SHVD (Server Hosted Virtual Desktops) Infrastructure Costs: VMware View 4 vs. Citrix XenDesktop 4

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Introduction: Infrastructure Costs of a SHVD Implementation

A Server Hosted Virtual Desktop (SHVD) can provide significant cost savings and IT manageability improvements by consolidating a vast number of supported end points onto a centralized service providing platform. In fact, ENTERPRISE MANAGEMENT ASSOCIATES® (EMA™) primary research indicates that 71% of organizations that have implemented desktop virtualization have seen real, measurable costs savings with roughly a 60% reduction in hardware, software, and administration costs. SHVD also provides greater user flexibility by allowing them to access their desktop from a variety of end points, which can improve productivity for meeting organizational requirements and increasing profitability.

Responding to the growing demand for SHVD products and services, a number of vendors have developed unique virtual infrastructure platforms. Although many of these solutions provide similar functionality, the architectures are often radically different. In all cases, however, an up-front investment in hardware and software resources is necessary. When selecting a SHVD solution, organizations must balance the breadth of support each candidate product provides with its cost-effectiveness. Although feature sets are easily identified from product literature, total infrastructure costs often are not. There are many variables involved in determining implementation expenses, but they principally fall into three distinct categories: server, storage, and software. All three of these cost elements should be carefully evaluated prior to investing in a SHVD solution to ensure value is achieved in deploying a solution that best meets organizational requirements.

Although feature sets are easily identified from product literature, total infrastructure costs often are not.

SHVD Infrastructure Cost Comparison

Methodology

In order to help identify total infrastructure costs of a desktop virtualization solution, EMA has analyzed and compared implementation costs of two of the most popular SHVD products: VMware™ View and Citrix™ XenDesktop. Comparable implementations have been established based on recommended configurations derived from publicly available sources (see Appendix B for reference material). The configurations have been developed to include the minimum number of components necessary to support small (800 VMs), medium (3000 VMs), and large (10,000 VMs) infrastructures. Hardware component costs were estimated by determining the purchase price of components necessary to meet established system configuration requirements (as identified in Appendix A). The resulting configuration profiles were submitted to their respective vendors for independent review and their comments have been incorporated to ensure a fair and accurate comparison.

It should be noted that this analysis did not include a full functional comparison as the feature sets of the two products are not completely identical. However, the infrastructure and individual components have been carefully sized to achieve as close to an equivalency in performance as can be determined through analytical processes. Additionally, the infrastructure configurations have been developed to identify SHVD implementation requirement only. The utilization of additional virtualization resources – such

as application or server virtualization – will likely alter both the software and hardware requirements and associated costs. Each organization should perform product evaluations based on its own unique requirements. The data provided here is intended to help indicate a starting point for that process.

Server Components

All SHVD implementations require physical servers for hosting, managing and delivering virtual desktop instances. These hardware components are typically deployed in data centers and supported by a centralized IT operations team. Although a total cost of ownership (TCO) evaluation would involve all infrastructure expenses including those for power consumption, HVAC, backup and disaster recovery (BDR), maintenance and support staff compensation for all managed components, this evaluation will assume such secondary costs to be roughly equivalent between the two solutions and only focus on the areas where the primary cost factors differ.

Virtual desktops in a VMware View implementation are maintained on a series of physical Desktop Servers. Each Desktop Server requires a minimum of 48 GB in memory to host up to 142 virtual machine (VM) instances. A VMware View Connection Server is also required for every 1000 VMs supported for brokering desktops and controlling user access. Centralized virtual image management of the environment is performed by VMware View Composer software which can be installed on vCenter Servers that also provide storage management functionality. These combined management platforms can support up to 1000 VMs each, but can be consolidated through server virtualization so that a single physical vCenter Server can support up to five such implementations. Similarly, SQL servers necessary for hosting the vCenter and View Manager databases can also be consolidated through server virtualization at a ratio of 5:1, and VMware recommends the SQL Server and vCenter Server be combined into a single system on implementations of less than 1000 VMs.

VMware View Infrastructure Components				
	Estimated Server Cost	Supporting 800 VMs	Supporting 3,000 VMs	Supporting 10,000 VMs
Number of Desktop Servers Needed	$8,100	6	22	71
Number of View Connection Servers Needed	$6,600	1	1	3
Number of vCenter Servers Needed	$6,600	1	1	3
Number of SQL Servers Needed	$6,200	0	1	2
Total Number of Servers Needed		**8**	**25**	**79**
Total Estimated Server Costs		**$61,800**	**$197,600**	**$627,100**

With Citrix XenDesktop, 125 VMs can be supported on each XenServer with a minimum of 72GB of memory. A cluster of Provisioning Servers, which is utilized for managing and delivering virtual images, can each reliably support 2000 VMs with one additional server added for fault tolerance (as recommended by Citrix). Functionality for managing, maintaining and optimizing virtual desktop connections is provided by Desktop Delivery Controllers (DDCs). For DDC's, Citrix advises that a single physical server can provide the resources necessary to reliably support 10,000 VMs. A XenDesktop infrastructure also commonly includes 2 Web Interfaces that allow users to access their published resources through a standard web browser.

Citrix XenDesktop Infrastructure Components				
	Estimated Server Cost	Supporting 800 VMs	Supporting 3,000 VMs	Supporting 10,000 VMs
Number of XenServers Needed	$11,900	7	24	80
Number of Provisioning Servers Needed	$6,100	2	3	6
Number of Desktop Delivery Controllers needed	$6,100	1	1	1
Number of Web Interface Servers Needed	$3,200	2	2	2
Total Number of Servers Needed		**12**	**30**	**89**
Total Estimated Server Costs		**$108,000**	**$316,400**	**$1,001,100**

Two significant cost factors contribute heavily to the hardware cost differences between the two solutions, both related specifically to the desktop server requirements: the density of supported VMs and the total amount of required memory. Both show some very impressive ratios of VMs per gigabytes of memory in their reported test environments. VMware, however, demonstrated roughly 60% greater efficiencies in memory utilization which contributed to the VMware View solution requiring 19% fewer servers than Citrix XenDesktop in order to host 10,000 users. It can be anticipated that both vendors will continue to improve the effectiveness of how their solutions make use of memory resources because of the direct and significant implementation cost impact. Not only is the direct cost of DIMMs impactful, larger memory configurations typically require more expensive system chassis to house them, increasing the total server cost exponentially.

Storage Requirements

For improved performance, flexibility, and reliability, both VMware and Citrix utilize shared storage solutions for desktop images and software requirements. For sizing purposes, an average of 3 images per desktop has been assumed, each with a size of 20 GB. Pricing is based on an average cost of $5/GB in storage hardware. This cost model was selected as a compromise between economy solutions that can be as low as $3/GB and high-performance, high-availability solutions that can be as much as $8/GB. BDR and management costs of storage have not been considered in this analysis, but it should be noted the true total cost of storage can be as high as $20/GB.

VMware View Premier is able to significantly reduce storage requirements through the use of linked clones, which is a process that allows a master replica to be created to which dependent VMs can be linked so that only the differences from the master (the delta) need to be stored. In this example, it is

assumed that each replica image can support 64 users (to match server sizing) and that 100% of the linked clones will be utilized. Note that this feature is included with VMware's View Composer package which is not natively included with the Enterprise edition of View.

VMware View Shared Storage Requirements			
	Supporting 800 VMs	Supporting 3,000 VMs	Supporting 10,000 VMs
Storage requirements for Replica Images	750 GB	2813 GB	9375 GB
Storage requirements for Delta data	1600 GB	6000 GB	20000 GB
Total Storage Required	**2350 GB**	**8813 GB**	**29375 GB**
Total Storage Costs	**$11,750**	**$44,065**	**$146,875**

For Citrix XenDesktop, an average temporary storage requirement of 5 GB for each supported desktop has been calculated for this environment. This storage is used to accommodate the transient write caches associated with Provisioning Server virtual disks. Additionally, each provisioning server needs 20 GB for its application requirements and a fixed 100 GB needs to be collectively available to all provisioning servers as a caching area for live images. DDCs and Web Interfaces each require 5 GB for application installation.

Citrix XenDesktop Shared Storage Requirements			
	Supporting 800 VMs	Supporting 3,000 VMs	Supporting 10,000 VMs
Desktop Storage Requirements	4000 GB	15000 GB	50000 GB
Total Storage Costs	**$20,000**	**$75,000**	**$250,000**

VMware View is advantaged in this comparison by the utilization of linked clones, with storage infrastructure costs less than 60% of those necessary for XenDesktop. Usage requirements, unique environment configurations, and how virtual desktops are deployed to clients will all factor into the sizing of the storage solution, so careful planning of the SHVD implementation should be performed prior to investing in a storage platform.

Software Costs

VMware and Citrix both offer scaled editions of their respective SHVD platforms. Each edition offers a particular feature set, allowing organizations to choose the platform most applicable and cost-effective to meeting their requirements. Since none of the editions offered by the two vendors provide exactly the same set of functionality, all cost possibilities have been listed to allow a variety of comparison points. Of particular consideration should be whether or not application virtualization will also be implemented. Although not specifically included in this evaluation, application virtualization is integrated with some SHVD editions, so its use will alter the pricing model of the software deployment. As with hardware requirements, secondary cost for software management support staff and maintenance have not been included in this analysis.

VMware offers two editions of its View solution. The Enterprise Edition offers all software components necessary for full SHVD deployment, including high availability and dynamic provision capabilities. The Premier Edition also adds application virtualization and enables offline desktops, which allows virtual desktops to function on end points when they are not connected to the network. VMware recognizes that, in many cases, not all end users are actively utilizing their virtual desktops at the same time. Since unused license purchases can incur significant unnecessary costs, VMware has introduced a license model based on concurrency – that is, licenses only need to be purchased for the number of VMs that actively need to be accessed at the same time. Actual concurrency levels will vary greatly depending on each use case. To indicate cost saving that can be achieved with this pricing model, the concurrency level has been assumed to be 60%, but evaluators are encouraged to adjust these figures to match expected usage rates for their particular support stacks.

VMware View Software Costs					
	License Cost/VM	Level of Concurrency	Supporting 800 VMs	Supporting 3,000 VMs	Supporting 10,000 VMs
VMware View Enterprise Edition	$150	60%	$72,000	$270,000	$900,000
VMware View Premier Edition	$250	60%	$120,000	$450,000	$1,500,000

Citrix offers three versions of its XenDesktop solution. The standalone VDI Edition provides basic virtual desktop functionality and is sold with either a cost per individual user or concurrent user license model. More advanced virtualization management capabilities and application virtualization are added with the Enterprise Edition, and the Platinum Edition offer the complete breadth of XenDesktop's SHVD feature set, including advanced access control and server level monitoring. All XenDesktop editions are offered at a flat price per managed desktop and they self-contain all applicable software components.

Citrix XenDesktop Software Costs				
	License Cost/VM	Supporting 800 VMs	Supporting 3,000 VMs	Supporting 10,000 VMs
XenDesktop VDI Edition (per VM)	$95	$76,000	$285,000	$950,000
XenDesktop VDI Edition (per CCU with 60% concurrency assumed)	$195	$93,600	$351,000	$1,170,000
XenDesktop Enterprise Edition	$225	$180,000	$675,000	$2,350,000
XenDesktop Platinum Edition	$350	$280,000	$1,050,000	$3,500,000

Software licenses are typically the most expensive element in a SHVD implementation because the license costs are directly related to the number of managed desktops – and that support stack can often be very large. Because of this, the utilization of concurrency with VMware View can dramatically reduce overall solution costs, though the ability to take advantage of this cost savings may not be practical in all cases.

Total Infrastructure Cost Comparison

Putting all the elements of server, storage, and software costs together provides a clear picture of how the two solutions compare. VMware View Premier is again assumed to be utilizing a 60% level of concurrency and is compared against the various Citrix XenDesktop editions. In the end, at this 60% concurrency for 10,000 users VMware View Premier costs 52% less than Citrix XenDesktop Platinum.

Total Infrastructure Cost Comparison				
	VMware View Premier	Citrix XenDesktop VDI (licensed by VM / CCU)	Citrix XenDesktop Enterprise	Citrix XenDesktop Platinum
Supporting 800 VMs	$193,550	$204,000 / $221,600	$308,000	$408,000
Supporting 3,000 VMs	$691,665	$676,400 / $742,400	$1,066,400	$1,441,400
Supporting 10,000 VMs	$2,273,975	$2,201,100 / $2,421,100	$3,501,100	$4,751,100

This evaluation has revealed three specific factors that have the greatest impact on total infrastructure costs: SHVD server memory utilization, density of VM per server, and level of concurrency. All three of these factors are influenced by the operational conditions of the enterprise in which the implementation will be utilized. Careful up-front identification of project requirements can enable cost-efficiencies and performance improvements in any SHVD deployment and will help guide organizations to adopt solutions that are most applicable to their unique business needs.

EMA Perspective

Driven by a new renaissance in centralized service management, the adoption of hosted desktop technologies can be expected to expand significantly in the near future, so it is no wonder the major players in this field – including Citrix, Microsoft, and VMware – are all elbowing for a leading position in the market space. Since cost is almost certainly a major contributing factor in product selection, some of the competing SHVD solution providers have made aggressive claims on the economic value of their solutions. What is not often clear is that these publicized cost reductions can only be achieved when utilized in certain specific business use cases. As has been demonstrated in this EMA analysis, a clear determination of organizational requirements for SHVD is instrumental in identifying a product that meets both functional and budgetary prerequisites.

About VMware

VMware delivers solutions for business infrastructure virtualization that enable IT organizations to energize businesses of all sizes. With an industry leading virtualization platform – VMware vSphere™ – customers rely on VMware to reduce capital and operating expenses, improve agility, ensure business continuity, strengthen security and go green. With 2009 revenues of $2 billion, more than 170,000 customers and 25,000 partners, VMware consistently ranks as a top priority among CIOs. VMware is headquartered in Silicon Valley with offices throughout the world and can be found online at www.vmware.com.

Appendix A: SHVD Server Configurations

Provided below are the high-lever server configuration requirements that were used to identify hardware implementation costs.

VMware View Server Configurations

VMware Desktop Server Configuration	
CPU Per Server	2
Core Per CPU	4
Cores Per Server	8
Memory	48GB
Network Interface	2 x dual 1GbE
Hard Disk	1 x 80GB
Estimated cost per server	$8,100

VMware vCenter & View Connection Server Configurations	
CPU Per Server	2
Core Per CPU	4
Cores Per Server	8
Memory	32GB
Network Interface	2 x dual 1GbE
Hard Disk	1 x 80GB
Estimated cost per server	$6,600

VMware SQL Server Configurations	
CPU Per Server	2
Core Per CPU	4
Cores Per Server	8
Memory	16GB
Network Interface	2 x dual 1GbE
Hard Disk	1 x 80GB
Estimated cost per server	$6,200

Citrix XenDesktop Server Configurations

Citrix XenServer Configuration	
Minimum CPUs Per Server	2
Minimum Cores Per CPU	4
Minimum Total Cores Per Server	8
Memory	72GB
Network Interface	2 x dual 1GbE
Hard Disk	1 x 80GB
Estimated cost per server	$11,900

Citrix DDC and PvS Configurations	
Minimum CPUs Per Server	2
Minimum Cores Per CPU	4
Minimum Total Cores Per Server	8
Memory	8GB
Network Interface	2 x dual 1GbE
Hard Disk	2 x 80GB Raid 1
Estimated cost per server	$6,100

Citrix Web Server Configuration	
Minimum CPUs Per Server	2
Minimum Cores Per CPU	1
Minimum Total Cores Per Server	2
Memory	2GB
Network Interface	2 x dual 1GbE
Hard Disk	1 x 160 GB
Estimated cost per server	$3,200

Appendix B: Reference Sources

Reference documents consulted for VMware View 3:

- VMware View Architecture Planning Guide
  http://www.vmware.com/pdf/view401_architecture_planning.pdf
- Storage Considerations for VMware View
  http://www.vmware.com/files/pdf/view3_storage.pdf
- VMware View Manager 3: A Guide to deploying VMware View Manager 3
  http://vmware.com/files/pdf/view-manager-deployment-guide.pdf
- Single Server Scalability Revisited
  http://blogs.vmware.com/view/2010/04/single-server-scalability-revisited.html

Reference documents consulted for Citrix XenDesktop 4:

- Citrix XenDesktop 4 Single Server Scalability Test Results on Citrix XenServer 5.5
  http://support.citrix.com/article/ctx124086
- Delivering 5000 Desktops with Citrix XenDesktop
  http://support.citrix.com/article/ctx123684
- XenDesktop Modular Reference Architecture (January, 2010)
  http://support.citrix.com/article/ctx124087

About Enterprise Management Associates, Inc.

Founded in 1996, Enterprise Management Associates (EMA) is a leading industry analyst firm that specializes in going "beyond the surface" to provide deep insight across the full spectrum of IT management technologies. EMA analysts leverage a unique combination of practical experience, insight into industry best practices, and in-depth knowledge of current and planned vendor solutions to help its clients achieve their goals. Learn more about EMA research, analysis, and consulting services for enterprise IT professionals and IT vendors at www.enterprisemanagement.com or follow EMA on Twitter.

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