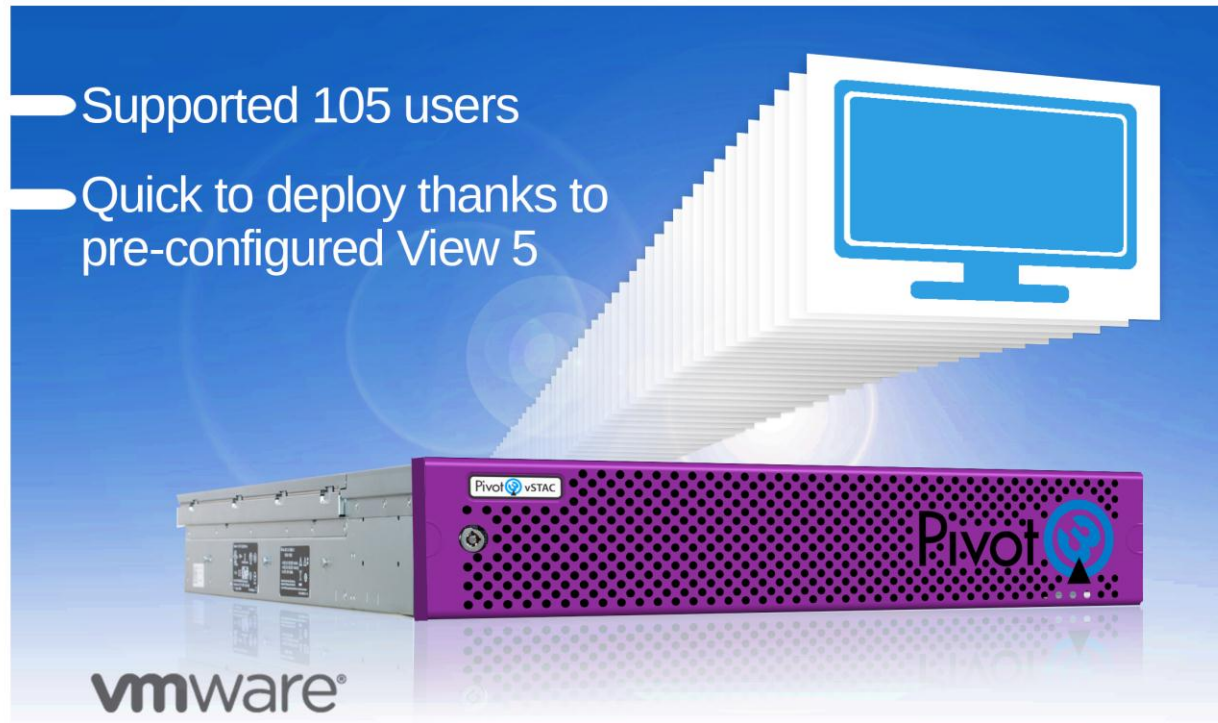


## VMware®-based vSTAC™ VDI appliance



Enterprises that are setting up a virtual desktop infrastructure (VDI) can choose from many hardware and software options. One integrated solution is the Pivot3 vSTAC VDI P Cubed Appliance, which uses VMware View software. P Cubed integrates storage, making it easy to set up and manage, and can scale as your business grows.

In the Principled Technologies (PT) labs, we tested the vSTAC P Cubed appliance. We found that it supported 105 users with an acceptable user response time.

## A SIMPLIFIED VDI SOLUTION

Virtual desktop infrastructures require a great deal of planning to ensure you can deliver the desktop performance employees require. One way to simplify the process is to choose an integrated solution, such as the Pivot3 vSTAC VDI P Cubed Appliance.

We tested a single Pivot3 vSTAC VDI P Cubed Appliance pre-configured with VMware vSphere 5.1, and VMware View 5.1. We used the Login VSI Medium workload to generate a reproducible, real-world test case that simulated the execution of various applications including Microsoft® Internet Explorer®, Adobe® Flash® video, and Microsoft Office applications. Using Login VSI, we could determine how many virtual desktop users the solution could support.

We configured Login VSI to run a Medium workload against a pool of virtual desktops and set up the test to incrementally log users into virtual desktop sessions over a 45-minute period. Login VSI measures the total response time of all the applications from each session and calculates the VSI Index by taking the average response times and dropping the highest and lowest 2 percent. The average response time of the first 15 sessions determines a baseline; the VSI<sub>max</sub> is  $\text{baseline} \times 125\% + 3000\text{ms}$ . As more sessions begin to consume system resources, response time degrades and the VSI index increases until it is above the VSI<sub>max</sub>. When this condition is met, the benchmark records a Login VSI<sub>max</sub>, which is the maximum number of sessions that platform could support. All sessions stayed logged in for 15 minutes.

## PROVEN PERFORMANCE

In our tests, we found that the Pivot3 vSTAC VDI P Cubed Appliance was able to host 105 concurrent sessions while retaining a satisfactory user response, and did not reach VSI<sub>max</sub>. Note: VSI<sub>max</sub> is the maximum user capacity at which performance did not degrade; therefore, not reaching VSI<sub>max</sub> is a positive indicator that response time remained satisfactory.

Figure 1 shows the response times, in milliseconds, as we increased the number of users in our test.

Figure 1: The vSTAC P Cubed appliance ran 105 sessions and didn't reach VSImax.

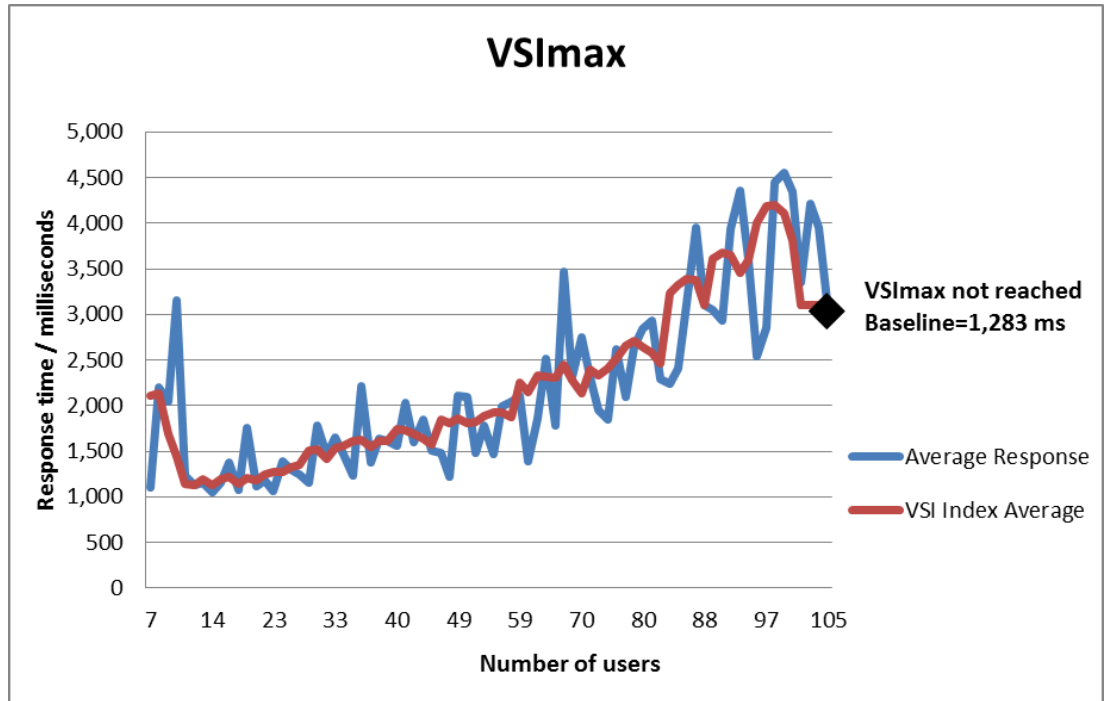


Figure 2 shows the percentage CPU utilization throughout our one-hour test. Average CPU utilization was 72.3 percent.

Figure 2: CPU utilization throughout our test period averaged 72.3 percent.

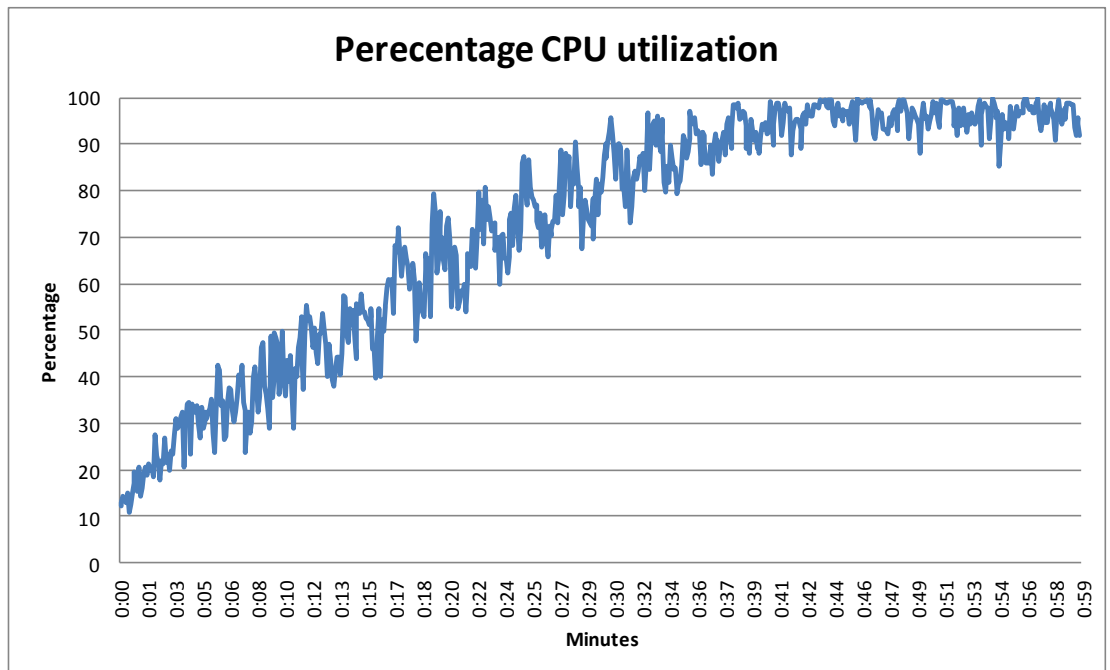
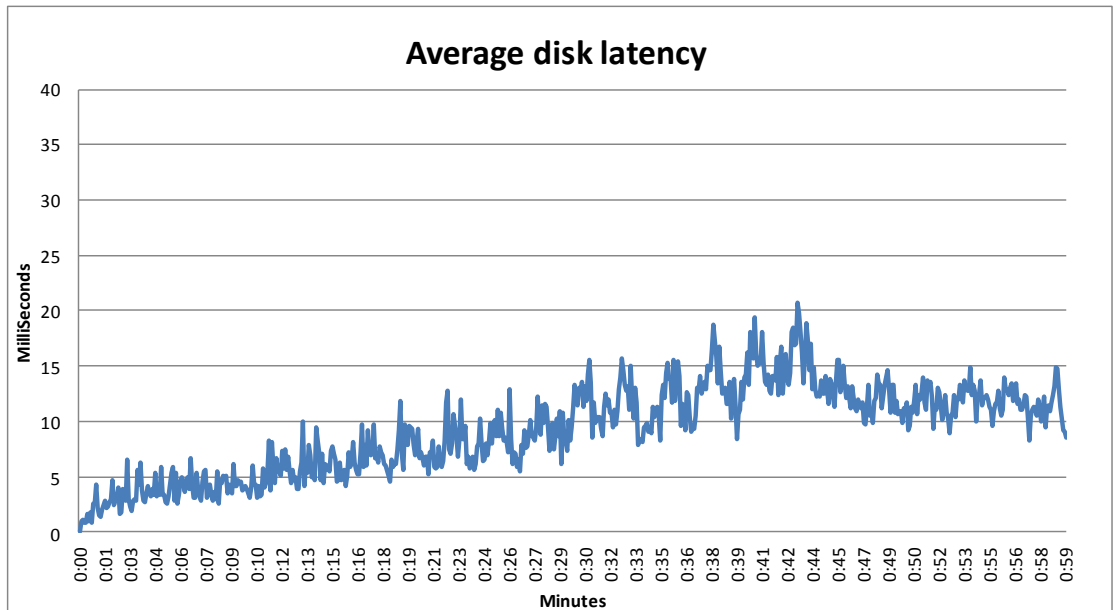


Figure 3 shows the disk latency, in milliseconds, throughout our one-hour test. Average disk latency was 9.2 milliseconds.

Figure 3: Disk latency throughout our test period averaged 9.2 milliseconds.



## CONFIGURING AND DEPLOYING VMS WITH THE PIVOT3 VSTAC VDI P CUBED APPLIANCE

Because the Pivot3 vSTAC VDI P Cubed Appliance comes with VMware View preconfigured, setting it up and getting your VMs up and running is extremely simple and quick. Figure 4 presents the time needed for the small number of steps involved in this process. As it shows, you can configure the appliance and get 105 VMs going in less than an hour.

Step	Time
Connect Network and power on	0:00:09
Power on VMs and Configure Networking on ESXi	0:03:25
Assign user to desktop pool	0:00:12
Update vSphere License and View license	0:01:01
Configure View connection server	0:00:37
Activate and customize sample desktop	0:02:14
<b>Total time to configure</b>	<b>0:07:38</b>
<b>Total time to deploy 105 VMs</b>	<b>0:45:51</b>
<b>Total time to configure and deploy 105 VMs</b>	<b>0:53:29</b>

Figure 4: Time to configure and deploy VMs using the Pivot3 vSTAC VDI P Cubed Appliance.

## WHAT WE TESTED

### About Pivot3 vSTAC VDI P Cubed Appliance

The vSTAC P Cubed appliance provides a full VDI production deployment out-of-the-box with minimal configuration and in less than one hour. By efficiently eliminating the need of specialized external storage, IT administrators can easily scale to hundreds of virtual desktops by simply adding additional vSTAC appliances. The plug-and-play capabilities of the appliance allow customers to consolidate server and storage resources in to a single hardware platform in an easy to use low factory pre-configured environment. Automatic storage load balancing and high-availability are features fully supported by the vSTAC P Cubed appliance.

To learn more about the vSTAC P Cubed appliance, visit

<http://www.pivot3.com/products/p3/>

### About VMware View 5

VMware designed its View 5 desktop virtualization software to simplify IT management of virtual desktops from within the cloud. A centralized interface allows administrators to manage upwards of tens of thousands of end-users. An administrator can easily manage settings such as policy enforcement, performance monitoring, connection brokering, and provisioning, to name a few. The result includes improved security, less costly management, and faster provisioning and maintenance of desktop images and applications. The end-user enjoys easier access to his or her View desktop from a variety of locations, less downtime, a customizable desktop, and robust multimedia capabilities.

To learn more about VMware View 5, visit

<http://www.vmware.com/products/view/overview.html>.

### About VMware vSphere 5

vSphere 5 is the latest virtualization operating system from VMware. vSphere 5 allows companies to virtualize their server, storage, and networking resources, achieving a consolidation ratio greater than 15:1. Features such as automated management and dynamic resource allocation improve efficiency. The services that vSphere 5 provides fall into two categories: Infrastructure services or application services. The former handle the virtualization of resources and their allocation to application when most needed, while the latter provide service-level controls to applications running on vSphere 5.

To learn more about VMware vSphere 5, visit

<http://www.vmware.com/products/vsphere/overview.html>.

## About Login VSI 3.6

Login Virtual Session Indexer (Login VSI) 3.6 is a tool that helps assess the virtual desktop performance, capacity, and scalability of a server.

The newest version of Login VSI, Login VSI 3.6, includes client side performance testing that test character response, large text response, mouse-click feedback, and image quality and loading times on clients to ensure good end-user performance. In our tests, we did not use the client-side testing portion of Login VSI, but instead used the tool to determine how many virtual desktops the appliance could support. For more information about Login VSI 3.6, see <http://www.loginvsi.com/product-overview>.

## CONCLUSION

Choosing an integrated solution to host your VMware View virtual desktops can simplify your infrastructure and ultimately reduce costs associated with storage administration, power, and cooling costs. We put one such solution that combines processors, memory, and local storage, the Pivot3 vSTAC VDI P Cubed Appliance, to the test to see how many VMware View virtual desktops the solution could host while delivering acceptable performance.

As our tests show, the vSTAC VDI P Cubed Appliance can host up to 105 concurrent typical medium-workload users on VMware View virtual desktops.

## APPENDIX A – CONFIGURATION INFORMATION

Figure 5 provides detailed configuration information for the Pivot3 vSTAC P Cubed appliance.

System	Pivot3 vSTAC P Cubed
<b>Power supplies</b>	
Total number	2
Vendor and model number	Dell F750E-S0
Wattage of each (W)	750
<b>Cooling fans</b>	
Total number	6
Vendor and model number	Sanyo 9GA0612P1J611
Dimensions (h x w) of each	3 x 3
Volts	12
<b>General</b>	
Number of processor packages	2
Number of cores per processor	6
Number of hardware threads per core	2
System power management policy	Performance
<b>CPU</b>	
Vendor	Intel®
Name	Intel Xeon® E5-2630
Model number	Xeon E5-2630
Stepping	C1
Socket type	LGA2011
Core frequency (GHz)	2.3
Bus frequency (GT/s)	7.2
L1 cache	32 KB + 32 KB (per core)
L2 cache	256 KB (per core)
L3 cache (MB)	15
<b>Platform</b>	
Vendor and model number	Pivot3 vSTAC Appliance
BIOS name and version	1.2.6 [Pivot3 1.0.0]
BIOS settings	Performance
<b>Memory module(s)</b>	
Total RAM in system (GB)	128
Vendor and model number	Samsung® M393B2G70BH0-YH9
Type	PC3-10700
Speed (MHz)	1,333
Speed running in the system (MHz)	1,333
Timing/Latency (tCL-tRCD-tRP-tRASmin)	9-9-9-25
Size (GB)	16
Number of RAM module(s)	8
Chip organization	Double-sided
Rank	Dual

System	Pivot3 vSTAC P Cubed
<b>Operating system</b>	
Name	VMware ESXi 5.1.0
Build number	799733
File system	VMFS
Service Pack	N/A
Language	English
<b>Hard drive</b>	
Vendor and model number	Seagate® ST2000NM0011
Number of drives	12
Size (GB)	2000
RPM	7,200
Type	SATA
<b>Ethernet adapter</b>	
Vendor and model number	Intel I350 Gigabit
Type	Integrated
<b>USB ports</b>	
Number	4
Type	2.0

Figure 5: Detailed configuration information for the Pivot3 vSTAC P Cubed appliance.



## APPENDIX B – HOW WE TESTED

Figure 6 presents the settings we used to configure the Pivot3 P Cubed VMware View environment.

VM name	Hosted OS	Role (s)	Host	Memory	# vCPUs
AD01	Win 2008 R2 x64 Enterprise	AD Domain controller VSI Share, DHCP, DNS, NTP, AD roaming profiles, folder redirection	vDT-host	4 GB	2
View Connection	Win 2008 R2 x64 Enterprise	VMware View Connection server	vDT-host	4 GB	4
vCenter	Win 2008 R2 x64 Enterprise	VMware Virtual Center, Composer	vDT-host	4 GB	4
Management Station	Win 2008 R2 x64 Enterprise	Configuration and management software for Pivot3 STACs	vDT-host	4 GB	1
Pivot3_VM	pvt.00.6.0.TALON.05A7.53301130	Pivot3 storage appliance	vDT-host	4 GB	4
Launcher	Windows 7 x 86 Enterprise	Login VSI master launcher	Launcher server	4 GB	2
Golden Desktop	Windows 7 x 86 Enterprise	View master image	vDT-host	1 GB	1

Figure 6: Configuration settings we used when testing the Pivot3 vSTAC P Cubed appliance.

### Setting up Pivot3 vSTAC VDI P Cubed

#### Configuring the network

1. Connect network cables into the management and private networks.
2. Connect to the host via the VMware vSphere client.
3. Log in as `root`.
4. Right click on the icons to power up each VM.
5. Configure IP addresses for both NICs on the management appliances.
6. Open the console for AD01 and login in using domain administrator credentials.
7. Open DNS and update the IP address of the management appliance.

#### Setting up the Login VSI share and Active Directory users

For Login VSI to work correctly, you must create a CIFS share, Active Directory OU, and Active directory. For more information on Login VSI, see <http://www.loginvsi.com/en/admin-guide/installation.html>. Open Windows Explorer, and create a file called `f:\share`, `e:\profiles` and `e:\folderredirect`

1. Assign permissions of read/write to the `pcube/everyone` group.
2. Right-click the `f:\share`, `e:\profiles` and `e:\folderredirect` folders, and select Properties.
3. Click the Sharing tab, and click Share...
4. Add everyone, system and administrators to the Read/Write group, and click Share.
5. Right-click the `e:\folderredirect` folder and select Properties→Sharing→Advanced Sharing→Caching, and select No files or programs from the Share Folder are available offline.
6. Click OK, Apply, OK and Close.
7. From the Login VSI 3.6 media, run the Login VSI AD Setup.
8. Keep the defaults, and click Start.

#### Creating roaming profiles for users

1. Open Active Directory Users and Computers.

2. Browse to pcube.local→Login\_VSI→Users→Target.
3. Select all Login VSI users, and right-click Properties.
4. Click the Profiles tab.
5. Check box Profile path, and type e: \profiles\%username%
6. Click OK.

### Configuring folder redirection

1. Log into DC1 as administrator
2. Open the Group Policy editor.
3. Open forest→domains→pcube.local→right-click group Policy Objects, and select New.
4. Type folder redirection, leave source starter GPO as none, and click OK.
5. Right-click the folder redirection GPO, and click Edit.
6. Browse to User Configuration→Policies→Windows Settings→Folder Redirection, and right-click AppData (roaming).
7. In the AppData (roaming) Properties target tab, select the following:
  - Setting= select Basic= Redirect everyone's folders to the same location
  - Target folder location= Create a folder for each user under the root path
  - Root Path= \\DC1\folderredirection
  - In the AppData (roaming) Properties setting tab, uncheck the box for Grant the user exclusive right to AppData (Roaming), and click OK.
8. Repeat steps 6 through 8 for all subfolders in the folder redirection tree.
9. Close the Folder redirection group policy window.
10. In the group policy editor, right-click the folder redirection policy, and select GPO status→Computer Configuration Settings Disabled.
11. In the group policy editor, drag the folder redirect GPO to Forest→Domains→pcube.local→Login\_VSI→Users→Target.

### Update vCenter Licensing

1. Connect to the vCenter VM via the VMware vSphere client.
2. Log in using the administrator account.
3. Navigate to Home→Administration→Licensing, and click Manage vSphere Licenses.
4. Click Add Licenses Keys, and click Next.
5. Click Assign to add a license to the VMware vSphere 5 desktop host.
6. Select the Host and the License, and click Next twice.

### Customize Sample Desktop

1. Log into the Golden\_Desktop with the pcube\administrator account.
2. In Windows Activation, click Activate Now.
3. Right-click Computer→Properties→Change settings→Advanced→Performance→Settings.
4. In Performance settings, select the Advanced tab, and select Change for Virtual Memory.
5. Deselect Automatically manage page file.
6. Select Custom size, type 2048 for both values, and select Set.

### Enabling ClearType fonts

1. Click Start→Run, and type cttune.exe
2. Check the Turn on ClearType box, and click Next.
3. Follow the wizard to enable ClearType fonts.

### Installing Office 2010 Professional

1. From the Office 2010 media, run Setup.

2. Enter the product key for Office 2010, and click Continue.
3. Accept the licensing agreement.
4. Select Install Now.
5. Reboot the system.

#### **Installing Login VSI target software on view\_gold**

1. Log into the Golden\_Desktop VM as `pcube\administrator`
2. Browse to `\vsi-install\Target setup`.
3. Run the setup.exe.
4. In the Target Setup wizard, specify the VSI share `\\dc1\share`.
5. Click Start.
6. At the security warnings, click OK.
7. Reboot the system.
8. Open console, navigate to VM→Snapshot, and click Take Snapshot.

#### **Configure VMware View**

1. In the ManagementStation Console, open Internet Explorer. Click continue to this website.
2. Log into VMware View Administrator with the `pcube\administrator` account.
3. Navigate to View Configuration→Product Licensing and Usage. Click Edit License.
4. Enter the license, and click OK.
5. Navigate to Inventory→Pools, and click the SampleDesktop in the ID column.
6. Select ViewComposer→Recompose.
7. In select Parent VM, select Golden\_Desktop, and click OK.
8. In Image, highlight the new snapshot. Click Next.
9. In Scheduling, click Next.
10. In Ready to complete, click Finish.
11. Navigate to Inventory→Pools, and click SampleDesktop.
12. Click Edit.
13. Under the Provisioning Settings tab, set the Max number of desktops to 100. Click OK.

#### **Creating a Windows 7 Enterprise x86 VM**

##### **Installing the Windows 7 Enterprise (x86) base image VM**

1. Connect to the vDT-host via the VMware vSphere client.
2. Log in as `root`.
3. Click the Virtual Machines tab.
4. Right-click, and choose New Virtual Machine.
5. Choose Custom, and click Next.
6. Assign the name as `win7-temp` and click Next.
7. Select infra for the host, and click Next.
8. Select vdiLUN.
9. Choose Virtual Machine Version 8, and click Next.
10. Choose Windows, choose Microsoft Windows 7 (32-bit), and click Next.
11. For CPUs, select one virtual processor socket and one core per virtual socket, and click Next.
12. Choose 1GB RAM, and click Next.
13. Click 1 for the number of NICs, select VMX, and click Next.
14. Leave the default virtual storage controller, and click Next.
15. Choose to create a new virtual disk, and click Next.
16. Make the OS virtual disk size 20 GB, choose thick-provisioned lazy zeroed, specify the OS datastore on the external storage, and click Next.

17. Keep the default virtual device node (0:0), and click Next.
18. Click Finish.
19. Click Finish, and click OK.
20. Right-click the win7-temp VM, and click Edit settings.
21. Click the Resources tab, click Memory, and check the Reserve all guest memory box.
22. Click the Hardware tab, CD/DVD Drive, and connect the VM virtual CD-ROM to the Microsoft Windows 7 x86 installation disk.
23. Click OK.

### **Installing the Windows 7 Enterprise (X86) on the base image 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, and the setup begins.
7. Type `user` for the username and change the computer name, and click Next.
8. Enter no password, and click Next.
9. For system protection, 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. Use Windows Update to patch the Windows 7 installation.
13. Install VMware Tools from [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).
14. Join the domain and Reboot.

### **Adjusting page file**

1. Log in as `pcube\administrator`
2. Right-click Computer→Properties→Change settings→Advanced→Performance→Settings.
3. In Performance settings, select the Advanced tab, and select Change for Virtual Memory.
4. Deselect automatically manage page file.
5. Select Custom size, type `2048` for both values, and select Set.

### **Enabling ClearType fonts**

1. Click Start→Run, and type `cttune.exe`
2. Check the Turn on ClearType checkbox, and click Next.
3. Follow the wizard to enable ClearType fonts.

### **Disabling Windows Firewall**

The domain GPO automatically disables the Windows Firewall.

### **Installing Office 2010 Professional**

1. From the Office 2010 media, run Setup.
2. Enter the product key for Office 2010, and click Continue.
3. Accept the licensing agreement.
4. Select Install Now.
5. Reboot the system.

### **Installing Login VSI target software**

1. Log into the VDI-gold VM as `pcube\administrator`
2. Browse to `\vsi-install\Target setup`.

3. Run the `setup.exe`.
4. In the Target Setup wizard, specify the VSI share `\\dc1\share`
5. Click Start.
6. At the security warnings, click OK.
7. Reboot the system.

## Setting up Windows 7 Enterprise Launchers

On a separate server, we created a Windows Enterprise X86 VMs base image and converted it into a template.

Using our template, we deployed Login VSI launchers.

We installed the VMware View 5.1 client, added it to the `pcube.local` domain and Login VSI OU in Active Directory, and installed the Login VSI Launcher software.

## Installing the Windows 7 Enterprise (x86) base image VM

1. Log into the vCenter.
2. In the vSphere client, connect to the vCenter Server, and browse to the Launcher host.
3. Click the Virtual Machines tab.
4. Right-click, and choose New Virtual Machine.
5. Choose Custom, and click Next.
6. Assign the name as `win7-temp` and click Next.
7. Select `infra` for the host, and click Next.
8. Select `infraLUN`.
9. Choose Virtual Machine Version 8, and click Next.
10. Choose Windows, choose Microsoft Windows 7 (32-bit), and click Next.
11. For CPUs, select two virtual processor sockets and one core per virtual socket, and click Next.
12. Choose 4GB RAM, and click Next.
13. Click 1 for the number of NICs, select VMX, and click Next.
14. Leave the default virtual storage controller, and click Next.
15. Choose to create a new virtual disk, and click Next.
16. Make the OS virtual disk size 20 GB, choose thick-provisioned lazy zeroed, specify the OS datastore on the external storage, and click Next.
17. Keep the default virtual device node (0:0), and click Next.
18. Click Finish.
19. Click Finish, and click OK.
20. Right-click the `win7-temp` VM, and click Edit settings.
21. Click the Resources tab, click Memory, and check the Reserve all guest memory checkbox.
22. Click the Hardware tab, CD/DVD Drive, and Connect the VM virtual CD-ROM to the Microsoft Windows 7 x86 installation disk.
23. Click OK.

## Installing the Windows 7 Enterprise (X86) on the base image 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, and the setup begins.
7. Type `user` for the username and change the computer name, and click Next.
8. Enter no password, and click Next.

9. For system protection, 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 from [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. Use Windows Update to patch the Windows 7 installation.
14. Reboot.

#### **Installing the Login VSI launcher**

1. Log into the XD\_gold VM as `pcube\administrator`
2. Browse to `\vsi-install\Launcher setup`.
3. Run the `setup.exe`.
4. In the Target Setup wizard, specify the VSI share `\\dc1\share`

#### **Installing the VMware View client**

1. Browse to the VMware View 5.1 media, and run the `VMware-viewclient.exe` file.
2. Click Run.
3. At the welcome screen, click Next.
4. At the Patents screen, click Next.
5. Accept the VMware end user license agreement, and click Next.
6. Select defaults, and click Next.
7. Click Install.

#### **Configuring the Login VSI Management Console**

For VMware View testing we used the following Settings:

- Connection Type: Custom Commandline with CSV
- Specify Custom Commandline:

```
c:\program files\VMware\VMware View\Client\bin\wswc.exe -serverURL
http://viewconnection.pcube.local -username: %view_user% -password
Password1 -domainname pcube -desktopname View -Standalone -
LoginAsCurrentUser False -ConnectUSBonStartup False
```
- Specify CSV file:  
`\\ad01\Share\csv\view_user.csv`
- Connection Settings session:
  - Connect: Specify User
  - Formatting Length: Set to 1
  - Server Name: Leave blank
  - User Name: Leave blank
  - Password: Leave blank
  - Domain: Leave blank

## ABOUT PRINCIPLED TECHNOLOGIES



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