Dell and Citrix-Kaviza VDI-in-a-Box Reference Architecture

Technical White Paper: VMware ESXi Version

Dell Desktop Virtualization Solutions

Contents

Executive Summary

Desktop virtualization is a proven methodology for delivering a rich computing experience from centralized data centers. In desktop virtualization the desktop OS, user applications, user preferences and data are decoupled from the client device giving IT the ability to deliver desktops to multiple devices, improve operational efficiency and security, and ultimately enhance end user productivity.

Dell™ Desktop Virtualization Solutions (DDVS) delivers enterprise computing to virtually any end user computing device, anytime, anywhere -- improving employee productivity while reducing IT management complexity. DDVS is designed to ease design and implementation complexities and address each organization's unique business, user, and IT requirements. By accelerating adoption of desktop virtualization organizations can adapt to the dynamics of today's more mobile and global workforce and take advantage of the consumerization of IT. Dell Desktop Virtualization Solutions combine high-performance desktop virtualization software with Dell hardware platforms, PC, Thin and Mobile client devices, and Dell Services to provide secure end-user computing, increased systems efficiency, and simplified deployment--without compromising centralized IT control.

Kaviza's VDI-in-a-box, now from Citrix, provides a simplified all-in-one cost effective solution enabling smaller entities with limited budgets and IT staff to leverage the benefits of desktop virtualization. VDI-in-a-box integrates connection brokering, load balancing, desktop provisioning, high-availability and management functions into a single package that runs on servers with local storage. VDI-in-a-box also delivers anytime anywhere access with built-in support for Citrix® HDX™ to provide a rich user experience. VDI-in-a-box is compatible with VMware® vSphere/ESX and Citrix® XenServer™ hypervisors.

This paper provides general sizing guidance and recommendations for implementing a Dell virtual desktop infrastructure (VDI) solution powered by Kaviza VDI-in-a-box and VMware ESXi infrastructure. This configuration combines Dell™ PowerEdge™ R710 servers with VDI-in-a-box software to create a resilient VDI solution capable of providing an end user experience that is the same or better than a traditional PC desktop.

Audience

This whitepaper is in intended for IT professionals and System Integrators. The goals of this white paper are to:

- Provide architecture guidance for implementing Kaviza VDI-in-a-Box with Dell PowerEdge servers.
- Provide configuration guidance spanning server, storage and network considerations.
- Clarify, aid, and simplify the selection of Dell servers to support two Kaviza based VDI configurations.

This white paper outlines two configurations including a 300 user desktop configuration for a standard user profile (i.e., medium knowledge worker profile) and a 360 user desktop configuration for a basic user profile (i.e., task worker profile). For more information regarding Dell standard and basic user profile definitions, please see appendix 1.

This architecture is provided in this paper is for reference purposes only. Specific configurations for your hardware, software, and services ingredients will vary depending on your unique business requirements, the intensity of your workloads, host operating systems, and individual feature preferences.

Dell Citrix-Kaviza VDI-in-a-box Reference Architecture
Solution Overview

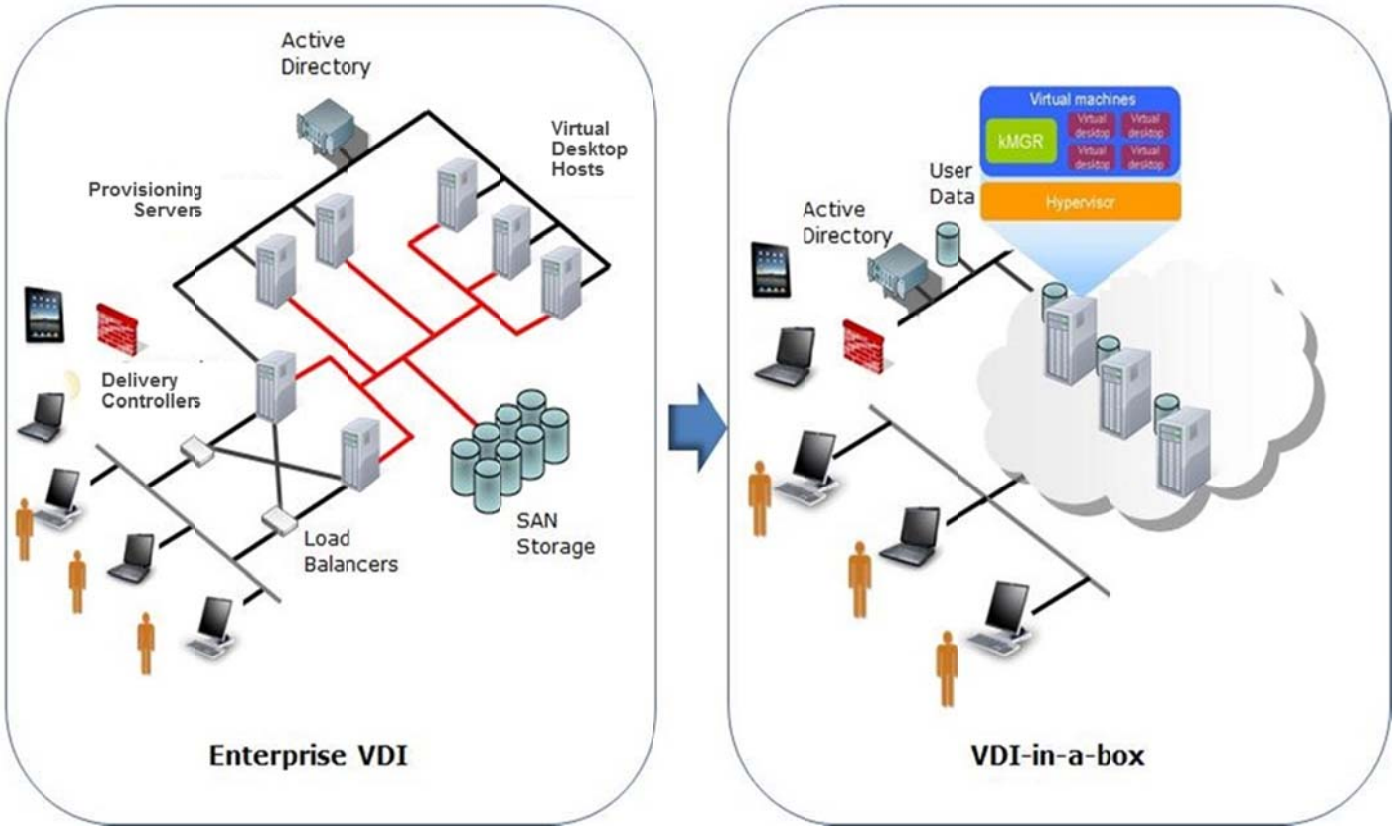

Figure 1: Enterprise VDI vs. Kaviza VDI-in-a-box

A typical Enterprise VDI deployment architected for production-level usage with high-availability includes the following components as illustrated in the left-hand side of Figure 1:

Provisioning Servers: These management servers control the dynamic provisioning and de-allocation of virtual desktops. Typically, a minimum of two provisioning servers are required for high-availability.

Delivery controllers: These servers manage and broker the end-user connections to the virtual desktops. Typically, a minimum of two delivery controllers/connection brokers is required for high-availability.

Virtual desktop hosts: These are the servers that run the virtual desktop workloads, and the number of these depends on their capacity and the sizing guidelines of the VDI solution.

Load balancers: A minimum of two load balancers are typically placed in front of the delivery controllers to evenly distribute the desktop workload.

Shared storage SAN: The shared storage is required to keep a central state of the running virtual desktops, so that in the event of a server failure, a different VM host can pick up the desktop state from the SAN and run the desktops.

High-speed interconnects: Typically, for performance reasons, high-speed interconnects are used among these components.

While this Enterprise VDI architecture is cost-effective for large deployments, it requires a sizable investment that may not be efficient for smaller deployments. Kaviza VDI-in-a-box, illustrated in the right-hand side of Figure 1, consolidates various VDI software and management components into a single integrated software that can be implemented with Dell's enterprise class PowerEdge servers.

The Kaviza software includes:

- Built-in delivery controller/connection broker
- Built-in load balancing
- Built-in desktop provisioning engine
- Built-in user management
- Built-in grid engine to deliver high-availability

Kaviza uses a grid architecture that makes expansion easy, and delivers high-availability without requiring externally attached shared storage (e.g., SAN). To expand a Kaviza deployment, simply load Kaviza on additional Dell PowerEdge servers and add the new servers to the Kaviza grid by answering two simple questions in the Kaviza management software. Kaviza automatically prepares the new servers with the appropriate desktop images, and load balances the desktop workload across the grid.

Dell and Kaviza VDI-in-a-box Solution Architecture

The Dell and Kaviza VDI-in-a-box Solution Architecture described in this document is sized for 300 Standard (i.e., knowledge worker) and 360 Basic (i.e., task worker) user profiles in a highly-available, Kaviza N+1 configuration. While 300 and 360 desktops are excellent starting points, it is important to note that our implementation can be scaled modularly (i.e., on a per server basis) to accommodate more or fewer desktops.

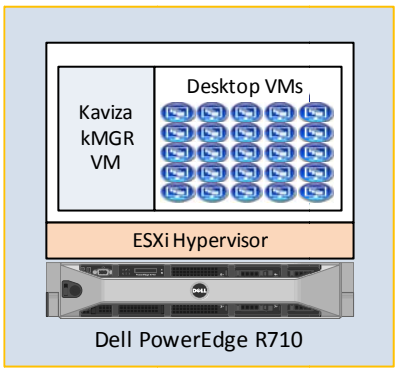

Figure 2: Dell and Kaviza VDI-in-box Single Server View

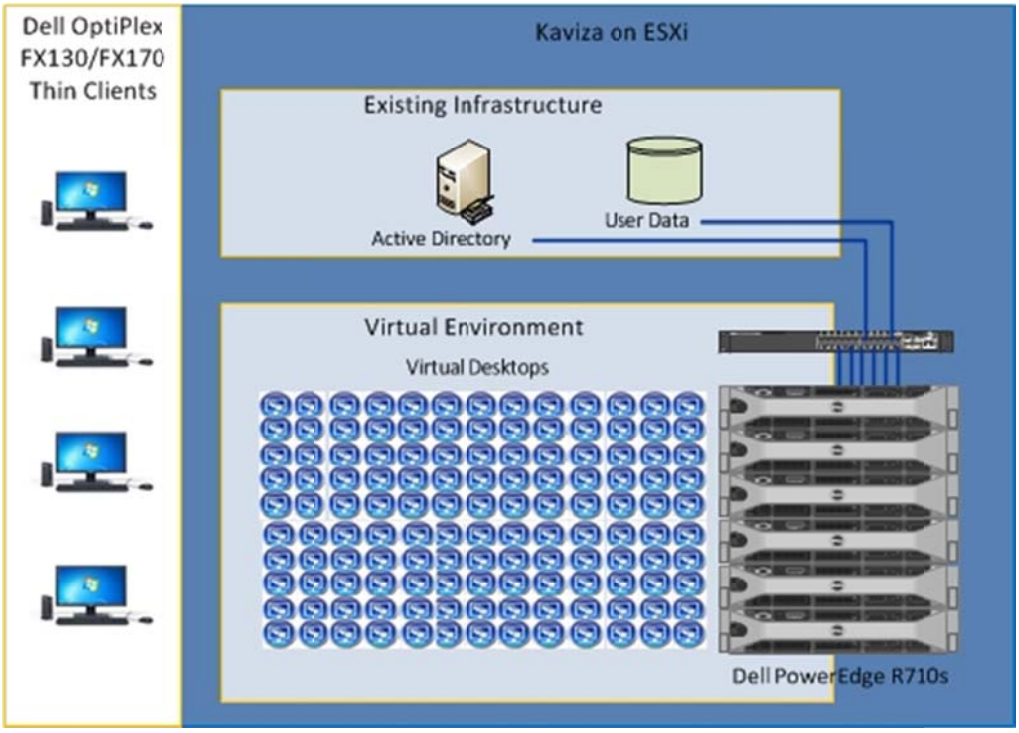

Figure 3: Dell and Kaviza VDI-in-box Solution Architecture

The complete 300 Standard desktop and 360 Basic desktop solutions are built out with Kaviza's N+1 high-availability solution and a licensed version of VMware ESXi. The architectural components that encompass the reference architecture are illustrated in Figure 3 and include the following:

Hardware

- 6 Dell PowerEdge R710 Servers configured/installed with:
  - Dual Hex Core Processors
  - 96 GB of RAM
  - 6 or 7 (depending on desktop profile), 146 GB 15K SAS Drives configured in a RAID-0 Array
  - Integrated RAID Controller
  - Dual Port GbE Network Card
  - Embedded VMware ESXi 4.1
  - 2 High Output Redundant Power Supplies
- 1 24-Port GbE Switch

Software

- Kaviza VDI-in-a-Box 4.1

Virtual Machines

- 300 Standard Profile Desktops: 150 Windows 7 Professional (32-bit) and 150 Windows XP Professional (32-bit).
- 360 Basic Profile Desktops: 180 Windows 7 Professional (32-bit) and 180 Windows XP Professional (32-bit).
- All VMs are non-persistent.

Solution Architecture Considerations

The following considerations were taken into account when designing the 300 standard and 360 basic desktop configurations.

High-Availability Considerations

In the event of a server failure, VDI-in-a-box provides built-in high-availability without requiring shared storage. The grid architecture maintains fault-tolerance via redundancy so that if any server on the grid fails, others can pick-up the workload.

Users connected to desktops hosted on a failed server will lose their desktop connection. When users re-login to connect to their desktop, the system will re-authenticate the user and will attempt to connect the user to a new desktop running on a live server. Upon logon, the system automatically migrates the workload to an active server on the grid. Depending on how the solution and application policy settings are configured, some data loss may occur. To avoid data loss, network file sharing is recommended. Additionally, in instances where data is mission critical, additional HA protection solutions may be required.

In order to accomplish the scenario described above, the solution uses an N+1 model with hot sparing. This means the server infrastructure must be designed to include a "spare" server to support failover. For proper set up, the infrastructure must include servers to accommodate all required desktops for the organization, plus one additional server that is equal in capacity to the largest server in the grid for high availability usage. Regardless of deployment size only one (1) extra server is required for failover.

CPU Considerations

In addition to CPUs that enable virtualization support (e.g., VT-x), the number of cores is an important factor to consider when choosing the correct hardware to host a multi-desktop VDI solution. Underutilizing the host CPU is not cost effective, while overloading the host with too many desktops can lead to poor VDI performance. The Dell Kaviza solution described in this paper is designed to accommodate an optimum number of desktops per core without overloading the CPU.

In addition, the solution takes into account the memory and workload constraints that affect the number of desktops per core that can be realistically delivered for an optimum end-user experience. While some believe that upwards of 12 desktops per core can be implemented on current generation of processors, Dell's position is to allocate a range of five to six desktops per core so server CPU and memory utilization do not impact the VM experience.

The following table summarizes the amount of desktops per core used in our calculations:

300 Standard User Desktops	360 Basic User Desktops
5 Desktops / CPU Core	6 Desktops / CPU Core

Table 1: CPU Considerations

Note the increase in the amount of desktops per core for the basic user desktops. Unlike the standard profile, the basic user profile does not perform as many CPU-intensive activities, like viewing Adobe Flash content.

Now that the numbers of desktops per core have been determined, it is simple to determine how many servers would be needed to accommodate 300 standard and 360 basic user desktops based CPU alone. Our calculations relied on servers containing dual quad and dual hex core processors:

<u>300 Standard User Desktops</u>

$$Dual\ Quad\ Core\ Server\text{: } 5\ Desktops/Core\ \times 8\ Cores/Server = 40\ Desktops/Server$$

$$300\ Desktops\ \div 40\ Desktops/Server\ =\ {\sim}8\ Servers$$

$$Dual\ Hex\ Core\ Server\text{: } 5\ Desktops/Core \times 12\ Cores/Server = 60\ Desktops/Server$$

$$300\ Desktops\ \div 60\ Desktops/Server\ = 5\ Servers$$

360 Basic User Desktops

$$Dual\ Quad\ Core\ Server: Desktops/Core\ \times 8\ Cores/Server = 48\ Desktops/Server$$

$$360\ Desktops\ \div 48\ Desktops/Server\ =\ \sim 8\ Servers$$

$$Dual\ Hex\ Core\ Server: 6\ Desktops/Core \times 12\ Cores/Server = 72\ Desktops/Server$$

$$360\ Desktops\ \div 72\ Desktops/Server\ = 5\ Servers$$

As one can see from the calculations above, the dual hex core servers can accommodate 50% more users than the same solution utilizing servers with a dual quad core configuration. The dual hex core solution also reduces the amount of servers needed for each configuration by approximately 38%. As a result, the Dell solution recommends that each of the 5 servers for both the 300 standard and 360 basic user desktop solutions contain dual hex core processors.

Memory Considerations

Virtual desktop memory allocation is dependent on the type of operating system as well as the type of user accessing the desktop. Additionally, it is important to consider the amount of memory overhead incurred by virtual machines hosted by VMware ESXi 4.1. The following table lists the amount of memory to allocate for each desktop:

	300 Standard User Desktops			360 Basic User Desktops		
	VM Memory	Overhead	Total Memory	VM Memory	Overhead	Total Memory
32-bit Windows XP Professional	1 GB	150 MB	1.15 GB	0.5 GB	100 MB	0.6 GB
32-bit Windows 7 Professional	1.5 GB	150 MB	1.65 GB	1 GB	150 MB	1.15 GB
Kaviza VM	1 GB	150 MB	1.15 GB	1 GB	150 MB	1.15 GB
VMware ESXi 4.1	1 GB	0 GB	1 GB	1 GB	0 GB	1 GB

Table 2: Memory Considerations

Since it is established that each dual hex core server can handle approximately 60 standard desktops and 72 basic desktops, it must be determined how much memory is required on a per server basis.

300 Standard User Desktops

$$30\ Windows\ XP\ \times\ 1.15\ GB + 30\ Windows\ 7\ \times\ 1.65\ GB + Kaviza\ 1.15\ GB + ESX\ 1\ GB = \sim 85\ GB$$

360 Basic User Desktops

$$36\ Windows\ XP\ \times\ .6\ GB + 36\ Windows\ 7\ \times\ 1.15\ GB + Kaviza\ VM\ 1.15\ GB + ESX\ 1\ GB\ =\ \sim 64\ \text{GB}$$

The calculations point to 85 GB and 64 GB configuration per server for standard and basic user desktops, respectively. Since 85 GB is not a valid memory configuration and 64 GB of memory will not provide any overhead for basic user desktops, it is recommended that 96 GB of memory be installed on each server for the 300 standard and 360 basic user desktop solutions. This additional memory will not only provide flexibility when allocating memory for desktops, but it will also give each solution ample memory should a spike in memory utilization occur.

Storage Considerations

Storage plays an important part in any successful VDI implementation. Storage capacity, storage type, and read/write performance (IOPS) can place performance constraints on VDI deployments that impact user density and VM performance. In order to address these potential issues, this architecture provides guidance for the amount of storage and storage type needed based desktop image and storage sizing considerations. RAID configurations will also be addressed.

Desktop Image Considerations

Although many IT infrastructures have migrated to Windows 7 for end-user desktops, given the large and well established Windows XP install base it is still important to consider Windows XP in VDI architectures. Both the 300 and 360 desktop configurations in this reference architecture evenly divide the number of Windows 7 and Windows XP images within the same host servers. Additionally, all images referenced in this solution encompass the 32-bit versions of Windows XP Professional and Windows 7 Professional.

The solution must also account for and specify the number of golden "base" images that will be stored and their respective sizes. These golden images represent the base template that is used when Kaviza creates desktop pools. The following table summarizes the number of base images and sizes.

	300 Standard User Desktops	360 Basic User Desktops
Number of Golden Images	5	5
Size of Golden Images (ea)	30GB	20GB

Table 3: Desktop Image Considerations

Note that the size of the golden image for the 300 desktop configuration is larger than the basic configuration since it will contain more applications.

Storage Sizing Considerations

The following table details the methods by which to calculate storage capacity:

	300 Standard User Desktops	360 Basic User Desktops
Total Storage for Golden Images	$2 \times Golden\ Image\ Size$	
Total Storage for VMs	$15\% \times Golden\ Image\ Size \times Number\ of\ VMs$	
Total Storage for Kaviza VM	$70\ GB$	
Kaviza Recommendation for Swap and Transient Activity	$100\ GB$	

Table 4: Storage Requirements

Note that Table 4: Storage Requirements does not include space allocated for VMware ESXi. As part of the architecture, Dell recommends that the hypervisor reside on an internal SD card. This configuration allows for lower mean time between failures since the hypervisor does not reside on a standard disk. Additionally, 1 GB of storage space does not have to be allocated.

Also note that VDI-in-a-box utilizes linked clones technology in order to further reduce the amount of storage required. This means the virtual machine is a copy of the golden image and in turn, shares virtual disks of the parent clone (i.e., golden image). This is why the storage required per VM is only 15% of the golden image as opposed to 100%. To provide linked clones, VDI-in-a-box must copy the golden images to each server on the grid so that linked clones can be created on each host server.

Another significant point is that the Kaviza VM must be installed on each host machine. This requirement expands the storage necessity by approximately 170 GB per server since Kaviza allocates 70GB of space and recommends another 100GB of space be reserved for swap and other transient activity.

The next important factor when considering storage capacity is the type of local storage (e.g., SATA or SAS) to utilize for virtual machines. The type of storage must be able to accommodate the amount of input/output operations per second (i.e., IOPS) that originate from the virtual machines. Note that each virtual machine may be allocated differently and therefore must take into account the user profile assigned.

As guidance for the Dell Citrix-Kaviza solution, disk IOPS and user profile IOPS were used to calculate the type of drive needed. The following tables outline the IOPS profile per drive and per user type, respectively.

	300 Standard User Desktops	360 Basic User Desktops
7200 RPM SATA Hard Drive	75 IOPS	
10K RPM SAS Hard Drive	125 IOPS	
15K RPM SAS Hard Drive	175 IOPS	

Table 5: Disk IOPS Profiles

	300 Standard User Desktops	360 Basic User Desktops
Average IOPS / Desktop[1]	15	10

Table 6: Average IOPS per User Type

Given these listed storage considerations, IT administrators have a formula to calculate the amount of storage required to house the 300 and 360 desktop configurations. Since all VMs in our solution utilize golden images of the same size, it is trivial to calculate the amount of storage required:

Standard User Desktops

$$Space\ Required\ for\ Golden\ Images: 2 \times 30\ GB \times 5\ Golden\ Images = 300\ GB$$

$$Space\ Required\ for\ VMs: 15\% \times 30\ GB \times 60\ VMs = 270\ GB$$

$$Server\ Capacity\ Required: 300\ GB + 270\ GB + 100\ GB(Swap) + 70\ GB(Kaviza\ kMgr\ VM) = 740 GB\ per\ server$$

Basic User Desktops

$$Space\ Required\ for\ Golden\ Images: 2 \times 20\ GB \times 5\ Golden\ Images = 200\ GB$$

$$Space\ Required\ for\ VMs: 15\% \times 20\ GB \times 72\ VMs = 216\ GB$$

$$Server\ Capacity\ Required: 200\ GB + 216\ GB + 100\ GB(Swap) + 70\ GB(Kaviza\ kMgr\ VM)$$

$$= 586\ GB \text{ per server}$$

The next step is to determine how many disks can satisfy both the storage and the IOPS requirements.

[1] Average IOPS for typical desktop usage.

Standard User Desktops

$$Average\ IOPS\ per\ Server = 60\ Desktops * 15\ Average\ IOPS = 900\ IOPS$$

$$Number\ of\ 10K\ SAS\ Drives\ Needed = 900\ IOPS \div 125\ IOPS\ per\ Disk = \sim 8$$

- $Size\ of\ each\ 10K\ drive\ nedded\ to\ accomodate\ capacity = 740\ GB\ \div 8 = \sim 93\ GB$

$$Number\ of\ 15K\ SAS\ Drives\ Needed = 900\ IOPS \div 175\ IOPS\ per\ Disk = \sim 6$$

- $Size\ of\ each\ 15K\ drive\ needed\ to\ accomodate\ capacity = 740\ GB \div 6\ = \sim 124\ GB$

Basic User Desktops

$$Average\ IOPS\ per\ Server = 72\ Desktops * 10\ Average\ IOPS = 720\ IOPS$$

$$Number\ of\ 10K\ SAS\ Drives\ Needed = 720\ IOPS \div 125\ IOPS\ per\ Disk = \sim 6$$

- $Size\ of\ each\ 10K\ drive\ nedded\ to\ accomodate\ capacity = 586\ GB\ \div 6 = \sim 98\ GB$

$$Number\ of\ 15K\ SAS\ Drives\ Needed = 720\ IOPS \div 175\ IOPS\ per\ Disk = \sim 5$$

- $Size\ of\ each\ 15K\ drive\ needed\ to\ accomodate\ capacity = 586\ GB \div 5\ = \sim 118\ GB$

While the above calculations show that 6 and 5, 15K SAS drives support the average IOPS requirements for the standard and basic user desktops, respectively, it is recommended that an extra drive be added to prevent any degradation in performance that could occur from login storms or any increase IOPS. As a result, Dell recommends that servers for standard user desktops are configured with 7, 146 GB 15K SAS drives; servers for basic user desktops will need six, 146 GB 15K SAS drives.

The last storage detail relates to the RAID configuration. Since storage performance can often be a bottleneck in VDI solutions, it would be beneficial to consider a RAID configuration whose read/write profile is close to native disk performance. As a result, Dell recommends that RAID-0 be used. Note that RAID-5 was considered for its ability to survive a single disk failure, however, its read/write performance could dramatically impact virtual desktop performance. Another reason for using RAID-0 instead of RAID-5 is the fact that this solution does not contain any persistent data.

Active Directory/User Profile Data

VDI-in-a-box can be set up to leverage a corporate user directory, such as Active Directory server. This ensures that Kaviza leverages the user credentials that an existing user directory has already set up. Alternatively, one can set up a VDI-in-a-box user directory using Windows Workgroups.

User profile data for non-persistent desktops should be stored on a networked share that can be accessed from the virtual desktops. There are currently two recommended ways to store user profiles. The first is to use roaming profiles with Active Directory. The second, is to use the User Profile Management (UPM) tool from Citrix that is bundled with Kaviza. Both use the storage accessed by the Active Directory to store the user profile.

Networking Considerations

Kaviza's approach to network configuration is keep both management and virtual desktop traffic on the same network. The main reasoning behind this combined network is the grid component of Kaviza. This architecture provides Kaviza the ability to copy golden images across servers, load balance virtual desktops across servers, and redistribute desktops amongst servers when a host fails.

In addition to the VDI-in-a-box network, it is important to take into account the integration of an existing network infrastructure to a VDI-in-a-box environment. This integration provides VDI-in-a-box the gateway to access user profiles and data as well as access Active Directory to import users.

Although all of these functions may increase the amount of bandwidth required by an infrastructure, the overhead would not severely impact a network of at least 1 gigabit. As a result, Dell recommends that both the VDI-in-a-box grid and managed switch used to integrate the host servers into an existing environment be at least 1 gigabit.

Solution Hardware/Software Recommendations

The following hardware and software describes the recommended components of the 300 Standard and 360 Basic configurations.

Server Configuration

	300 Standard User Desktops	360 Basic User Desktops
Dell Enterprise Class Rack Mount Server	6, Dell PowerEdge R710 Chassis for Up to 8 2.5-Inch Hard Drives	
CPUs	Dual Intel Xeon® X5675 3.06Ghz, 6 Cores	
RAM	96 GB (12x8GB) DDR3 1333MHz	
Storage	7, 146 GB 15K RPM SAS 6 Gbps 2.5 Inch Hot plug Hard Drives	6, 146 GB 15K RPM SAS 6 Gbps 2.5 Inch Hot plug Hard Drives
Internal RAID Controller	PERC H700 Integrated RAID Controller, 1 GB NV Cache	
Hard Drive Configuration	RAID 0	
Network Adapter	Broadcom 5709 Dual Port 1 GbE NIC iSCSI offload not needed	
Virtualization	VMware ESXi v4.1 2CPU Embedded Basic	
Power Supply	High Output Power Supply, Redundant, 870W	
Systems Management	iDRAC6 Enterprise	

Networking Configuration

	300 Standard User Desktops	360 Basic User Desktops
Network Switch	Dell PowerConnect 5524	

Virtual Machine Configurations

	300 Standard User Desktops		360 Basic User Desktops	
	Windows XP Professional	Windows 7 Professional	Windows XP Professional	Windows 7 Professional
vCPU	1	1	1	1
RAM	1 GB	1.5 GB	.5 GB	1 GB
Network Adapters	1	1	1	1
USB Adapters	1	1	1	1

Deployment Best Practices

The following are suggested best practices for setting up a Kaviza VDI-in-a-box environment. Deploying VDI-in-a-box is a fairly straightforward process and is very easy to build out. IT administrators must first start by creating a "grid" and then scale one by one.

Servers and images

It is best to first start with a single server, create one image and test it by generating desktops and having users login. This will help you to quickly iron out any issues related to unique environments. Once you have this first server deployed, you can then expand the deployment by simply adding more servers.

Since preparing an image for remote VDI access requires many time-consuming preparatory steps, it is best to do this once with one "base" image for each OS (e.g. one for XP and one for Win7). The base image should contain only the bare minimum applications that will be required by all desktops. Once this base image is tested and working properly, create all specific golden images (e.g. the accounting image, the engineering image) by making a copy of the master image and then installing the necessary applications. This allows IT administrators to avoid the initial preparatory work for each golden image.

Using an ISO to create the base image will help ensure clean customization of the images with all applications required by the user. It is important that only necessary applications or services are maintained on the image. If using P2V, it is important to clean up unnecessary applications, services and folders from the image. To keep the image small, clean up any temporary files and user profiles. Also, turn off services that would cause periodic rebooting of desktops (e.g., screen savers, automatic Windows update). Follow the vendor-recommended procedure for setting up anti-virus services on the virtual desktops. It is also recommended the image footprint be kept small to save on storage space; no larger than 30GB or 40GB should meet most use case requirements. Additionally, to reduce management overhead and save disk space on the servers, it is suggested to keep the number of images to a minimum. Once created, the base image can issue production images and store the copy of the "golden image." Distribute images during off-peak hours to minimize user disruption.

Server naming, capacity and upgrades

In the set-up of your infrastructure, it is recommended that you keep host versions consistent and avoid DNS names and instead assign static IP addresses to servers (kMGR). Desktops use the IP address of kMGR for system communication, so it is imperative that the IP address be static, otherwise communication will be lost. The static IP address can be configured from the "Servers" properties page.

It is **strongly recommend** that administrators allocate full resources (CPU, memory, disk) on the server to VDI-in-a-box desktops. Before this is done, it is recommended that each ESXi host disable the *CPU.HaltingIdleMsecPenalty* parameter. Disabling this parameter in the Advanced Settings menu provides an increase in VM throughput. If other services are running on the server, it is important to adjust the capacity utilization calibration on the server. (See the References section at the end of this paper for additional details) Capacity adjustment is used to customize what is considered 100% utilization, to share a server with other services, and to manage the virtual desktop density per server. A convenient Capacity Bar provides a view of the grid's utilization and is calculated based on the available CPU and Memory resources across the grid. Calibration is managed per server and must be managed from the "Servers" tab. To customize the calibration, select the <magnifying glass icon> on the server and click the <adjust capacity button> to adjust its capacity.

Patches and licenses are automatically distributed to all the servers in the grid from the kMGR. It is important to maintain the latest patches and updates for your grid. Patches and Hotfix patches are available on the Kaviza website (support.kaviza.com). All patches and licenses are in *.tar* format and do not require extraction. All upgrades can be performed from the "Admin" tab. A new server joining the grid will receive the grid's license automatically.

Templates and users

To maintain the ideal experience for your users, it is important to follow certain template policies. When using the "on logout" policy option, prepare the image with the "Fast refresh" option enabled. The system will then revert to a snapshot image upon logout, thus providing a quick method to refresh the virtual desktops. It is recommended that you encourage customers to use non-persistent desktops.

Template refreshes destroy the existing desktops and create the desktops from the golden image unless the image is prepared with "fast refresh" option. The created desktops will go through the sysprep specialize phase, which is time consuming and IOPS-intensive. So, it is important to plan virtual desktop refreshes for after hours or off-peak hours to avoid the side effects such as slow desktop access or unavailability.

In order to ensure successful authentication, create one domain administrator account for Active Directory (AD) authentication and a second for image sysprep. Also, it is best to create a separate Kaviza specific root account for hypervisor management. It is important to minimize password changes to these accounts. If a password changes, you must immediately update the credentials in the VDI-in-a-box system in order to avoid authentication failure.

About Kaviza VDI-in-a-box

Kaviza VDI-in-a-box, now from Citrix, enables customers to easily get started with VDI and incrementally grow their deployment as their needs grow. VDI-in-a-box simplifies implementation and lifecycle support with a grid architecture that leverages industry standard server configurations without requiring shared network storage.

VDI-in-a-box is a simplified and cost effective solution that provides a local desktop-like experience, enabling smaller entities with limited budgets and IT staff to gain the benefits of desktop virtualization. VDI-in-a-box is an all in one solution that can be managed by IT professionals without requiring detailed specialized experience. Simplicity is achieved by integrating multiple components including connection brokering, load balancing, desktop provisioning and management into a VDI-only desktop virtualization solution.

While deployment size is important, the solution is architected to reflect the behavior of the smaller deployments and specifically focuses on the following attributes:

- Easy to deploy and manage – all in one software
- Rich end user experience – leverages Citrix HDX for a rich user experience
- Simple grid infrastructure – provides linear and predictable expansion
- Justifiable capital expense – rapid ROI for deployments of 25+ desktops
- Focused on VDI implementation – no specialized experience required

VDI-in-a-box makes it easy for customers with smaller deployments to realize the business benefits of virtual desktops with minimal upfront investment.

About Dell Desktop Virtualization Solutions

Dell Desktop Virtualization Solutions brings enterprise computing to virtually any end user computing device, anytime, anywhere --- improving employee productivity, while reducing IT management complexity. Dell offers open, capable and affordable solution delivery models including virtual Desktop as-a-Service (vDaaS), hosted and custom solutions.

Dell's solution integrates purpose built hardware, software and services ingredients – to deliver an integrated validated solution stack with a best practices implementation methodology to guide customers through a clear and predictable path to making the right business decision for adopting desktop virtualization. DDVS is designed to ease design and implementation complexities and address each organization's unique business, user, and IT requirements – accelerating adoption so organizations can adapt to the dynamics of today's more mobile and global workforce.

References

Dell Desktop virtualization Solutions web site www.dell.com/virtualdesktop

Dell PowerEdge Servers web site http://www.dell.com/poweredge

Citrix-Kaviza web site www.citrix.com/kaviza

VMware ESXi Memory Overhead
http://pubs.vmware.com/vsp40u1/wwhelp/wwhimpl/js/html/wwhelp.htm#href=resmgmt/r_overhead_memory_on_virtual_machines.html#1_12_8_8_7_1

VMware ESXi CPU.HaltingIdleMsecPenalty: Guidance for Modifying vSphere's Fairness/Throughput Balance
http://kb.vmware.com/selfservice/microsites/search.do?language=en_US&cmd=displayKC&externalId=1020233

Appendix 1: User Profile Characteristics

User Profile	Profile Characteristics
Basic	This user profile emulates a task worker. • Only 2 apps are open simultaneously. • Only apps used are IE, Word and Outlook.
Standard	This user profile emulates a medium knowledge worker . • Up to 5 apps are open simultaneously. • Apps used are IE, Word, Outlook, PDF Printer, Adobe Acrobat Reader, Excel, PowerPoint • Light multimedia content is viewed.