



The science behind the report:

# Support more VDI users with a Dell EMC PowerEdge R7515 server powered by an AMD EPYC 75F3 processor

This document describes what we tested, how we tested, and what we found. To learn how these facts translate into real-world benefits, read the report [Support more VDI users with a Dell EMC PowerEdge R7515 server powered by an AMD EPYC 75F3 processor](#).

We concluded our hands-on testing on February 9, 2021. During testing, we determined the appropriate hardware and software configurations and applied updates as they became available. The results in this report reflect configurations that we finalized on January 11, 2021 or earlier. Unavoidably, these configurations may not represent the latest versions available when this report appears.

## Our results

Table 1: Results of our testing.

	AMD EPYC™ 7542 processor-powered Dell EMC™ PowerEdge™ R7515	AMD EPYC 75F3 processor-powered Dell EMC PowerEdge R7515
Hardware and support price	\$50,792.80	\$54,362.80
Max VDI user count	185	223
Percentage more VDI users	-	20.54%
Cost per VDI user (USD)	\$274.56	\$243.78
Percentage less cost per VDI user	-	11%
Cost savings per VDI user (USD)	-	\$30.78

# Login VSI results charts

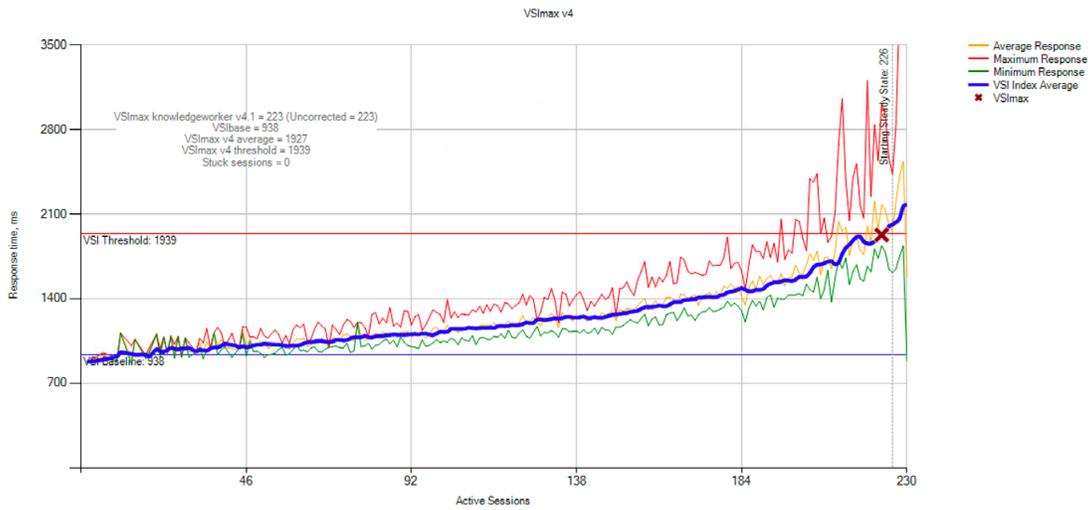


Figure 1: Login VSI results for the Dell EMC PowerEdge R7515 powered by an AMD EPYC 75F3 processor. Source: Principled Technologies.

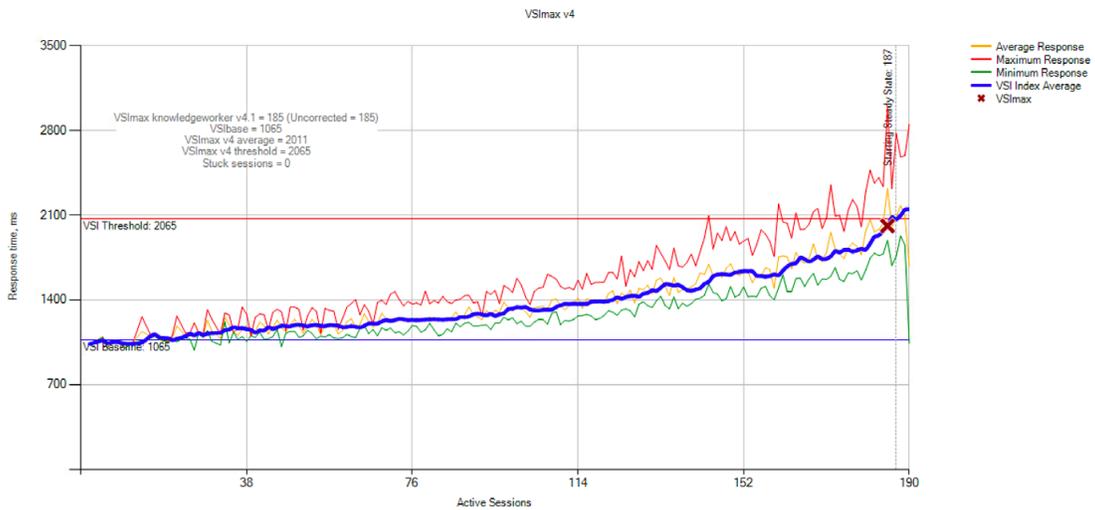


Figure 2: Login VSI results for the Dell EMC PowerEdge R7515 powered by an AMD EPYC 7542 processor. Source: Principled Technologies.

## CPU results charts

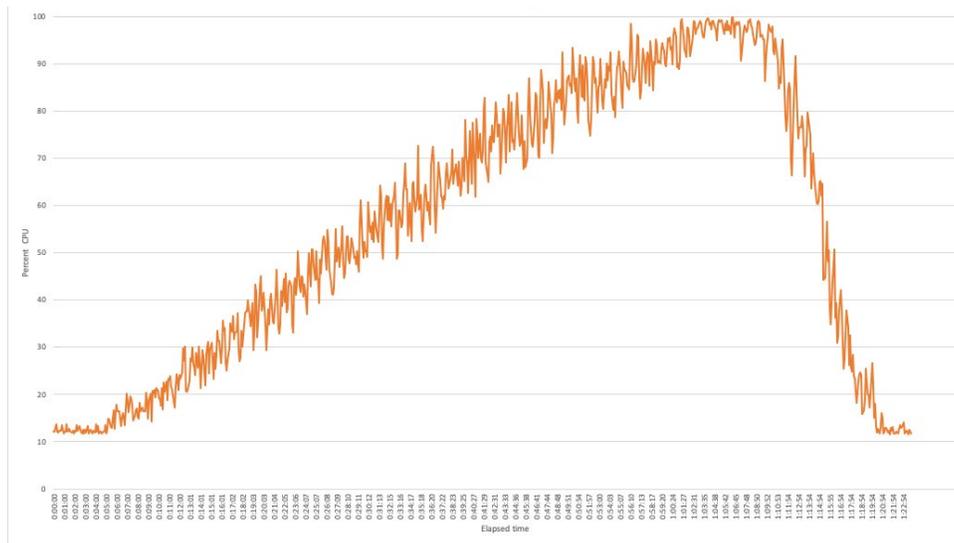


Figure 3: CPU utilization for the Dell EMC PowerEdge R7515 powered by an AMD EPYC 75F3 processor over the course of the Login VSI test.  
Source: Principled Technologies.

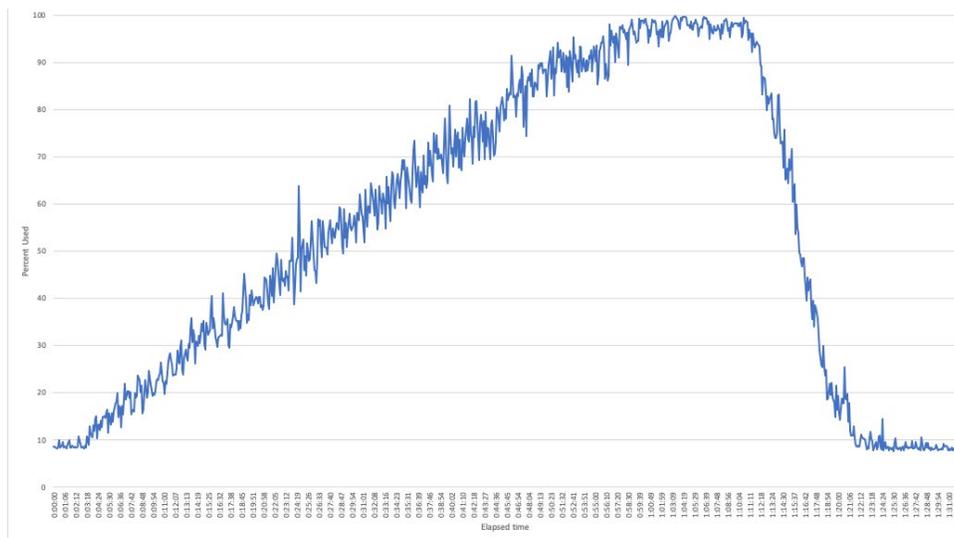


Figure 4: CPU utilization for the Dell EMC PowerEdge R7515 powered by an AMD EPYC 7542 processor over the course of the Login VSI test.  
Source: Principled Technologies.

## System configuration information

Table 2: Detailed information on the systems we tested. We tested the Dell EMC PowerEdge R7515 with two different processors, which we specify in the Processor section.

System configuration information	Dell EMC PowerEdge R7515	
BIOS name and version	Dell 2.0.0	
Non-default BIOS settings	N/A	
Operating system name and version/build number	VMWare ESXi 7.0.1 (Build 17325551)	
Date of last OS updates/patches applied	1/11/2021	
Power management policy	Performance	
Processor	3rd Gen	2nd Gen
Number of processors	1	1
Vendor and model	AMD EPYC 75F3	AMD EPYC 7542
Core count (per processor)	32	32
Core frequency (GHz)	2.95	2.9
Turbo Boost Clock (GHz)	4.0	3.4
L3 Cache (MB)	256	128
Memory module(s)		
Total memory in system (GB)	1,024	
Number of memory modules	16	
Vendor and model	SK Hynix HMAA8GR7AJR4N-XN TG AD	
Size (GB)	64	
Type	2Rx4 PC4-3200AA	
Local storage 1		
Number of drives	1	
Drive vendor and model	Dell EMC MZWLJ3T2HBLS-00AD3	
Drive size (TB)	3.2	
Drive information (speed, interface, type)	PCIe 4.0 NVMe™	
Network adapter		
Vendor and model	Broadcom Gigabit Ethernet BCM5720	
Number and type of ports	2 x 1GbE	
Driver version	ixgben	

System configuration information	Dell EMC PowerEdge R7515
Cooling fans	
Vendor and model	Dell PFM0612XHE-SM02
Number of cooling fans	6
Power supplies	
Vendor and model	Dell L750E-S0
Number of power supplies	2
Wattage of each (W)	750

# How we tested

## Testing overview

We used a pair of dual-socket servers equipped with Intel Xeon® Gold 6142M CPUs to host infrastructure. We connected each server to a 1Gbps top of rack (TOR) switch. We also connected a Dell EMC PowerEdge R7515 server to the TOR switch via two 1Gbps connections. We installed VMware ESXi 7.0 U1 on both infrastructure servers and the Dell EMC PowerEdge R7515 server. For storage on the Dell EMC PowerEdge R7515 server, we used a single non-RAID 3.2TB PCIe 4.0 NVMe SSD. We created the VMs outlined in Table 4 on the infrastructure servers to create an enterprise environment consisting of a Windows Active Directory, DNS and DHCP services, as well as a VMware® Horizon® View™ 8. We then created a persistent desktop pool of instant clones on the Dell EMC PowerEdge R7515. We ran the VDI benchmark Login VSI 4.1 Knowledge Worker workload. We determined the maximum number of supported users for the single-socket AMD EPYC 7542 processor, and repeated the process for the AMD EPYC 75F3 processor. We performed all testing with Windows 10 desktops using two vCPUs and 4 GB of RAM, with 2 GB of RAM reserved.

Table 3: Physical servers we used in our tests.

Server name	OS	Role(s)
Infra1 and 2	VMware ESXi 7.0 U1	Infrastructure cluster
SUT	VMware ESXi 7.0 U1	Server under test

Table 4: Virtual machine specifications.

VM name	OS / Role	vCPU count	Memory size (GB)	Disk size (GB)	Server host / cluster
DC1	Windows Server 2019 / Domain controller, DNS, DHCP	4	8	C:\40	infra
vCenter	VMware vCenter Server® Virtual Appliance ver 7 U1	4	20	Appliance determined	infra
View	VMWare Horizon 8 Connection server	4	8	C:\40 D:\50	infra
CIFS1	Windows Server 2019 / Roaming profiles and redirected folders	2	8	C:\40 D:\200	infra
CIFS2	Windows Server 2019 / LoginVSI content share	2	8	C:\40 D:\200	infra
VSI-MGMT	Windows Server 2019 / LoginVSI management server	2	8	C:\40 D:\200	infra
L01-16	Windows 10 x64 Enterprise / Login VSI launcher	4	8	C:\40	infra
Win10-gold	Windows 10 x64	2	4 (2 reserved)	C:\50	SUT

## Installing ESXi vSphere 7.0 U1 on the infrastructure servers and the Dell PowerEdge R7515

### Installing ESXi vSphere 7.0 U1

1. Attach the installation media.
2. Boot the server.
3. Select the installation media.
4. At the VMware Installer screen, press Enter.
5. At the EULA screen, to Accept and Continue, press F11.
6. Under Storage Devices, select the appropriate virtual disk, and press Enter.
7. Select US as the keyboard layout, and press Enter.
8. Enter the root password twice, and press Enter.
9. To start the installation, press F11.
10. After the server reboots, press F2, and enter the root credentials.
11. Select Configure Management Network, and press Enter.
12. Select the appropriate network adapter, and click OK.
13. Select IPv4 settings, and enter the desired IP address, subnet mask, and gateway for the server.
14. Select OK, and restart the management network.

### Deploying VMware vCenter 7.0 U1

We deployed VMware vCenter Server 7.0 U1 virtual appliance on one infrastructure server, added our two infrastructure servers and the PowerEdge R7515 to vCenter Server, and created our VDI infrastructure VMs.

### Deploying VMware vCenter Server 7.0 U1

1. On a Windows machine or VM, locate the VMware-VCSA installer image.
2. Mount the image, navigate to the vcsa-ui-installer folder, and double-click win32.
3. Double-click installer.exe
4. Click Install.
5. Click Next.
6. Accept the terms of the license agreement, and click Next.
7. Leave the default "vCenter Server with an Embedded Platform Services Controller" selected, and click Next.
8. Enter the FQDN or IP address of the host onto which the vCenter Server Appliance will deploy.
9. Provide the server's credentials, and click Next.
10. At the Configure Network Settings page, configure the network settings for your environment, and click Next.
11. Review your settings, and click Finish.
12. When the deployment completes, click Next.
13. At the Introduction page, click Next.
14. At the Appliance configuration page, select the time synchronization mode and SSH access settings, and click Next. We used a local NTP server and enabled SSH.
15. Select Create a new SSO domain.
16. Provide a password, and confirm it.
17. Provide an SSO Domain name and SSO Site name, and click Next.
18. At the CEIP page, click Next.
19. At the Ready to complete page, click Finish.
20. When the installation completes, click Close.
21. Using the vSphere web client, log into the vCenter server using the credentials you previously provided.

## Creating a data center in VMware vCenter and adding hosts

We created a cluster named `infra` to host infrastructure VMs necessary for testing. We named the Dell EMC PowerEdge R7515 SUT to host all virtual desktops. We used Direct Attached Storage, a single 3.2TB NVMe SSD, to host the desktops.

### Creating the data center

1. Log into vCenter, and navigate to Hosts and Clusters.
2. Select the primary site management vCenter.
3. Right-click the vCenter object, and select New Datacenter...
4. Enter a name for the new data center, and click OK.
5. Right-click the new data center, and click New Cluster...
6. Enter `infra` as the name for the new cluster.
7. Click OK.
8. Repeat steps 1 through 7 to create a SUT cluster.

### Adding the hosts

1. Once you have created the clusters, right-click the cluster, and click Add Host.
2. Enter the FQDN or IP address of the first host, and click Next.
3. Enter the root credentials for the server, and click Next.
4. To accept the server's certificate, click Yes.
5. Review the server details, and click Next.
6. Assign the desired license, and click Next.
7. Disable Lockdown mode, and click Next.
8. Click Finish.
9. Repeat steps 1 through 8 for the second `infra` server, and again for the SUT.

## Creating the VM template for Windows Server 2019

We used a simple Microsoft Windows Server 2019 VM template to create all infrastructure VMs.

### Deploying a template VM

1. Launch the VMware vCenter HTML5 client.
2. Right-click the infrastructure host, and choose New Virtual Machine...
3. Choose Create a new virtual machine, and click Next.
4. Name the virtual machine, and click Next.
5. Choose the correct host, and click Next.
6. Choose the correct datastore, and click Next.
7. Choose ESXi 7.0 and later, and click Next.
8. Choose Windows for the Guest OS Family, and Microsoft Windows Server 2019 (64-bit) for Guest OS Version. Click Next.
9. Set the vCPU count to 4, memory to 4GB, New Hard Disk capacity to 40GB, and change the network adapter to VMXnet3.
10. Click Finish.

### Installing and configuring Windows Server 2019 Enterprise on the template VM

Install a base OS on the template VM.

1. In the VMware vCenter HTML5 client, click on the VM you created, and click Launch Remote Console.
2. Attach the Windows Server 2019 Enterprise ISO to the VM, and turn the VM on.
3. When prompted to boot from DVD, press any key.
4. When the installation screen appears, leave language, time/currency format, and input method as default, and click Next.
5. Click Install now.
6. When prompted, enter the product key.
7. Select Windows Server 2019 Datacenter Edition (Server with a GUI), and click Next.
8. Check I accept the license terms, and click Next.
9. Click Custom: Install Windows only (advanced).
10. Select Drive 0 Unallocated Space, and click Next. This will start the install automatically, and Windows will restart automatically after completing the install.
11. When the Settings page appears, fill in the Password and Reenter Password fields with the password of your choice.
12. Log in with the password you set.

13. In the VMware Remote Console™, attach VMware tools to the VM.
14. In Windows, the VMware tools should show up in the CD drive. Double-click the tools to start the install.
15. Choose Typical as the install type. When the installation completes, reboot the VM when the install is finished.
16. Log back into Windows and in Server Manager, set the time zone, enable RDP if you wish, and disable the firewall.
17. Run Windows updates until you have no new updates to install.
18. Power off the template VM. All Windows Server 2019 infra VMs in Table 4 will use this.

## Installing and configuring Microsoft Windows Active Directory Domain Controller and supporting services

We installed and configured a VM to host Microsoft Active Directory services, DNS, DHCP, and NTP. These services are prerequisites for the LoginVSI 4.1 benchmark.

### Installing the Domain Controller VM

1. Log into the vSphere client as administrator@vsphere.local.
2. On the infra server, deploy a Windows Server 2019 VM from the template using the appropriate specs for DC1 from Table 4, and log in as an administrator.
3. Launch Server Manager.
4. Click Manage→Add Roles and Features.
5. At the Before you begin screen, click Next.
6. At the Select installation type screen, leave Role-based or feature-based installation selected, and click Next.
7. At the Server Selection Screen, select the server from the pool, and click Next.
8. At the Select Server Roles screen, select Active Directory Domain Services.
9. When prompted, click Add Features, and click Next.
10. At the Select Features screen, click Next.
11. At the Active Directory Domain Services screen, click Next.
12. At the Confirm installation selections screen, check Restart the destination server automatically if required, and click Install.

### Configuring Active Directory and DNS services on the Domain Controller VM

1. After the installation completes, a screen should pop up with configuration options. If a screen does not appear, click the Tasks flag in the upper-right section of Server Manager.
2. Click Promote this server to a Domain Controller.
3. At the Deployment Configuration screen, select Add a new forest.
4. In the Root domain name field, type test.local and click Next.
5. At the Domain Controller Options screen, leave the default values, and enter a password twice.
6. Click Next four times to accept default settings for DNS, NetBIOS, and directory paths.
7. At the Review Options screen, click Next.
8. At the Prerequisites Check dialog, allow the check to complete.
9. If there are no relevant errors, check Restart the destination server automatically if required, and click Install.
10. When the server restarts, log in using test\Administrator and the password you chose in step 5.

### Configuring the Windows time service on the Domain Controller VM

1. To ensure reliable time, we pointed our Active Directory server to a physical NTP server.
2. Open a command prompt.
3. Type the following:

```
W32tm /config /syncfromflags:manual /manualpeerlist:"us.pool.ntp.org"  
W32tm /config /reliable:yes  
W32tm /config /update  
W32tm /resync  
Net stop w32time  
Net start w32time
```

## Setting up DHCP services on the domain controller VM

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. Set the following values, and click OK:
  - a. Start IP address = 172.16.10.1
  - b. End IP address = 172.16.100.254
  - c. Subnet mask = 255.255.0.0
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 the DHCP server installation succeeded.
18. Click Close.

## Installing the Login VSI 4.1 benchmark

The Login VSI 4.1 installation has several parts, the Active directory setup (DC1), a CIFS media share (CIFS2), a management server (VSI-MGMT), and target agent (win10-gold). We deployed each according to the Login VSI 4.1 documentation: <https://www.loginvsi.com/documents/documentation/Login-VSI-Installation-Guide.pdf>.

## Installing and setting up the Login VSI 4.1 management VM

To create users and coordinate testing, we first setup a VM named VSI-MGMT and ran the Login VSI Data Server install media on it. This installed the Login VSI management console.

1. On the infra server cluster, deploy a Windows Server 2019 VM from the template using the appropriate specs from Table 4 named VSI-MGMT. Log in as test\administrator.
2. Create a folder named D:\share.
3. Right-click the D:\share folder, and click Properties.
4. Click the Sharing tab, and click Share...
5. To the Read/Write group add everyone, system, and administrators, and click Share.
6. Unpack the Login VSI install media.
7. Open Datacenter setup\setup.exe.
8. At the welcome screen, click Next.
9. Select the share named \\vsi-mgmt\share, and click Next.
10. To start the Management Console when the setup is completed, check the Start Login VSI Management Console checkbox, and click Finish.
11. At the management console, enter the path to your Login VSI license file, and click Save.

## Configuring Login VSI: setting up active directory (AD) and creating users and default group policy objects (GPOs)

Login VSI Management Console creates a PowerShell script that automates the creation of users and GPOs within our Microsoft Active Directory server (DC1) that are necessary for testing. During our testing, we used this functionality to create the .ps1 file, copy it, and execute the file on our Domain Controller via PowerShell. This process also created our desktop users and OUs, and applied GPOs to the desktop users and computers.

1. On the VM named VSI-MGMT, open the VSI management console and click 1. AD setup.
2. Enter the following:
  - a. Base OU: DC=test,DC=local
  - b. Username: LoginVSI
  - c. Password1: \*\*\*\*\*
  - d. Domain: (auto detect checked)
  - e. Number of users: 300
  - f. Formatting length: 3
  - g. Launcher user: Launcher-v4
  - h. Launcher password: \*\*\*\*\*
3. Click Save to .sp1.
4. Copy the VSIADSetup.ps1 file to \\DC1\c\$.
5. Log into DC1 as administrator, and execute the c:\VSIADSetup.ps1 from step 2 in Windows PowerShell.™

## Setting up the Active Directory Roaming Profiles and folder redirection

We chose to use Microsoft Windows Active directory roaming profiles and folder redirection. This way, all Virtual Desktop users would keep their profile information regardless of which desktop VM assignment they received at logon or how many times we may need to recreate desktop pools.

### Deploying a VM for roaming profiles and folder redirection.

1. Log into the vSphere client as administrator@vsphere.local.
2. On the infra server cluster, deploy a Windows Server 2019 VM from the template using the appropriate specs for CIFS1 from Table 4, and log in as an administrator.
3. Launch Server Manager.
4. Click Manage→Add Roles and Features.
5. At the Before you begin screen, click Next.
6. At the Select installation type screen, leave Role-based or feature-based installation selected, and click Next.
7. At the Server Selection Screen, select the server from the pool, and click Next.
8. At the Select Server Roles screen, select Active Directory Domain Services.
9. When prompted, click Add Features, and click Next.
10. At the Select Features screen, click Next.
11. At the Active Directory Domain Services screen, click Next.
12. At the Confirm installation selections screen, check Restart the destination server automatically if required, and click Install.

### Setting up Microsoft Active Directory roaming profiles CIFS shares on CIFS1

1. Log onto the VM named CIFS1, open Windows Explorer, and create the following folders: D:\user\_profiles and D:\user\_folders, and add permissions of read/write to the test.local/everyone group.
2. Right-click the D:\user\_profiles and D:\user\_folders folder, and select Properties. For each:
  - a. Click the Sharing tab, and select Share...
  - b. Add everyone, system, and administrators to the read/write group, and click Share.
  - c. Click OK, Apply, OK, and Close.

### Assigning Login VSI user profiles to the user\_profiles share

1. Log onto the VM named DC1 as test\administrator.
2. Open Active Directory Users and Computers.
3. Browse to test.local→Login\_VSI→Users→Target.
4. Select all Login VSI users, and right-click Properties.
5. Click Profile, and enter profile path \\cifs1\user\_profiles\%username%

## Configuring folder redirection for Login VSI users

1. Log onto the VM named DC1 as test\administrator.
2. Open the Group Policy Editor.
3. Open Forest→Domains→test.local, right-click Group Policy Objects, and select New.
4. Type `folder_redirection`
5. Leave source starter GPO as None, and click OK.
6. Right-click the folder redirection GPO, and click Edit.
7. Browse User Configuration→Policies→Windows Settings→Folder Redirection, and right-click AppData (roaming).
8. In the AppData (roaming) Properties, target-tab select the following:
  - a. Setting = select Basic = Redirect everyone's folders to the same location
  - b. Target folder location = Create a folder for each user under the root path
  - c. Root Path = \\CIFS1\user\_folders
9. In the AppData (roaming) Properties→Setting tab, remove the checkbox for Grant the user exclusive right to AppData (roaming), and click OK.
10. Repeat steps 7 through 9 for all subfolders in the folder redirection tree.
11. Close the Folder Redirection group policy.
12. In the Group Policy Editor, right-click the folder redirection policy, and select GPO Status→Computer Configuration Settings Disabled.
13. In the Group Policy Editor, drag the folder redirection GPO to Forest→Domains→test.local→Login\_VSI→Users→Target.

## Copying the LoginVSI media to from the management server to CIFS2

1. Log into the VM named CIFS2 as test\administrator.
2. Open Windows Explorer, and create the following folder: d:\vsishare.
3. Add permissions of read/write to the test.local/everyone group.
4. Right-click d:\share, and select Properties.
5. Click the Sharing tab, and select Share...
6. Add everyone, system, and administrators to the read/write group, and click Share.
7. Click OK, Apply, OK, and Close.
8. Copy the \\lsi-mgmt\vsishare\\_VSIwebsites\_ folder to D:\vsishare.
9. Copy the \\lsi-mgmt\lsi\\_VSI\_Content folder to D:\vsishare.

## Installing and configuring the VMware Horizon 8 Connection server

We installed a Microsoft Windows 2019 VM named `view` from template and installed VMware Horizon 8 Connection server on it. We configured the necessary components to deploy Instant Clones as well as the necessary license.

### Deploying the Horizon Connection server

1. Click VMware-Horizon-Connection-Server-x86\_64-8.1.0-17351278.
2. At the Welcome screen, click Next.
3. Accept the license agreement, and click Next.
4. Accept the default install folder, and click Next.
5. Accept defaults for standard server and ipv4, and click Next.
6. Enter an appropriate data recovery password, and click Next.
7. Select configure Windows firewall automatically, and click Next.
8. Authorize the TEST\domain admins group, and click Next.
9. Deselect join the VMware Customer Experience Improvement Program, and click Next.
10. Accept the default installation path and general, and click Next.
11. Wait for the installation to complete, and click Finish.

### Configuring the Horizon Connection server

#### Adding a vCenter and Domain

1. Open the Horizon administrator client, and log in as admin.
2. Click Settings→Servers, and under vCenter Servers, click Add.
3. Enter the vCenter IP, username, and password, and click Next.
4. To accept the certificate, click Accept.
5. To accept storage defaults, click Next.
6. To add the vCenter to Horizons inventory, click Submit.
7. Click Settings→Domain, and click Add.
8. Enter administrator and the administrator's password for the test.local domain, and click OK.

### Adding the Horizon 8 license

1. Click Settings→Product Licensing and Usage, and click Edit License.
2. Enter the License Serial Number, and click OK.

## Creating the Windows 10 Enterprise (x64) Login VSI Launcher image

We created a Microsoft Windows 10 Enterprise (x64) ver 20h2 template VM named Launcher and cloned out launcher VMs per Table 4. Each Launcher can launch up to a maximum of 25 virtual desktop sessions.

### Deploying the launcher VM

1. Log into vCenter via the VMware Web client.
2. Right-click the Virtual Machines tab, and select New Virtual Machine.
3. Select Create a new virtual machine.
4. Choose Custom, and click Next.
5. Assign the name launcher, and click Next.
6. Select the infrastructure cluster, and click Next.
7. Select the local DAS.
8. Choose compatible with ESXi 7.0, and click Next.
9. Choose Windows, choose Microsoft Windows 10 (64-bit), and click Next.
10. For CPUs, select 4 CPUs, 8 GB RAM 50 GB Disk, and click Next.
11. Click Finish.
12. Click the Hardware tab.
13. Click CD/DVD Drive.
14. Select Connect the VM virtual CD-ROM to the Microsoft Windows 10 x64 installation disk.
15. Click OK.
16. Power on the Microsoft Windows 10 VM.

### Installing Windows 10 Enterprise (x64) on the launcher 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. Do not enter a 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, and select Complete Installation. For more information, visit [http://kb.vmware.com/selfservice/microsites/search.do?language=en\\_US&cmd=displayKC&externalId=340](http://kb.vmware.com/selfservice/microsites/search.do?language=en_US&cmd=displayKC&externalId=340).
13. Reboot the server.
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 the VMware Horizon client on the launcher VM

1. Log into the launcher VM as `test\administrator`.
2. Run `VMware-Horizon-Client-2012-8.1.0-17349995`.
3. To complete the client installation, Click Finish and restart now.
4. Open the VMware Horizon Client.
5. To open options, press `Alt+O`.
6. Click Configure ssl...
7. Select Do not verify server identity certificates, and click OK.
8. Click Add server.
9. Enter the Horizon connection server name, and click OK.
10. Close the VMware Horizon client.
11. Shutdown the VM named Launcher.
12. Click Finish, and power off the launcher VM. You can now clone it to make 16 total launcher VMs.

## Converting the launcher VM to a template and cloning the template

1. In vSphere Client, right-click the launcher VM, and select Template→Convert to Template.
2. To deploy a virtual machine from the template, right-click the launcher template.
3. Type `launcher_1` as the new VM name, and click Next.
4. Click Datacenter, and click Next.
5. Click the launcher server, and click Next.
6. Select the appropriate storage, and click Next.
7. Select Customization using existing customization specifications, select the appropriate file, and click Next.
8. To deploy the new VM, click Finish.
9. To to deploy all 16 launchers, repeat steps 2 through 8.

## Creating the Windows 10 Enterprise (x64) gold image VM

We created a Microsoft Windows 10 Enterprise (x64) ver 20h2 template VM named Win10-gold and added applications for testing.

### Creating the Win10-gold VM

1. Log into vCenter via the VMware Web client.
2. Right-click the Virtual Machines tab, and select New Virtual Machine.
3. Select Create a new virtual machine.
4. Choose Custom, and click Next.
5. Assign the name `win10-gold`, and click Next.
6. Select the Cluster Under test, and click Next.
7. Select the local DAS DataStore
8. Choose Compatible with ESXi 7.0, and click Next.
9. Choose Windows, choose Microsoft Windows 10 (64-bit), and click Next.
10. For CPUs, select 2 vCPUs, 4 GB RAM (2 reserved), 50 GB Disk, and click Next.
11. Click Finish.
12. Click the Hardware tab.
13. Click CD/DVD Drive.
14. Select Connect the VM virtual CD-ROM to the Microsoft Windows 10 x64 installation disk.
15. Click OK.
16. Power on the Microsoft Windows 10 VM.

### Installing Windows 10 Enterprise (x64) on the gold image VM

1. Press any key when the installation prompts you 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. Do not enter a 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, and select Complete Installation. For more information, visit [http://kb.vmware.com/selfservice/microsites/search.do?language=en\\_US&cmd=displayKCC&externalId=340](http://kb.vmware.com/selfservice/microsites/search.do?language=en_US&cmd=displayKCC&externalId=340).
13. Reboot the VM.
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 Microsoft Office Professional Plus 2019 on the gold image VM

1. Log onto the `win10-gold` VM as `test\administrator`.
2. Mount the Microsoft Office 2019 media to `d:\`.
3. Open to `d:\office\setup64.exe`.
4. Wait for Office 2019 Professional Pro to install.

## Installing and configuring the Horizon Enterprise 8 agent on the gold image VM

1. Log onto the gold image VM as administrator.
2. Click VMware-Horizon-Agent-x86\_64-2012-8.1.0-17352461.exe.
3. At the welcome screen, and click Next.
4. Accept the license agreement, and click Next.
5. Keep ipv4 as the network protocol, and click Next.
6. Keep the default install directory, and click Next.
7. Select Enable remote desktop, and click Next.
8. Click Install.
9. Click Finish.
10. Click Start, Run, and type `regedit`
11. Browse to HKEY\_LOCAL\_MACHINE\SYSTEM\CurrentControlSet\Services\vmware-viewcomposer-ga.
12. Right-click SkipLicenseActivation, and click Modify...
13. Change the value from 0 to 1.
14. Reboot the VM.

## Installing the Login VSI 4.1 agent on the gold image VM

1. Log onto the win10-gold VM as test\administrator.
2. Mount the LoginVSI media, and run \LoginVSI4140\Target Setup\Target setup.exe.
3. Click Next.
4. Keep all defaults, and click Next.
5. Click Finish.

## Optimizing the gold image VM

1. Log onto the win10-gold VM as test\administrator.
2. Download the Windows optimization tool from VMware at <https://flings.vmware.com/vmware-os-optimization-tool>.
3. Extract the zip file, and run VMwareOSOptimizationTool\_b1170\_16669532.exe.
4. Click Template, and select VMWare\Windows 10.
5. Click Analyze.
6. Select all suggestions, and click Optimize.
7. When settings finish applying, reboot the VM.
8. Run the EnableHTML5.reg file (see Appendix A).
9. Shut down the VM.

## Finalizing the Windows 10 gold image VM and taking a snapshot

VMware Horizon Instant clones require a reference snapshot.

1. In vCenter, shut down the Windows 10 gold image.
2. Right-click the VM named win10-gold, and select Take a snapshot.
3. Name each snapshot, and click OK.

## Deploying persistent instant clones via VMware Horizon 8 connection server

Using the Horizon 8 connection server, we created a pool of persistent instant clones with our gold image.

### Deploying a pool of instant clones

1. Log onto the VM named `view`
2. Click Inventory→Desktops. Under Desktop Pools, click Add.
3. Select Automatic Desktop Pool, and click Next.
4. Select Instant Clone, and click Next.
5. Select Dedicated and Enable Automatic Assignment, and click Next.
6. Leave Storage Policy Management as default, and click Next
7. Name the pool `pool` and click Next.
8. Enter a naming pattern and the desired Maximum Machines and Spare (Powered On) machines for testing. We entered 230 for the AMD EPYC 75F3, and 190 for the AMD EPYC 7542.
9. For vCenter Settings, select the gold-vm, the appropriate snapshot, VM folder location, SUT, and local DAS for storage, and click Next.
10. For Desktop Pool Settings, set Refresh OS Disk After Logoff to Never, and click Next.
11. Leave display settings as default, and click Next.
12. For Guest Customization, browse to OU=Target,OU=Computers,OU>LoginVSI, and click Next.
13. Click the checkbox next to Entitle Users After Adding Pools. To create the pool, click Submit.
14. Add the Domain group LoginVSI, and click OK.

### Configuring the Login VSI 4.1 Management Console for testing

1. Log onto the VSI-MGMT VM as `test\administrator`.
2. Open the Login VSI Management Console.
3. Click Infrastructure→Data servers.
4. Right-click, select Add server, and for the UNC path, enter `\\CIFS2\vsishare\_VSI_Content`
5. Click Infrastructure →Web Servers.
6. Right-click, select Add server, and for the UNC path, enter `\\CIFS2\vsishare\_VSI_Content`
7. Click Add Launchers.
8. At the Add launchers wizard, click Next.
9. Click batch entry, and enter the following:
  - ◆ Name: L
  - ◆ Start number: 1
  - ◆ Increment: 1
  - ◆ Count: 16
  - ◆ Maximum capacity: 25
  - ◆ Formatting length: 2
10. Click Next, and Click Finish.

### Running the Login VSI benchmark

Before we could run the Login VSI benchmark, we first needed to run a profile create test. We added the `office-accept.reg` file to the AD logon script (see Appendix A), and removed the `office-accept.reg` from the AD logon script. We created a Login VSI run profile by creating the files outlined in Appendix A. Afterwards, we created a profile by copying the files to the `vsi-mgmt` VM.

1. Log into the `vsi-mgmt` VM as `test/administrator`.
2. Create a folder called `//vsi-mgmt/vsishare/_VSI_Configuration/testing_profile`
3. Create a folder called `//vsi-mgmt/vsishare/_VSI_Configuration/testing_profile/_CurrentTest`
4. Copy the launchers to `//vsi-mgmt/vsishare/_VSI_Configuration/testing_profile`.
5. Copy `DataLocations`, `Global`, and `VSIlauncher` to `//vsi-mgmt/vsishare/_VSI_Configuration/testing_profile/_CurrentTest`.
6. Open the management console, and begin a test.

## Appendix A: Configuration files

### EnableHTML5.reg

Windows Registry Editor Version 5.00

The VMware OS Optimizer default template disables settings that prevent the benchmark from properly running the video portion. We created a registry file to correct this.

```
[HKEY_LOCAL_MACHINE\SOFTWARE\Policies\Microsoft\Internet Explorer\Main]
"DisableFirstRunCustomize"=dword:00000001
"EnableAutoUpgrade"=dword:00000000
"Play_Animations"="yes"
"TabProcGrowth"="low"
"EnableAlternativeCodec"="yes"

[HKEY_LOCAL_MACHINE\SOFTWARE\Policies\Microsoft\Internet Explorer\Main\FormatDetection]
"PhoneNumberEnabled"=dword:00000000

[HKEY_LOCAL_MACHINE\SOFTWARE\Policies\Microsoft\Internet Explorer\Main\WindowsSearch]
"EnabledScopes"=dword:00000000
```

### Office-accept.reg

Windows Registry Editor Version 5.00

When we ran the profile create job, we needed to automate the acceptance of Microsoft Office 2019 License agreement. We created the Office-accept.regfile and called it via Active Directory logon script (\\DC1\sysvol\test.local\scripts\v4-VSI\Logon.cmd).

```
[HKEY_CURRENT_USER\SOFTWARE\Microsoft\Office\16.0\Common\Licensing]
"RemoveOOBE"=dword:00000001
"FirstCleanValidation"=dword:00000001
"EulasSetAccepted"="0,28,"

[HKEY_CURRENT_USER\SOFTWARE\Microsoft\Office\16.0\Common\Licensing\BootTimeSkuOverride]
"{DC5CCACD-A7AC-4FD3-9F70-9454B5DE5161}"="{85DD8B5F-EAA4-4AF3-A628-CCE9E77C9A03}"

[HKEY_CURRENT_USER\SOFTWARE\Microsoft\Office\16.0\Common\Licensing\CachedLicenseData]
"winword.exe"=hex:01,5f,8b,dd,85,a4,ea,f3,4a,a6,28,cc,e9,e7,7c,9a,03,10,00,00,\
00,00,00,00,00,30,00,34,00,31,00,34,00,35,00,2d,00,30,00,30,00,30,00,2d,00,\
30,00,30,00,30,00,30,00,30,00,01,00,02,00,00,00,06,00,00,00,07,00,00,\
00

[HKEY_CURRENT_USER\SOFTWARE\Microsoft\Office\16.0\Common\Licensing\CurrentSkuIdAggregationForApp]
"Access"="{85DD8B5F-EAA4-4AF3-A628-CCE9E77C9A03},"
"Excel"="{85DD8B5F-EAA4-4AF3-A628-CCE9E77C9A03},"
"OneNote"="{85DD8B5F-EAA4-4AF3-A628-CCE9E77C9A03},"
"Outlook"="{85DD8B5F-EAA4-4AF3-A628-CCE9E77C9A03},"
"PowerPoint"="{85DD8B5F-EAA4-4AF3-A628-CCE9E77C9A03},"
"Publisher"="{85DD8B5F-EAA4-4AF3-A628-CCE9E77C9A03},"
"Word"="{85DD8B5F-EAA4-4AF3-A628-CCE9E77C9A03},"
"Lync"="{85DD8B5F-EAA4-4AF3-A628-CCE9E77C9A03},"

[HKEY_CURRENT_USER\SOFTWARE\Microsoft\Office\16.0\Common\Licensing\LastKnownC2RProductReleaseId]
"Access"="ProPlus2019Retail"
"Excel"="ProPlus2019Retail"
"OneNote"="ProPlus2019Retail"
"Outlook"="ProPlus2019Retail"
"PowerPoint"="ProPlus2019Retail"
"Publisher"="ProPlus2019Retail"
"Word"="ProPlus2019Retail"
"Lync"="ProPlus2019Retail"

[HKEY_CURRENT_USER\Software\Microsoft\Office\16.0\Common]
"PrivacyNoticeShown"=dword:00000002
```

## Login VSI configuration files

This section contains the configuration information for four files: Launchers, DataLocations, Global, and VSILauncher. We created each file using Windows Notepad, and saved each file without specifying a file extension. Please note that we truncated the repetitious and redundant nature of some of the files by typing [...]. This requires duplication of the session for the file to work correctly. Also, note that you must edit NumberOfSessions in the VSILauncher file to reflect the testing scenario you desire.

### Launchers

```
[101]
Capacity=25
Disabled=0
CMLaunch=0
Notes=
[102]
Capacity=25
Disabled=0
CMLaunch=0
Notes=
[...]
[116]
Capacity=25
Disabled=0
CMLaunch=0
Notes=
```

### DataLocations

```
[Dataservers]
Server1=\\CIFS2\vsishare\_VSI_Content
[Server1]
name=Default
enabled=1
[WebServers]
WebServer1=\\CIFS2\vsishare\_VSI_Websites
[WebServer1]
name=Default
enabled=1
[Server2]
[WebServer2]
[Library]
doc=1000
docx=1000
jpg=1000
mm=1000
pdf=1000
ppt=1000
pptx=1000
pst=1000
txt=1
xlsx=1
[Websites]
BBC=20
ENGADGET=20
PINTEREST=20
Player=20
THEVERGE=20
```

## Global

```
[Settings]
Use_SessionM=1
LauncherHeartbeat=10
UserHome=H:
Groupdrive=M:
LauncherPollInterval=5
EngineWorkloadIndexPollInterval=5
EngineProcessPollInterval=5
TimerInterval=360
PublishedAppsLogFileShare=
RelaunchAppsOnSubsequentLoops=1
WorkloadIndexDebug=0
LogoffAt=segment
Logoff_Action=shutdown /l /f
logout_on_fatal_error=0
EsxstopEnabled=0
EsxstopServer=
EsxstopUsername=
EsxstopPassword=
EsxstopIntervalRecording=30
EsxstopAmountRecording=120
EsxstopFileKeepDuration=never
Pause={Pause}
MashupBehavior=Calculated
Workload_Loops=99999
SegmentBehavior=Calculated
SBC_timer_detect=0
PDFPrinting=1
ZIPLocation=%TEMP%\VSI\Zip
Verify_runtime_files=1
RandomInitialWait=5
DisableVideoViewing=0
IEVideoOption=Auto
Workload_Language=English
IEVersion=11
Office_code=2019
Office_version=16
Office_Language=English
office_print_sequence={altdown}fppp{altup}
log_category_AppStart=True
log_category_ShellExecuteWait=True
log_category_WebStart=False
log_category_LoopTimer=False
log_category_RandomCopy=False
log_category_SegmentTimer=False
SegmentsPerFile=20
Engine_Debug=0
Workload_Debug=0
winwait_timeout=120
winwaitactive_timeout=120
timer_timeout=60
ShellExecuteWaitTimeout=0
Workload=knowledgeworker
[GUI]
AgentRunLoop=1
Fancy=1
CheckShareWritable=1
Mode=Normal
[Logon]
MapUserHome=1
MapGroupDrive=1
ImportOfficeReg=1
CopyPST=1
```

```
SetFreemindFTA=1
EngineStartup=Shell
```

## VSILauncher

```
[Scenario]
CPUEnabled=disabled
NumberOfCPU=0
CoresEnabled=disabled
NumberOfCores=0
HyperThreadingEnabled=disabled
HostsEnabled=disabled
NumberOfHosts=0
[Launcher]
BaseLinePhase=0
Servername=
Username=
Password=enc:BD177557C81239CED1:enc
ShowPassword=C04033148B4E
Domain=
useCSV=1
MultipleResources=0
CCL="C:\Program Files (x86)\VMware\VMware Horizon View Client\vmware-view" -serverURL view -username
%csv_username% -password Password1 -domainname test -desktopName pool --desktoplayout 1280x1240##
CSV=\\vsi-mgmt\vsishare\ccv.csv
AgentRunLoop=1
PhasesCount=1
NumberOfSessions=230
NumberOfWindows=3600
SequentialInterval=30
AutoLogoff=1
LogoffTimeOut=120
CreateProfile=0
TSDiscon=0
PreTestScript=
PostTestScript=
[Launcher_FD]
Servername=
Username=
Password=
ShowPassword=
Domain=
useCSV=1
MultipleResources=0
CCL="C:\Program Files (x86)\VMware\VMware Horizon View Client\vmware-view" -serverURL view -username
%csv_username% -password Password1 -domainname test -desktopName pool --desktoplayout 1920x1080##
CSV=\\vsi-mgmt\vsishare\singleserver.csv
AgentRunLoop=1
[VSI]
SkipAddLaunchersScreen=0
SkipCommandLineScreen=0
Increment=0
TestNamePattern=
SkipStartTestScreen=0
SkipAllWelcomeScreens=1
[Phase1]
Name=Phase 1
Sessions=
PhaseTime=3600
Pause=False
[LauncherWorkload]
launcherUsername=launcher
launcherDomain=test
launcherPassword=
launcherWorkflow=0
```

```
limitConcurrent=25
launcherResolution=1920x1080
launcherDisconnectAfterLaunch=0
```

#### Custom CCV-

```
UserName,DDC,resource
loginvsi001,pool
loginvsi002,pool
loginvsi003,pool
loginvsi004,pool
loginvsi005,pool
[...]
```

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