50. Change the assignment preference to Attach AppStacks immediately, and click Assign.

This project was commissioned by VMware.

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