Step-by-Step Guide to Designing School Labs with VMware® View™
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Introduction

Students and teachers alike want to use an ever-broadening array of devices to access their data and applications—from any location, at any time. Virtualization is the key to this new model, and that is why more and more schools are leveraging the benefits of virtualization—particularly in on-site and mobile labs.

There’s no question that these next-generation school labs can help educators meet broad curriculum requirements for diverse groups of faculty and students. The question is how to build a school lab in a way that maximizes the benefits while minimizing cost and complexity. This document summarizes the capabilities of VMware® View™ in an educational environment, and provides specific, step-by-step instructions for building a school lab that can accommodate 10-30 end user devices.

VMware View 4.5: A Brief Recap

VMware View 4.5 is the leading desktop virtualization solution, built for delivering desktops as a managed service. With VMware View, IT organizations can unlock a user’s data, applications and Operating System from the end device and manage these components centrally in the datacenter to provide a secure and customized desktop to users—with a superior end-user experience from any location, on any compatible device. This document will help familiarize you with several key components of VMware View 4.5.

The VMware View client is a native Windows client and provides access to the View infrastructure. The client is also available for the Macintosh and the Linux platform as open source. The VMware View agent runs in the virtual desktop and can be currently hosted in Windows XP, Windows Vista, or Windows 7. It provides a management point for the View Connection Manager.

The View Connection Manager (also known as the View Manager) can run in either Windows 2003 or Windows 2008 (as either a virtual machine or a physical machine). It provides brokering services to the end user accessing the View infrastructure from the View client. It also provides management services to the View administrator.

An optional VMware® View Security Server™ is installed in the DMZ. This is a hardened installation of the VMware View Connection Server and provides access for users connecting to the View infrastructure from the public Internet. Finally, an optional VMware View Transfer Server provides the ability to transfer desktop virtual machines to authorized VMware View clients.

The VMware View environment runs on top of the VMware® vSphere™ infrastructure, which provides the virtualization services necessary to deliver the virtual desktop. The management of vSphere is accomplished via VMware® vCenter,™ which provides a single pane of glass for setting up, monitoring and managing the virtual infrastructure. Management of the VMware View environment is accomplished through the View Connection/Management Server.
Starting Point: Defining a Use Case

The design process for a school lab based on VMware View 4.5 begins with the definition of a use case. In our scenario, we will assume a lab environment that is based in one location. Lab users will access the virtual infrastructure from the VMware View client, which will be installed in either a Windows desktop or provided through a certified end client device such as a thin terminal device. The assumption is that this environment is limited to a single lab of 10 to 30 end-user-devices. Scaling beyond this size will require a re-architecture of the ESX[i] environment. For instance, we assume that all user and management traffic flows over a single 1Gb link. This, and other assumptions, may change in a real-world deployment.

VMware View leverages a concept of Desktop Pools, which are logical containers that represent a unique use case. In our case, the use case is a lab environment. Desktop type, access mode, user experience, performance and application set will be characterized in the Desktop Pool. Use cases align to Desktop Pools. The table shown in Appendix C lists various pool attributes and the values recommended for our lab environment use case.

An important question to consider is whether a particular use case requires a stateful or stateless desktop image. Stateless architectures have significant advantages such as being easier to support, enabling View Composer-based management and reducing storage costs. Stateful desktop images require traditional image management techniques. They are created by assigning a dedicated pool of full virtual machines. In our lab scenario, we will deploy stateless desktop images by utilizing VMware View Composer and leverage floating assignment pools of linked clone virtual machines.

As mentioned previously, View 4.5 leverages the VMware hypervisor (ESX or ESXi) and vCenter Server. If an existing ESX or ESXi installation is in place and has sufficient resources available to host the lab, you can jump straight to the installation of the View 4.5 manager. If that is not the case, then stand up a new instance of ESX or ESXi. You can reference Appendix A for assistance with the installation of the hypervisor.

Please note that the performance of the Proof of Concept (POC) will be highly dependent on a number of factors, including the host configuration (CPU, memory, network) and storage. vCenter Server requires 2 physical 64-bit CPU cores (2.0 GHz or faster), 4 GB of RAM, 5 GB of disk space, and a one-Gigabit or faster networking connection. Appendix B reviews the installation of the vCenter Server if one is not in place.
Preparing for View 4.5 Manager Installation

There are several VMware documents that will be referenced in this document. The first is the VMware View 4.5 Evaluators Guide. A detailed manual for the installation of View 4.5 Manager and Composer can be found in the View 4.5 Installation guide at: [http://www.vmware.com/pdf/view45_installation_guide.pdf](http://www.vmware.com/pdf/view45_installation_guide.pdf).

The purpose of this VMware View 4.5 Lab Installation guide is to provide step-by-step instructions for installing and configuring View 4.5 for a lab environment. If there are any questions or issues that come up during the installation, please consult the authoritative VMware View 4.5 Installation Guide. You can also find help at the VMware View Community Forum: [http://communities.vmware.com/community/vmtn/entdesk/view](http://communities.vmware.com/community/vmtn/entdesk/view).

View Manager Requirements

The View Manager can be installed on a 32-bit or 64-bit dedicated physical or virtual machine (a system hosted on VMware ESX or ESXi hypervisor). The hardware requirements are listed in Chapter 1 of the View installation manual; but briefly, the system should support at least dual processors, have multiple network interface cards, 4GB of RAM (Windows Server 2008) or 2 GB of RAM (Windows Server 2003 32-bit). Windows Server 2003 32-bit, Windows Server 2003 R2 32-bit and Windows Server 2008 R2 64-bit are supported for the View Manager. Note that the View Manager provides a web server interface which supports Internet Explorer 7 or greater. You may need to update the View Manager host web browser if you are running an older Operating System.

Ensure that you have a valid license key for the VMware View Connection Server. You can request an evaluation key as well as download the View and ESXi software from the VMware website at: [https://www.vmware.com/tryvmware/?p=default](https://www.vmware.com/tryvmware/?p=default).

The View Manager must be joined to an Active Directory domain. The View Manager must also be configured with a static IP address.

View Composer Requirements

For the purposes of our lab environment we will be deploying linked-clone desktops from a single desktop image. View Composer provides this capability and has a few requirements. Namely, a SQL database must reside on or be available to the vCenter Server instance that will be integrated with the View Manager. If an SQL database already exists for vCenter Server, View Composer can use that existing database instance. If not, View Composer can use the Microsoft SQL Server 2005 Express instance provided with vCenter for quick proof of concept deployment. In actual production, we recommend that you have a standalone SQL server instance that can also be used later for logging the VMware View event database. This SQL Server Express database should be upgraded if the View system is going into production use. The VMware hypervisor, ESX or ESXi must be vSphere 4 or later to take advantage of View Composer.

Preparing Active Directory

VMware View utilizes Microsoft Active Directory for user authentication and management. Windows 2000 AD, Windows 2003 AD, and Windows 2008 AD are supported. Again, ensure that the View Manager system is joined to an Active Directory domain. Since users will be authenticated against Active Directory, the View Manager domain should have proper trust agreements in place to authenticate the lab users.

You may want to consider (although it’s not required) creating an Active Directory organizational unit (OU) specifically for your View desktops. An OU is a subdivision in Active Directory that contains users, groups, computers, or other OUs. This capability allows group policies to be applied uniquely to the virtual desktops. GPOs can be managed via the Group Policy module for PowerShell (including in Windows Server 2008 or with Microsoft’s Remote Server Administration Tools).
1. Create a new Active Directory Organizational Unit that will store all of your lab linked clone desktops. Open Active Directory Users and Computers (run dsa.msc) and create the new OU. For the purposes of this lab, it is named the new OU “lab linked clones”.

![Active Directory Users and Computers](image1)

2. Create a user account in Active Directory for the View Composer. This user should have the following capabilities to the OU just created: Delete Computer Objects, Create Computer Objects, Write All Properties, Read Permissions, Read All Properties, and List Contents. The account permissions should apply to all child objects in the linked clone OU. We will use the user name “Composer”.

![Active Directory Users and Computers](image2)

3. Log in into vCenter and create a new folder to hold the lab linked clone desktops (right-click on your datacenter object -> New Folder). If vCenter is not installed yet, see Appendix B and complete the installation of vCenter.
Installing View 4.5 Manager

1. The View 4.5 Manager can be installed on either a Windows 2008 Server or Windows 2003 Server. You can download the necessary View 4.5 components from the VMware Support download site: http://downloads.vmware.com/d/info/desktop_downloads/vmware_view/4_5

   For reference purposes, a video of “how to install and configure the VMware View 4.5 Manager” can be found at: http://www.youtube.com/watch?v=eKYHdUJ3O5s

2. After downloading the VMware-viewconnectionserver-x86* image, run the installation as an administrator.
3. After accepting the defaults for the agreements, accept the default install folder or change it as appropriate and click next.

4. Since this is the first View Manager installation, select the Standard Server build.
5. If you receive the following message, follow the directions indicated and change the IP from DHCP to a static IP. You’ll need to start the View Manager installation again after the change.

![VMware View Connection Server](image)

6. You will see the following window as the installation makes progress:

![VMware View Connection Server](image)

7. If you are installing on a Windows 2008 Server you will see the following window. Click Next and continue the installation. Note that a list of network ports used in VMware View can be found in Appendix D.

![VMware View Connection Server](image)
8. When the View 4.5 Manager installation is complete you will see the following:

![Installer Completed][1]

The installer has successfully installed VMware View Connection Server. Click Finish to exit the wizard.

9. You can confirm the installation by bringing up the View Manager Configuration display by typing in the View Manager IP address into an Internet browser: (http://<IP_ADDRESS_VIEW_MANAGER>/admin). Note that the View administration interface will require Flash (you will receive a notice the first time you bring up the admin GUI along with a download option). You can also bring up a web browser to the same address by double clicking on the “View Administrator Console” icon on the View Manager desktop. Click on “Continue to this website” to accept the default security certificate.
Configuring the View Environment

1. Log in to the View administrative interface by pointing your web browser to the IP address followed by /admin (for example, http://192.168.0.201/admin). Login using the credentials of a domain administrator.

2. Select Product Licensing and Usage on the left-hand part of the display and select the “Edit License” button. Enter the VMware View 4.5 License Key and click OK. As noted above, an evaluation key can be requested from the VMware website: https://www.vmware.com/tryvmware/?p=default
3. Add the vCenter Server to the View Manager. Select View Configuration -> Servers in the left hand selection window. Then select Add .. under the vCenter Servers in the right result pane. Enter the vCenter Server address or FQDN, user name and password. Select OK.

![Edit vCenter Server](image)

Note: If you receive a “Server Error: There was a connection problem” then note the user name entered with the vCenter Server Settings. It should be set as DOMAIN\user. If the domain is left out, then expect the Server Error listed above.
Installing View Composer

Since we will be utilizing linked-clones, it will be necessary to install View Composer, which the following steps outline. Briefly, you will install View Composer on the vCenter Server, create a data source name (DSN) and then create a View Composer database (either Oracle 9i, Oracle 10g, Oracle 11g or a SQL Server database). The View Composer service does not include a database. The View Composer database stores information about the desktops deployed by View Composer.

For our purposes, we will add a new View Composer database to the existing vCenter Server SQL Server 2005 express database. To create the database, first download and then launch the SQL Server Management Studio Express (this is a free utility from Microsoft). Since vCenter is running on a 64-bit Operating System be sure to download the 64 bit package. In our case that is SQLServer2005_SSMSEE_x64.msi from http://download.microsoft.com.

1. The procedure on the vCenter Server is to select Start -> All Programs -> Microsoft SQL Management Studio Express 2005. Right click on the databases folder and click New Database. We'll use the name ViewComposer. Click OK.

2. Now that the database exists, you must configure an ODBC connection to the Composer server. On the vCenter Server, select Start -> Administrative Tools -> Data Source (ODBC). Select System DSN tab. Click Add and select SQL Native Client from the list and click finish.
3. Complete the form. In this case we’ll use the name ViewComposer to describe the ODBC DSN and specify the virtual server hostname in the server field drop down box. Click on Next.

You can specify either Windows NT authentication (for a local SQL server as in our specific case) or SQL Server authentication (if you are using a remote instance of SQL Server).

4. Click Next. Change the default database to the name of the View Composer database from the dropdown list.
Ensure you have both “Use ANSI quoted identifiers” enabled and “Use ANSI nulls, paddings and warnings” enabled as well.

5. Select Next and then Finish. Select the Test Data Source to verify that the connection is established properly. Don’t proceed until the test completes successfully. If you will be using an Oracle 11g or 10g Database for View Composer instead of SQL, please see the View Installation Guide for details on the setup.

Now that the View Composer database and View Composer DSN are configured, you can move on to the installation of the View Composer service on the vCenter Server.
Installing the View Composer Service

1. If you have not already done so, download and run the VMware View Composer 2.5 executable on the vCenter Server. The installer filename is VMware-viewcomposer-xxxxxx.exe, where xxxxxx is the build number. This installer file installs the View Composer service on 64-bit and 32-bit Windows Server Operating Systems.

2. Accept the End User Agreement by clicking Next and accept the terms. For our case, we'll install the Composer in the default directory by clicking Next. Select the DSN for the View Composer database that you provided in the Microsoft or Oracle ODBC Data Source Administrator Wizard. In our case, we'll use View Composer. If you have not already created a DSN for the View Composer database, click on ODBC DSN Setup to configure a name now.
3. Accept the default SOAP Port and click Next. Either provide an SSL certificate or select the radio button to create a default SSL certificate. Click Install and Finish to complete the Composer service installation.

We will be deploying linked clone desktops in our lab environment. It will be important to ensure that the vSphere environment has enough CPU, memory, and I/O resources to host the desktops that you require. It is a best practice to use the vSphere client to monitor those resources. There are several other important practices to follow. Stagger the run times of the antivirus software. Also ensure that the Dynamic Name Service (DNS) is operating correctly and that the desktop virtual machine names can be resolved in DNS. To test DNS operation, ping the Active Directory and View Connection Servers by name.
Configuring View Composer

To use View Composer, you must configure View Manager with initial settings. Earlier in the procedure, a domain user was created with permissions to add and remove virtual desktop machines from the Active Directory domain that contains the linked clones. We’ll now configure that same user in the View Manager.

In the View Manager administration window (http://<IP_ADDRESS_OF_VIEW_MGR>/admin) select View Configuration->Servers. In the vCenter Servers panel, select the vCenter Server already configured. Now click Edit. Enable the View Composer. View Manager now attempts to communicate with the View Composer service running on the vCenter Server.
Preparing the Master Virtual Machine

The linked clone technology provided by VMware Composer enables the ability to use one “Parent” or master virtual machine and create multiple “Children” virtual machines which inherit from the one “Parent.” This provides dramatic savings in storage as well as proving unique administration capabilities. The Parent desktop image can be Windows XP (Professional, 32-bit, SP1 and SP2) or Windows 7 (Enterprise or Professional, 64-bit or 32-bit). If the Parent VM is Windows XP and the Active Directory runs on Windows 2008, apply an update patch on the Windows XP image from http://support.microsoft.com/kb/944043/en-us. The Parent virtual machine can only have one volume and should have VMware Tools installed. We’ll walk through these steps next.

1. To start, take either a Windows XP SP3 or Windows 7 image and make it accessible to vCenter Server. In the vSphere Client select the ESXi server and with the right mouse button select New Virtual Machine.
2. Provide a name for your Parent virtual machine and click Next after selecting the location. In our case, we'll select View.
3. Select the datastore where you want to store the virtual machine. This could be a Storage Area Network (SAN), LUN, or local disk on the ESX or ESXi server. Next select the appropriate Windows Version in the dropdown box and hit Next.
4. Select the appropriate virtual disk size (in this case, it is configured to use 24 GB) and select Next.

![Virtual Disk Size Selection](image)

Now that the virtual machine has been created, we will need to install the Operating System within it.

5. Select the newly created virtual machine in the vSphere Client and with the right mouse button select Open Console. The result will be a console window for the virtual machine. The console window provides numerous ways to map the Microsoft Windows iso (Windows XP SP3 or Windows 7) to the virtual machine. By selecting the CD/DVD symbol on the virtual machine console window you can view those options.

6. Install the Parent Operating System into the parent virtual machine.

7. The Parent virtual machine should have both the VMware View Agent and virtual machine tools installed. Any application software that you want to provide to every image could be installed now as well. For instance, if you wanted to upgrade Internet Explorer this would be a good time to do so. Or if you wanted to provide a copy of Microsoft Office this would be an appropriate time to install it. This is also a good time to configure the applications to your environment (setting the home page of the browser, applying application patches, and so on). There are alternatives to distributing software other than installing the software in the Parent image. VMware Thinapp provides one of these alternatives.

8. Also be mindful of configuring the network in the Parent virtual machines. Ensure that DNS is configured so that the Parent virtual machine can find the View Manager (try pinging the fully qualified domain name of the View Manager from the Parent virtual machine to verify proper name resolution) and vice-versa (try pinging the Parent virtual machine from the View Manager).
9. Ensure that VMware Tools is installed in the Parent virtual machine. This can be accomplished in several ways. If you select the Parent virtual machine in vCenter, click the right mouse button and select Guest -> Install/Upgrade VMware Tools. You will see the following window:

![Image of VMware Tools upgrade window]

10. Click OK. In a moment, you should be able to note that the Summary screen for the selected Parent virtual machines will display VMware Tools: OK indicating that the installation was successful. If you don't see the previous window in the Parent virtual machine, log in to the virtual machine (you can open a console window from vCenter) and you should find a CD/DVD mounted on the image labeled VMware Tools. Open the newly mounted drive and launch the VMware Tools installer.

![Image of VMware Tools summary screen]
11. Install the VMware View agent in the Parent virtual machine. Note that there are two versions of the VMware View Agent (32-bit and 64-bit). Make sure you install the appropriate version in the virtual machine.

12. Follow the wizard prompts until you see the following notification:
13. After powering off the virtual machine, take a snapshot. This is accomplished by selecting the virtual machine in the vSphere Client, selecting the right mouse button, and then selecting the Snapshot menu. Select Take Snapshot and provide a name.

Note the snapshot name you provide since we'll be using it in a few steps.

14. Now we will provide the domain name and Composer user to View. Log in to View as the View administrator (https://<IP_ADDRESS_OF_VIEW_MGR>/admin). Next select Servers under View Configuration and select the vCenter Server under the vCenter Servers result pane. Now hit the Edit button. At the bottom of the resulting window hit the Add button to specify the domain the virtual desktops will be deployed in. Also provide the credentials of the Composer user specified earlier in Active Directory. This is the Composer user who has access to the linked clone OU.
Creating the VMware Composer Linked Clone Pool

Now that you have created the Parent virtual machine, taken a snapshot, and configured VMware View to use the Composer user, we will next create a pool of linked clones.

1. Open the VMware View Administrator console. Select Inventory -> Pools and then the Add button.

2. Select the Automated Pool option in the resulting Add Pool Wizard.

Virtual desktop users can either have dedicated or floating desktops. Dedicated means that each time a user logs in they will get the same virtual machine. Floating provides the end user with a random desktop from the pool. In our use case, the lab environment, we will assign desktops to lab users randomly so we will use the “Floating” user assignment.
Virtual machines can be deployed as either full virtual machines created from a vCenter Server template or as Composer linked clones. We will be using Composer linked clones because they share the same base image (Parent) and therefore use significantly less storage space. The user profile can be redirected to persistent disks that will be unaffected by OS updates and refreshes.

3. After hitting Next, specify the attributes of the Pool. Provide a name for the pool, display name (which the users will see when they connect to the View Manager from the View client), the View Folder (which can be used for organizing the pool and delegating administration and a description to be shown in the Summary tab for the View Administrator.
4. Now specify the pool settings. These settings are detailed in the VMware View 4.5 Administrator Guide. For our purposes we will set the automatic logoff after disconnect to 60 minutes. Hit the Next button.

5. The following configuration screen gives you the option to redirect disposable files such as page files and temp files to a “Non-persistent disk.” This non-persistent disk will be deleted automatically when a user session ends. We will use the default 4096 MB value. Hit the Next button.
6. The next screen provides the ability to assign names to the virtual desktops. Enable the basic settings of Enable Provisioning and Stop provisioning on error. We have set the naming convention to include two digits (01, 02, …) beginning with LinkedClone--. The size of the pool is also specified here. In our case, we are setting up 10 desktops. These desktops can be provisioned whenever they are needed (on demand) or up-front. Up-front will ensure the desktops are ready when the users log in. Also note the number of spare desktops (which refers to the spare powered-on desktops). We will set the number to the maximum pool size to ensure that the desktops are all available immediately for the lab users.

7. The next screen is used to specify the default Parent image. Hit Browse and select the Parent virtual machine prepared earlier. Next specify the virtual machine folder in vCenter Server that you wish to place the desktop virtual machines within. Select the ESXi host (or Cluster) and the vCenter Server resource pool you wish to use. And finally, select the datastore you wish to place the new Desktop virtual machines within.
8. The next screen allows you to specify which Active Directory Container to place the virtual machines within. You can also specify whether you wish to use either Microsoft’s Sysprep or QuickPrep for preparing the virtual machines for lab use. As the name implies, QuickPrep is designed to work efficiently with View Composer and is generally faster than Microsoft Sysprep. Sysprep generates a unique SID and QuickPrep does not. Note that SysPrep is only supported on vSphere 4.1. You can also specify the use of a different datastore for the View Composer replica disks (Parent virtual machine). This is accomplished under the datastore’s browse button. If you have a high speed datastore such as a Solid State Drive or fast LUN you wish to use, this would be appropriate to host the Parent virtual machine. The View 4.5 reference architecture provides more information on how to optimize View 4.5 deployments by utilizing tiered storage. The image below provides a snapshot of the screen. For the lab deployment, consider using the stateless or non-persistent desktops and have linked clone replica stored in a solid state drive (SSD); this can greatly enhance desktop propagation before each lab course starts.

The Replica is the Parent image that the linked clones use as their base image. It considered a best practice to place this Parent image on a high-speed datastore such as a solid state drive on the ESXi server. If a higher speed datastore is not an option, then don’t select the “Use different datastore for View Composer replica disks”.

![Select Datastores](image-url)
9. The next screen lets you set the guest customization options. Specify the domain and AD container you wish to add the View desktops into. You can use the default OU (CN=Computers) or utilize the OU created earlier to contain the lab virtual desktops. You can also specify whether you want to use QuickPrep (with optional power-off and post-synchronization scripts) or Microsoft’s Sysprep. If you choose to use Sysprep, follow the directions in the VMware ESXi Administrators guide. For the purposes of our lab, we will choose to use QuickPrep.

10. Finally, the last screen summarizes the options selected. Hit Finish after reviewing the selections.

The View Manager will now begin to create the lab pool. You can watch the pool virtual machines being created by bringing up the vCenter client. Look under “Inventory -> virtual machines and Templates” and note the tasks in the lower part of the screen. Note also that the View Manager is in charge of creating and destroying the desktop virtual machines. DON'T create or destroy the desktop virtual machines from within vCenter. The entire lifecycle of the desktop virtual machines will be handled by VMware View Manager.

If you find errors with the customization process, see the VMware Knowledge Base article found online at: http://kb.vmware.com/kb/1026999
Now that the pool is being created, the next step is to entitle lab users to access the desktop virtual machines. This is done from within the View Administrator interface.

11. Go to the View Administrator (https://[name_of_View_Manager]/admin) and select the “Inventory -> Pools” tab. Select the newly created Pool and select the Entitlements button. Now hit the Add button. Enter the lab user active directory name into the “Find User or Group” screen. You can enter as many users or groups as you wish. These users will have access to the virtual desktop machines. After entering and then selecting the user name or group, hit the OK button. This will return you to the Entitlements interface. Hit OK. You should now note that the pool ID has a green arrow under the entitlements column indicating that the pool is entitled. Note also that the Enabled column is also checked. If checked, the pool is enabled for end users to access their entitled desktops.

You can check on the status of the newly created desktops by going to the View Administrator interface and selecting Inventory -> Desktops. The desktop name, pool ID, DNS name, host and so forth are presented here. Note in particular the Desktop Status. It will read Available when View is ready to present the desktop to the end user.

The final step is to connect the users to the newly created virtual desktop. This connection is accomplished via the VMware View Client. This client is supported on a number of end user devices such as zero clients, laptops, desktops, thin clients, and other mobile devices.
Connecting to the VMware View Virtual Desktops

The final step is to connect the users to the newly created virtual desktop, which is accomplished via the VMware View Client. This client is supported on a number of end-user devices such as laptops, desktops, thin clients and others. We will start by testing the connection from a Windows PC or laptop. Download the VMware View Client onto the end-user-access point and begin the installation. There are several types of the View Client. The larger View client image supports the ability of checking out the desktop virtual machine. Install the smaller image, which instead simply provides access to the lab desktops.

Once the VMware View Client is installed, run the client. Point the client to the Fully Qualified Domain Name or IP address of the View Manager. Enter the login credentials of the entitled lab user. Hit OK. Now select the Pool ID.

Now that the pool is being created, the next step is to entitle lab users to access the desktop virtual machines. This is done from within the View Administrator interface.

1. Go to the View Administrator (https://[name_of_View_Manager]/admin) and select the “Inventory -> Pools” tab. Select the newly created Pool and select the Entitlements button. Now hit the Add button. Enter the lab user active directory name into the “Find User or Group” screen. You can enter as many users or groups as you wish. These users will have access to the virtual desktop machines. After entering and then selecting the user name or group, hit the OK button. This will return you to the Entitlements interface. Hit OK. You should now note that the pool ID has a green arrow under the entitlements column indicating that the pool is entitled. Note also that the Enabled column is also checked. If checked, the pool is enabled for end users to access their entitled desktops.

You can check on the status of the newly created desktops by going to the View Administrator interface and selecting Inventory -> Desktops. The desktop name, pool ID, DNS name, host and so forth are presented here. Note in particular the Desktop Status. It will read Available when View is ready to present the desktop to the end user.

The final step is to connect the users to the newly created virtual desktop. This connection is accomplished via the VMware View Client. This client is supported on a number of end user devices such as zero clients, laptops, desktops, thin clients, and other mobile devices.
Now select the Pool ID and click on Connect. You should now be attached to the virtual desktop. If you move your mouse to the top of the screen you should see the Options menu available. Note there are several options to disconnect. You can disconnect or disconnect with logoff. Disconnecting from the desktop will leave the state of the desktop in place. Disconnecting with logoff will both disconnect the user from the virtual desktop as well as logoff the user from the session as well. There is a Connect USB Device menu pane at the top of the frame as well. This will allow the user to connect various USB devices to the virtual desktop.
Lifecycle of Lab Desktops

The stateless nature of the architecture makes it easier to populate the linked clone lab desktops at the beginning of each day and clean them up at the end of the day. There is no need to keep the lab running overnight, which also saves energy resources. A simple power-on script can be put in place to match the workload and lab profile.

As you build additional labs, you can create a Thinapp repository for each lab with a desktop pool. Thinapp offers a quick application packaging and streaming solution for virtual desktops where legacy software requires Internet Explorer 6 to function in a modern Windows 7 desktop. Also, fully manageable USB redirection policy can be configured to work with academic applications and devices such as interactive whiteboards, remote student response systems, or clickers with endpoint devices via USB interface.

This document summarizes the basics around setting up a View POC environment from scratch. Ongoing desktop management will be a function of how well you understand student workload, required applications, and peripheral devices. Should certain groups require additional personalization, you may want to consider using Windows roaming profiles or profile solutions such as Unidesk to support this broad range of personalization requirements in your environment.

Appendix A – Installation of ESXi


Appendix B – Installation of vCenter Server

The installation of the vCenter Server is covered in detail in the “ESXi Installable and vCenter Server Setup Guide.” The manual is available for download on the VMware support site located at: http://www.vmware.com/support/pubs. You can follow the ESXi Installation manual for detailed step-by-step instructions, or an abbreviated version can be found below. At the time of publication, the ESXi 4.1 Installable and vCenter Server manual was located at: http://www.vmware.com/pdf/vsphere4/r41/vsp_41_esxi_i_vc_setup_guide.pdf

vCenter Server requires databases to store and organize server data. You do not need to install a new database server for the vCenter Server installation to work. You can point the installation program to use any existing supported database (IBM DB2, Oracle, or Microsoft SQL Server). For information about supported databases see the vSphere Compatibility Matrix at http://www.vmware.com/support/pubs.

Note that for the purposes of the lab installation we can use the bundled Microsoft SQL Server 2005 Express
database. This should be sufficient for the purposes of the POC. The database though should be upgraded for a production environment. Unless you are planning to use the bundled SQL Server 2005 Express database, have a supported database created.

The detailed steps and prerequisites for installing the vCenter Server are found in Chapter 2 and Chapter 10 of the “ESXi Installable and vCenter Server Setup Guide.”

The system you use for the installation of vCenter Server must belong to a domain and not simply a workgroup, and should have a static IP address. The IP address must have a valid DNS registration that resolves properly from all managed hosts. The vCenter Server can be either virtual (hosted on the VMware hypervisor) or physical. It can be either Windows Server 2003 64-bit, XP Pro 64-bit or Windows Server 2008 (Enterprise 64-bit, Standard 64-bit, Datacenter 64-bit) and Windows Server 2008 R2. Make sure that your operation system is 64-bit enabled. Also note that if you are using an existing database that a 64-bit DSN is required for vCenter Server to connect to its database. For a current list of supported Operating Systems for vCenter Server see the “vSphere Compatibility Matrix” found on the support website: http://www.vmware.com/support/pubs

The vCenter server should be a member server in the domain. Mount the vCenter Server 4.1 iso on the 64-bit system. The mount can be accomplished in several ways. If the proposed vCenter Server is a physical system, then mount the image on the physical CD/DVD drive. If the proposed server is a virtual machine, the vCenter Server 4.1 iso can be mounted from the a CD on the local client CD/DVD drive which is running the Virtual Infrastructure Client, or the ESXi host CD/DVD drive or the SAN datastore itself. These options can be specified in the edit virtual machine properties in the VI Client. Another possibility is to run a third-party software package that will mount the vCenter Server 4.1 iso as a local drive. The image below shows the three options for adding a CD/DVD from the edit VM properties tab.
Once the vCenter iso is mounted, run the Autorun command on the DVD if it hasn’t already run. You will see the following GUI. The name of the vCenter image at the time of publication is VMware-VIMSetup-all-4.1.0-29021.iso. The name will change with the next release of patching.

Select the first option, vCenter Server. After selecting the appropriate language option, select Next several times and agree to the license terms. You will see the following display asking for the Windows user name, organization and license key. You can safely omit the licensee key in this step since the installer will use an evaluation key, which will last 60 days. You can enter a permanent key at a later date.
Choose either an existing database or have the installer place a SQL Server 2005 Express instance on the local machine. In our case, we'll choose the latter. This Express database is appropriate for small-scale deployments only (maximum of 5 ESXi hosts and 50 virtual machines).

You can run the vCenter Server Service as either a user-specified account in the domain or the default SYSTEM account. We'll use the default SYSTEM account.
Next, choose the folder where you wish to install vCenter Server. We’ll select the default.

When asked if vCenter Server should be standalone or join a vCenter Server group, select Create a standalone VMware vCenter Server instance.
The next display shows the default ports that vCenter Server utilizes. We will use the defaults.

When sizing the JVM Memory for vCenter select the appropriate inventory size. In our case, we will use the default small value.

Click Install to begin the installation.
When the installation is complete you can view the vCenter Server Manager through the vSphere Client. The vSphere client can be loaded from the same iso that delivered the vCenter Server Manager or downloaded from the vCenter Server Manager web server. Simply point your browser to the IP address of the vCenter Server Manager and hit the Download vSphere Client URL.

Next you will need to add the ESXi host to the vCenter Server. This is done by bringing up the vSphere Client and logging into the vCenter Server Manager. First, add a new datacenter. Select the vCenter Server Manager in the selection pane in the upper left hand part of your vSphere Client display after you’ve brought up the client and logged into the vCenter Server. Now right mouse button and select New Datacenter. In our case, we’ll name our datacenter View.

Once the display is presented, select the Hosts tab. Then click the right mouse button and select “Add Host ...”. Enter the host name or the IP address of the ESXi server and the credentials to log into the server.
Once vCenter Server has the ESXi host connected successfully it will look like the following in the vSphere Client:

We will leverage the VMware View Composer for the lab environment. To install, download the Composer from the VMware download site: http://www.vmware.com/downloads. You may also want to download the View Client and Agent while you are at the download site since we’ll need those components later.
## Appendix C – VMware View Attribute Settings

<table>
<thead>
<tr>
<th><strong>POOL ATTRIBUTE TYPE</strong></th>
<th><strong>Automated</strong>&lt;br&gt;Manual&lt;br&gt;Terminal Services&lt;br&gt;Automatic Assignment&lt;br&gt;Manual Assignment</th>
<th>Automated desktops are recommended</th>
</tr>
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</table>

| **DESKTOP PERSISTENCE** | **Floating**<br>Recommended. Persistence refers to associating a user to a specific Virtual desktop. Floating decouples the user from a specific virtual desktop and provides significant management efficiencies. Since we are recommending leveraging VMware Composer technology, user data and configurations will follow the user with the View floating desktop assignments.<br>Dedicated<br>Use when users have data or applications that they wish to install in a specific virtual desktop. While not set up in this document, Dedicated Desktops support another mode called “Local Mode” which enables an end user to checkout their virtual desktop to their local desktop. |
|-------------------------|-------------------------------------------------|----------------------------------------------------------------------------------|

| **POWER STATE WHEN THE VIRTUAL DESKTOP IS NOT IN USE THERE ARE SEVERAL OPTIONS.** | **Do Nothing**<br>Recommended. Virtual Desktop remains on; this provides the quickest access to desktops.<br>Always on<br>Suspend<br>Fast to boot (saves memory to disk).<br>Power Off<br>Saves host resources, but leads to longer login time. |
|-------------------------|-------------------------------------------------|----------------------------------------------------------------------------------|

| **RESET DESKTOP. ALLOW USER TO RESET THEIR VIRTUAL DESKTOP.** | **Yes**<br>No |
|-------------------------|-------------------------------------------------|----------------------------------------------------------------------------------|

| **DEFAULT DISPLAY PROTOCOL. THE CHOICE COMES DOWN TO UNDERSTANDING THE NETWORK AND APPLICATION.** | **RDP**<br>RDP is often adequate for users who don’t require multimedia/video; it consumes few network resources.<br>PCoIP<br>Provides superior capability for multimedia/video; also superior over a higher latency network (> 150ms).<br>Redirect Windows Profile<br>Redirects the user profile to a separate persistent User Data Disk (UDD). The UDD stores user changes. Options include size and location of UDD. Requires Composer/Linked Clones.<br>Designing the Virtual Desktop<br>Virtual desktops are mapped to a use case. In our scenario, the use case is a lab. Windows XP or Windows 7 can be used as the virtual desktop. |
|-------------------------|-------------------------------------------------|----------------------------------------------------------------------------------|
### Appendix D – VMware View Network Ports

<table>
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<th>INCOMING TCP PORT</th>
<th>OUTGOING TCP PORT</th>
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<tr>
<td>RDP Direct Connection from View Desktop to Client</td>
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<td>3389</td>
</tr>
<tr>
<td>RDP Tunneled Connection from View Security Server to View Desktop</td>
<td>3389</td>
<td>3389</td>
</tr>
<tr>
<td>PCoIP Direct Connection from View Client to View Desktop</td>
<td>4172 TCP/UDP</td>
<td>4172 TCP/UDP</td>
</tr>
<tr>
<td>USB Redirection from View Client to View Desktop (Direct and Tunneled)</td>
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<td>32111</td>
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<tr>
<td>View Manager to vCenter Server and Composer</td>
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<td>18443, 443</td>
</tr>
<tr>
<td>vCenter Server to ESX Host</td>
<td>902</td>
<td>902</td>
</tr>
<tr>
<td>View Manager to Active Directory</td>
<td>389</td>
<td>389</td>
</tr>
<tr>
<td>View Manager to View Manager Agent (JMS)</td>
<td>4001</td>
<td>4001</td>
</tr>
<tr>
<td>View Manager Server to View Manager Server (JMS)</td>
<td>4100</td>
<td>4100</td>
</tr>
</tbody>
</table>