



Dell DVS Simplified 1010

Reference Architecture

Dell Desktop Virtualization Solutions

5/2/2012

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1 Executive Summary

Dell and Citrix have taken a significant step to eliminate the complexity of desktop virtualization, developing a near turn-key solution for small and medium enterprise customers who hope to leverage this compelling technology. Desktop virtualization is a proven methodology for delivering a rich computing experience to end users from centralized data centers. These data centers can be on-site or cloud-based, in either customer-hosted or Dell-managed configurations. In desktop virtualization the desktop OS, user applications, user preferences and user 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 – 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 cutting edge 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.

Citrix VDI-in-a-Box provides a simplified all-in-one cost effective solution in a convenient appliance that allows smaller companies with limited budgets and IT staff to leverage the benefits of desktop virtualization. In that way, Dell is truly giving small and medium business owners the power to do more. VDI-in-a-Box integrates connection brokering, load balancing, desktop provisioning, high-availability and management functions into a single package that runs on standard Dell 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.

This reference architecture provides an introduction to the technology, features and benefits, target customer guidance, general sizing guidance and configuration recommendations for implementing a Dell virtual desktop infrastructure (VDI) solution powered by Citrix VDI-in-a-Box and Citrix® XenServer™ 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.



2 Introduction

2.1 Introducing the DVS Simplified 1010

Dell's Desktop Virtualization Solutions Simplified (DVS Simplified) Solution is a **simple, practical VDI Appliance** designed specifically to address the business and technical needs for mid-sized virtual desktop deployments so you can unlock innovation in the Virtual Era. The pre-configured appliance integrated hardware and software simplifying implementation and accelerating your time to value. DVS Simplified delivers the core benefits attributed to VDI including streamlined desktop management, stronger security, agility and flexibility and a rich user experience helping to make your IT organization a strategic contributor to business success.

The DVS Simplified 1010 includes the following key features:

- Easy to deploy and manage – all in one appliance, single server based grid architecture.
- Rich end user experience – maximum leverage of Citrix HDX technologies.
- Simple grid infrastructure – provides for linear and predictable expansion.

2.2 Value Proposition

DVS Simplified is architected to support the needs of simple non-enterprise deployments with a VDI appliance based solution that specifically provides the following attributes:

- Affordable – can be purchased with existing PC refresh budgets - \$400-600 per seat depending on user count
- Easy to deploy – wizard-based 4 step setup, factory installed software and pre-configured hardware
- Easy to manage – all in one software, server based grid architecture
- Easy to operate – single intuitive management console
- Easy to expand – modular, provides linear and predictable expansion
- Rich end user experience – leverages Citrix HDX for a rich user experience
- Justifiable capital expense – rapid ROI for deployments of 25+ desktops,
- Practical – no specialized IT experience required to deploy and manage

Simple

- **VDI Appliance:** – Integrated pre-configured hardware, Citrix VIAB software and hypervisor eliminates implementation and operational complexity.
- **Quick and Simple deployment:** – Wizard driven setup and configuration – rapidly deploy in hours to a few days, no special expertise required



- **Simplified desktop operations:** – “All-in-one” VDI software consolidates connection brokering, load balancing, provisioning and VDI management functions with Dell server hardware to radically simplify management and provisioning of desktops

Affordable

- **All in one appliance** – Integrates VDI Manager software, Dell ProSupport, and Dell PowerEdge servers to create a cost-efficient simple appliance with no requirement for network storage
- **Ideal balance of cost and performance** – Designed specifically with no-compromise solution components for simple IT environments and medium-sized deployments
- **A La Carte Dell Services** – Dell JumpStart Remote training and Remote Configuration Services are available to get you up and running in one to three days.

Practical - Pragmatic

- **Rich user experience** – Delivers a rich end-user experience with built-in Citrix® HDX® technology for optimizing a user’s virtual desktop experience. End users can access their virtual desktops and work resources from virtually anywhere, seamlessly across different locations and with the device of their choosing.
- **N+1 Grid Architecture** – Implements an easy to manage server grid architecture with integrated server redundancy. Scales linearly and predictably in a modular fashion.
- **End to end solution** –Dell’s single integrated solution contains components that are pre-integrated to save time. Dell provides end-to-end support on the appliance and software that utilizes the solution. The solution is complemented by Dell’s extensive portfolio of business and professional client devices including Wyze T-10 series Thin Clients.

2.3 DVS “Why Dell” Value Statements

- Benefit:
 - Will drastically decrease “Time to Value” return versus DIY or competitor solutions
 - Designed to fit within customer’s environment regardless of current infrastructure. Also allows for flexibility in terms of services and ownership models.
 - Select competitors offer proprietary solutions that lock customers into certain technologies, limit future expansion, and increase cost over time.
 - Offers increased productivity, better end user experience, and higher levels of efficiency.
 - Addresses the whole solution to meet both planned and unplanned future growth requirements.



- Value:
 - Removes the inherent complexity and enables customer to realize value and efficiencies versus customer DIY and competitors.
 - Removes economic barriers of entry, and mitigates risk due to Dell's extensive experience in cloud computing models.
 - Offers customer choice from data center to end point clients/devices, ease of expansion and mitigates cost by providing a scalable architecture for future growth.
 - Fosters IT alignment to core business objectives and needs increasing overall business performance.
 - The solution will maintain long term agility and financial viability for years to come.
- Differentiation:
 - Only Dell offers an end-to-end solution.
 - Single point of contact for all hardware, software and services support

2.4 Target Customers

The Dell DVS Simplified 1010 is designed for the progressive mid-market VDI customer who is supporting anywhere from few users to hundreds of end users. These customers while having considerable IT expertise often do not have the resources to design and implement a highly flexible and scalable Desktop Virtualization solution. This design point helps drive optimizations in the simplicity and agility of the solution. These optimizations help customers address these common business needs;

Target Buyer

- IT Managers in private and public sector organizations spanning all sectors including (LE, Pub, SMB) and in all core verticals.
- Person or persons responsible for management and operations of client computing and/or desktop computing infrastructure in the Information Technology organization.

Responsibilities include:

- Operations of IT systems and related hardware for client computing
- Providing maintenance, update and break/fix support services for IT systems and equipment
- Design and implementation of end user computing infrastructure and systems
- Ensure compliance with relevant governmental regulations and mandates
- Establish organization policies and procedures for secure and safe end user computing
- Develop requests/proposal for IT budgets, both capital expenditures and operating expenses for end user computing systems, hardware and services.
- Managing operating expenditures.



Influencers

- CIO, CFO and related staff
- Data center management and operations
- Network management and operations
- Security management and operations
- Business unit decision makers
- Employees and End Users (end users may not be employed by the organization – aka end users can include; students, partners, contractors, vendors, regulators, associates or stakeholders external to the organization)

Example use cases for Dell DVS Simplified 1010:

- o Organizations that lack in-house server and storage virtualization expertise - SMBs such as accounting firms, law firms, mortgage companies, Insurance brokers, K-12 and higher education, credit unions, regional banks.
- o Organizations that must limit capital outlay or who must fit VDI into their PC refresh budget – State/Local government libraries, county/community hospitals, financial brokerages, community banks.
- o Companies that want to employ VDI for a specific user group – department deployment, specific work group, or non-enterprise wide rollouts - VDI desktops for retail stations, call centers, for departments in larger organizations such as the administration staff at a branch office, tellers at credit union retail offices.
- o Non-primary desktops or access scenarios – home office, office hotel-ing, mobile user access via tablets, remote service technicians, office desktop pools

2.5 When is DVS Simplified Right for Me

Dell DVS Simplified 1010 is specifically targeted at customers that have hundreds of users versus the DVS Enterprise customers that have thousands of users. DVS Simplified is an architecture that has been perfected to meet the features and requirements of small and medium business. Refer to the charts below to determine if Dell DVS Simplified 1010 is right for you.

DVS Simplified is typically best suited to customers that agree with the following statements:

- I only have a small IT staff of primarily IT generalists.
- I am willing to forego advanced VDI features (e.g. image management or automation) in order to have simplified deployment and management.
- I don't need application virtualization or application streaming.
- I am comfortable with basic high availability.
- I only need virtual desktops for a few hundred users.
- My budget for VDI deployment is severely constrained.
- I don't anticipate needing an upgrade path to XenDesktop.



	DVS Simplified	DVS Enterprise
Advanced Image Management	No	Yes
High Availability Option (HA)	Basic	Enterprise grade
Dynamic Motion	No	Optional
Application Streaming	No	Optional
Application Virtualization	No	Yes
Shared Storage	Optional	Yes
Persistent and Non Persistent Desktops	Yes	Yes
Integrated Profile Persistence	Basic	Basic

2.6 Dell ProSupport and Professional Services Overview

Dell ProSupport is included with DVS Simplified, providing comprehensive hardware and software support so our customer's support people spend less time on issue resolution and more time on revenue-generating and strategic initiatives. With Dell ProSupport, customers have access to highly trained experts 24x7x365 to help resolve any issue quickly and effectively. Additionally, Dell ProSupport provides access to software updates, bug fixes/patches, and product updates for Citrix VDI-in-a-Box and XenServer.

Dell ProSupport benefits:

- Maximize uptime with the help of expert DVS Simplified technicians
- Software support for Citrix VDI-In-A-Box and XenServer
- Maintain productivity with Dell ProSupport Next Business Day and optional 4-hour response time

Additionally, Dell offers the following optional value-add services in support of DVS Simplified.

Highly recommended:

- **JumpStart Training** – Jumpstart training for Dell DVS Simplified is available as a 4-hr* web-based course that includes the guidance and hands-on exercises necessary for IT administrators of all levels to master appliance configuration and administration



activities quickly and effectively. The curriculum can be customized to fit the customer's specific needs.

*The training is also available as a 2-hr option when combined with Remote Advisory/Configuration Services.

- **Remote Advisory Services** – Dell Remote Advisory Services are available to remotely configure the DVS Simplified appliance. The 4-hr service also includes an option for knowledge transfer.

Recommended:

- **Onsite Installation Services** – Dell Onsite Installation Services provide a 3-day engagement at the customer's site to perform physical to virtual creation of desktop image, installation of the Dell DVS Simplified appliance and other client devices, and knowledge transfer.
- **Blueprint Assessment Services** – Dell's Blueprint Assessment Service uses a virtual appliance and agent software, deployed on the customer's network, to gather detailed data from every desktop targeted for virtualization. The outcome is an expansive and detailed report of the desktop environment and user profiles. This data-driven feedback is used as a basis for a productive virtual desktop environment. This information also helps Dell create a detailed and accurate design and implementation plan for delivering virtual desktops.
- **Blueprint Assessment Lite Services** – Dell's Blueprint Assessment Lite Service is similar to the Blueprint Assessment Service with the exception that the customer executes data collection activities and engages Dell to conduct the data analysis.
- **Network Optimization Services** – Dell's Network Optimization Service includes a comprehensive assessment of your network with detailed recommendations to optimize performance and availability. <available March 15>
- **Image Creation Services** – Dell's Image Creation Service converts physical desktop images into virtual images in accordance with Dell or customer-defined specifications, for use with the Dell DVS Simplified appliance.

2.7 Desktop Virtualization Solutions Overview

A typical Enterprise VDI deployment requires components that are not needed for the typical DVS Simplified customer. An illustration of your typical Enterprise deployment is shown in Figure 1 and described below:

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 workload, 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: Shared storage is required to create a centralized storage resource pool for 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. Dell configures the solution for customers and provides a thoroughly-tested, well-integrated appliance.

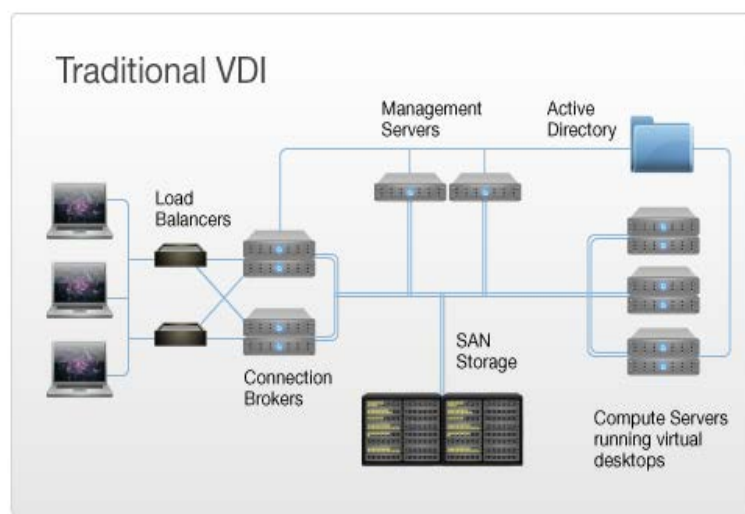


Figure 1: Enterprise VDI

While Enterprise VDI architecture is cost-effective for large deployment, it requires a sizable investment that may not be efficient or cost effective for the typical DVS Simplified customer. Dell configures the solution for customers and provides a thoroughly-tested, well-integrated appliance that will fit your needs.

Figure 2 references the Citrix “VDI-in-a-Box” deployment which uses a grid architecture that makes expansion easy, and delivers high-availability without requiring externally attached shared storage (e.g., SAN). To expand a VDI-in-a-Box deployment, simply load Citrix on additional Dell PowerEdge servers and add the new servers to the VDI-in-a-Box grid by answering two simple questions in the Citrix management software. VDI-in-a-Box automatically prepares the new servers with the appropriate desktop images, and load balances the desktop workload across the grid.

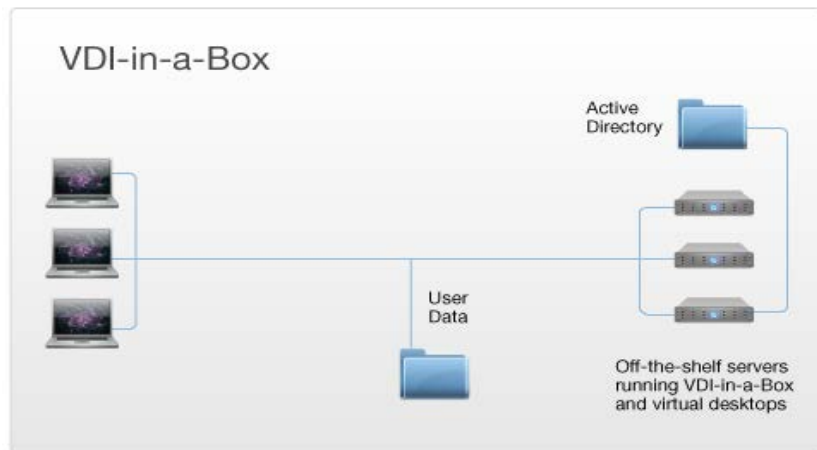


Figure 2: Citrix VDI-in-a-Box

3 Solution Architecture

The Dell Desktop Virtualization Solutions are a combination of purpose built horizontal architectures designed to be modular and scalable for an array of customer needs and a defined and tested services methodology.

Click [HERE](#) for more information on the DVS Integrated Solution Stacks.

This reference architecture focuses on the DVS Simplified 1010 solution which is marketed as an entry-level configuration to serve as pure entry point to VDI market. Per server user estimations are based on one of the following

- 80 users per server running a basic workload.
- 60 users per server running a standard workload.
- 36 users per server running a premium workload.

The solution is based on Citrix VDI-in-a-Box. Citrix VDI-in-a-Box provides a complete end-to-end solution that delivers Microsoft Windows XP, Vista or Windows 7 virtual desktops to users on a wide variety of endpoint devices. Citrix VDI-in-a-Box provides a complete virtual desktop delivery system by combining management and virtual desktops onto a single server.

The core components that encompass VDI-in-a-Box are:

- VDI-in-a-Box Broker
 - Installed on servers either in the data center or branch office, the broker authenticates users, manages the assembly of users' virtual desktop environments, and brokers connections between users and their virtual desktops.
- Virtual Desktop Agent
 - Installed on virtual desktops, the agent enables direct ICA (Independent Computing Architecture) connections between the virtual desktop and users' endpoint devices.
- Citrix Desktop Receiver
 - Software running on an endpoint that enables the device to connect to a virtual Windows XP, Vista or 7 desktop running on a server
- Additional VDI-in-a-Box components
 - Hypervisor Integration. The Citrix VDI-in-a-Box solution is used in conjunction with Citrix XenServer for the provisioning of virtual machines. The DVS Simplified 1010 environment is to be hosted by Citrix XenServer.
 - Active Directory Integration. VDI-in-a-Box optionally uses Active Directory for security services like authentication.
 - McAfee ePolicy Orchestrator – Antivirus Management

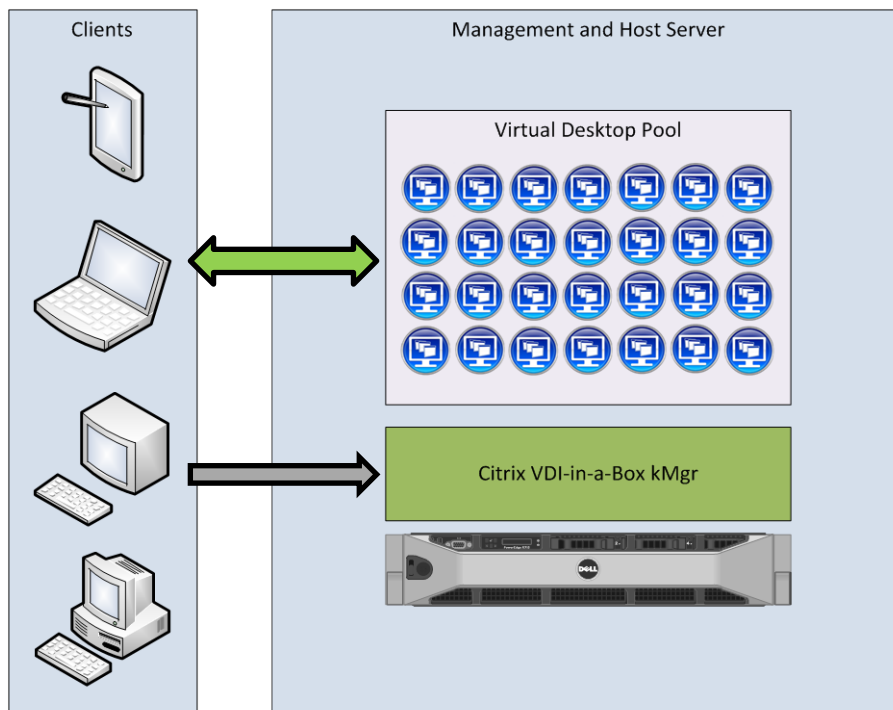


3.1 Initial Configuration Design

To provide a scalable and predictive solution stack Dell developed scalability and design criteria based on extensive testing and validation within our Global Solutions Lab. Based on this analysis the following design criteria has been established. This drives the design criteria to allow modular scalability which requires certain design constraints as outlined below.

Simplified 1010 Base Configuration:

- **One** R710 physical virtualization host/management server with local Tier 1 storage.



4 Hardware Components

4.1 Virtualization Host Appliance

All VDI-in-a-Box virtual desktops are hosted by a Citrix XenServer infrastructure running on single Virtualization Host Appliance. This appliance is based on a PowerEdge R710 server.

The PowerEdge R710 is designed with 125% more memory capacity and more integrated I/O than the previous generation PowerEdge 2950 III. This increased capacity is crucial for virtualization performance and scalability. The R710 allows for quick virtualization deployment with embedded hypervisors from leading vendors using a secure digital (SD) card or internal USB.

The PowerEdge R710 was identified as the best candidate for the DVS Simplified 1010 as it offers optimal CPU, Memory Network and Disk configuration capabilities for a locally hosted VDI infrastructure at a competitive price point.

Click [HERE](#) for more information on the R710 rack mount server.



PowerEdge R710
2x Intel Xeon X5675 Processor
96GB Memory
8x 146GB SAS 6Gbps 15k Disks - RAID10
PERC H700 Integrated RAID Controller
Embedded Broadcom 5709 GbE LOM with TCP/IP Engine (4 Port)
iDRAC6 Enterprise

4.2 Storage

Since VDI-in-a-Box only supports local storage, determining the correct size and type of disk is crucial. Please note that the storage requirements include an 8GB reservation for Citrix XenServer. This 8GB allocation is split across two 4GB partitions and is used by the XenServer host control domain (dom0). The following table details the methods by which to assume storage capacity:

Storage	Disk Space
---------	------------



Storage	Disk Space
Golden Desktop Images	2x Golden Image size
VM Storage	15% x Image size x #VMs
VDI-in-a-Box VM	70GB
Recommended Swap Space	100GB
Citrix XenServer 5.6.1 SP2	8GB

Also note that VDI-in-a-Box utilizes shared image 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%. In order 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. Note that XenServer must be configured to utilize thin provisioning in order to take advantage of this 85% storage reduction. Otherwise, each VM would require 100% of the disk space reservation used by the golden image. For example, if the golden image is 30GB and thin provisioning was not configured on XenServer, each VM would need at least 30GB of local storage space.

4.2.1 Disk Space Requirements

The VDI-in-a-Box kMGR virtual machine must be installed on each appliance. This requirement expands the storage necessity by approximately 170 GB per server since VDI-in-a-Box 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 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.

Drive Type	IOPS
7200 RPM SATA Hard Drive	75 IOPS
10k RPM SAS Hard Drive	150 IOPS
15k RPM SAS Hard Drive	200 IOPS



User Type	IOPS per User Type
Basic Workload	10 IOPS
Standard Workload	12 IOPS
Premium Workload	15 IOPS

4.2.2 Disk Space Requirement by Workload

Given these listed storage considerations, we can calculate the amount of storage required to house the 80, 60, and 36 desktop VM configurations. Using golden images that are the same size, it is straight forward to calculate the amount of storage required:

User Type	Storage Type	Space Requirements
Basic Workload	Golden Images	$2 \times 20\text{GB} \times 2 \text{ Golden Images} = 80 \text{ GB}$
	Virtual Machines	$15\% \times 20 \text{ GB} \times 80 \text{ VMs} = 240\text{GB}$
	Total Server Capacity	$80\text{GB} + 240\text{GB} + 100\text{GB}(\text{Swap}) + 70\text{GB}(\text{kMgr VM}) + 8\text{GB}(\text{XenServer}) = 498\text{GB per Server}$
Standard Workload	Golden Images	$2 \times 20\text{GB} \times 2 \text{ Golden Images} = 80\text{GB}$
	Virtual Machines	$15\% \times 20\text{GB} \times 60 \text{ VMs} = 180\text{GB}$
	Total Server Capacity	$80\text{GB} + 180\text{GB} + 100\text{GB}(\text{Swap}) + 70 \text{ GB}(\text{kMgr VM}) + 8\text{GB}(\text{XenServer}) = 438\text{GB per server}$
Premium Workload	Golden Images	$2 \times 20 \text{ GB} \times 2 \text{ Golden Images} = 80 \text{ GB}$
	Virtual Machines	$15\% \times 20\text{GB} \times 40 \text{ VMs} = 120\text{GB}$
	Total Server Capacity	$80\text{GB} + 120\text{GB} + 100\text{GB}(\text{Swap}) + 7 \text{ GB}(\text{kMgr VM}) + 8\text{GB}(\text{XenServer}) = 378\text{GB per server}$

4.2.3 Persistent vs. Shared Image Disk Space Planning

	Max number of Golden Images	Golden Image Size	Desktop Memory	Number of Shared Desktop Users
Basic	5	20 GB	1 GB	80
Standard	5	25 GB	1.5 GB	60
Premium	5	30 GB	2.5 GB	36



	Max number of Golden Images	Golden Image Size	Desktop Memory	Number of Persistent Desktop Users
Basic	5	20 GB	1 GB	30
Standard	5	25 GB	1.5 GB	20
Premium	5	30 GB	2.5 GB	14



4.3 Thin Client Recommendations

Wyse Thin Client devices and software provide superior security, reliability and energy efficiency when compared to a traditional PC. Wyse desktop devices and software help streamline the delivery of Citrix infrastructure to millions of users around the world. Thin Clients create a more secure environment that minimizes or eliminates exposure to data loss, viruses and malware. By utilizing thin clients as the access device for end user, deployments can benefit from centralized management and complete control of all endpoints. Since thin clients eliminate components with high failure rates, deployments can expect reduced costs and improved reliability over the life of a desktop virtualization deployment.

The Wyse T10 thin client has been tested with VDI-in-a-Box, and received the Citrix Ready™ certification. Citrix Ready™ is a product verification program that allows customers and users to quickly and easily find partner products and solutions that are trusted to enhance Citrix offerings.

[Wyse T10 thin client](#)



Overview

The best user experience. On a budget.

Wyse T-10 thin clients are compact, affordable and flexible entry level thin clients. They deliver the best Citrix VMware VDI user experience and performance to IT executives needing to equip their task workers with an enterprise standard client on a budget. Wyse T10 thin clients deliver this with an array of features found across the premium range of Wyse cloud clients.



Great to use. Great to manage.

Wyse T10 thin clients deliver an exceptional Citrix VDI user experience with unparalleled security, ease of use, and ease of management – on a budget. Users will find them easy to live with too, enjoying vibrant multimedia and Flash that plays in VDI, the power of their Marvell ARMADA™ PXA 510 v7 1.0 GHz system-on-chip (SoC) and the hands-off support provided by Wyse Automated Management capability.

No compromise performance boost.

The Wyse T10 features a Marvell ARMADA™ PXA 510 v7 1.0 GHz system-on-chip (SoC) delivering 150% better performance than the older 1.2GHz technology, over remote protocols like RDP. Coupled with its built-in hardware media processor the Wyse T10 delivers smooth multimedia, bi-directional audio and Flash playback performance.

Connects right out of the box.

Unlike other entry level budget clients, Wyse T10 thin clients arrive ready to connect to a huge array of environments and work seamlessly within Citrix, Microsoft and VMware environments. Users can enjoy two monitors using the DVI-I display option and high speed networking with support for Gigabit Ethernet and optional integrated b/g WiFi.

Saves budget. Saves the environment too.

Wyse T10 thin clients deliver great value from day one and will keep on doing so with a lower TCO than other solutions. All while delivering vital green credentials with its ENERGY STAR Version 5.0 and EPEAT compliance.

Specifications

Processors	Wyse T10: Marvell ARMADA™ PXA 510 v7 1.0 GHz system-on-chip (SoC)
Memory	T10 0GB Flash / 1GB RAM DDR3
I/O peripheral support	Four USB 2.0 ports One DVI-I port, DVI to VGA (DB-15) adapter included Dual display support with optional DVI-I to DVI-D plus VGA-monitor splitter cable (sold separately) Enhanced USB Keyboard with Windows Keys (104 keys) and PS/2 mouse port PS/2 Optical mouse included
Multimedia decoding	H.264, WMV9/VC1
Networking	RJ45 (10/100/1000Mbps) Factory options: Optional 802.11 b/g wireless support: WPA Personal, WPA2 Personal, WPA Enterprise, WPA2 Enterprise, WPA Enterprise Authentication support.
Display	Single: Up To 1920x1200@24bpp Dual: Up To 1920x1080@24bpp Hardware accelerated Monitor rotation support (L-Shaped Dual Monitors)



Audio	Output: 1/8-inch mini jack Input: 1/8-inch mini jack, 8 bit stereo microphone
Mountings	Stand for horizontal use and VESA/Wall mounting (included) or vertical feet (optional)
Device Security	Built-in Kensington security slot (cable sold separately)
	Physical characteristics Height: 1 inch (25mm) Width: 6.9 inches (177mm) Depth: 4.69 inches (119mm)
Shipping Weight	1.003 lbs (.455kg)
Power	Worldwide auto-sensing 100-240 VAC, 50/60 Hz. Energy Star V5.0 Phase V external and EuP compliant power adapter Average power usage with device connected to 1 keyboard with 1 PS/2 mouse and 1 monitor: Under 7.2 watts
Temperature Range	Operating: 32° to 104° F (10° to 40° C), horizontal and vertical positions Storage : 14° to 140° F (-10° to 60° C)
Humidity	20% to 80% condensing 10% to 95% non-condensing
	Safety Certifications German EMI-ITB 2000, ISO 9241-3/-8 cULus 60950, TÜV-GS, EN 60950 FCC Class B, CE, VCCI, C-Tick WEEE, RoHS Compliant Energy Star & EPEAT compliant
Warranty	Three-year hardware warranty

Click [HERE](#) for more information on the Wyse T10 thin client.



5 Software Components

5.1 Citrix XenServer 5.6.1 SP2

Citrix XenServer is a complete, managed server virtualization platform built on the powerful Xen hypervisor. Xen technology is widely acknowledged as the fastest and most secure virtualization software in the industry. XenServer is designed for efficient management of Windows® and Linux® virtual servers and delivers cost-effective server consolidation and business continuity.

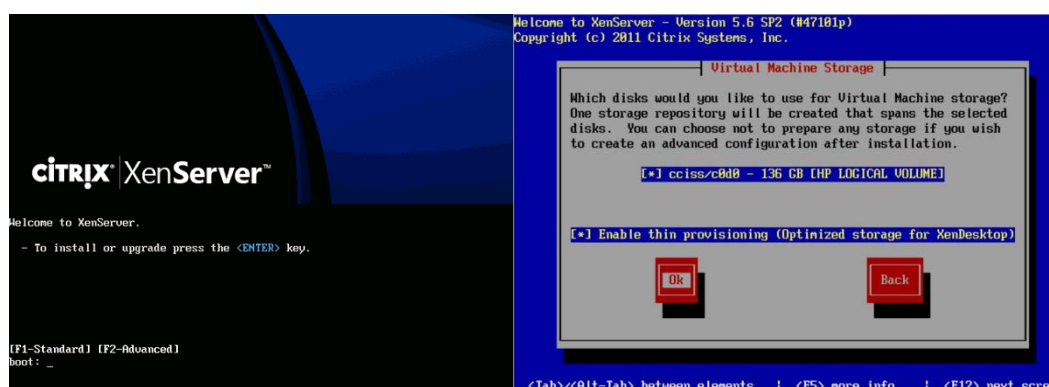
XenServer is the enterprise-ready, cloud-proven virtualization platform that contains all the capabilities required to create and manage a virtual infrastructure. It is trusted by demanding organizations to run the most mission critical applications and used by the largest clouds.

- Cuts costs. By reducing the number of physical servers required in the data center, organizations are able to save on their power and cooling costs.
- Increases IT agility and efficiency. Customers can easily adapt to changing data center and computing needs by dynamically flexing capacity, optimizing VM placement, and automating repetitive management tasks.
- Improves performance and user productivity. By enabling 'zero downtime' maintenance, automatically recovering from hardware failure, and providing failover capabilities in disaster situations, end users are ensured access to mission critical applications in all scenarios.

The free edition of XenServer starts with a 64-bit hypervisor and centralized management, live migration, and conversion tools to create a virtual platform that maximizes guest density and performance. The premium editions of XenServer extend the platform to enable organizations of any size to integrate and automate management processes, delivering a virtual data center solution.

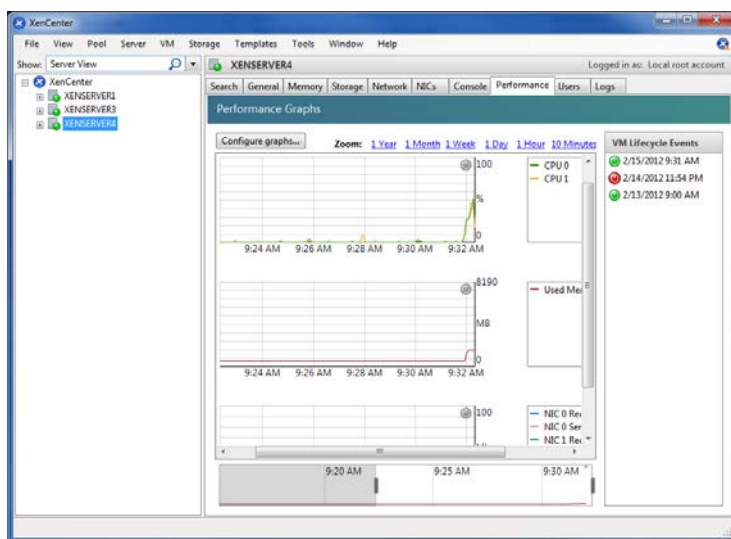
Click [HERE](#) for a Citrix XenServer product overview.

Click [HERE](#) for Citrix XenServer documentation and FAQ.



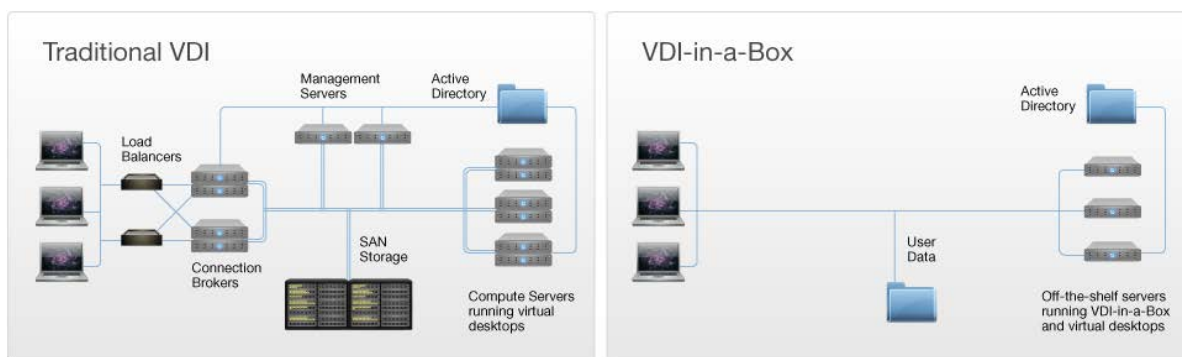
5.2 Citrix XenCenter 5.6 SP2

The DVS Simplified 1010 virtual machine environment provided by Citrix XenServer is monitored, managed and configured using Citrix XenCenter 5.6 SP2. Citrix XenCenter provides all the VM monitoring, management, and general administration functions in a single interface including configuration, patch management, and virtual machine libraries. A DVS Simplified 1010 administrator can easily manage hundreds of virtual machines from a centralized, highly available management console that installs on any Windows client desktop. Citrix XenCenter's highly resilient distributed management architecture leverages resource pooling to ensure that there is no single point of management failure.



5.3 Citrix VDI-in-a-Box 5.0

The DVS Simplified 1010 is based on Citrix's VDI-in-a-box solution. VDI-in-a-Box is an easy, affordable, all-in-one desktop virtualization solution that makes the benefits of desktop virtualization available to every business. VDI-in-a-Box is the virtualization solution that makes the benefits of desktop virtualization available to every business. Desktop administrators manage a grid of VDI-in-a-Box servers centrally with an intuitive wizard-driven interface that abstracts virtualization details. Automated policy-based management cuts desktop support costs.



Click [HERE](#) to learn more about Citrix VDI-in-a-Box.

5.4 Citrix Desktop Receiver

The Citrix Desktop Receiver is a client-based plug-in that is installed on the user's endpoint device. This is to be used in-conjunction with Citrix VDI-in-a-Box when the user requires the ability to interact with their local desktop as well as the virtual desktop. This package provides the toolbar functionality, allowing the user to pan and scale their virtual desktop inside their local desktop. When a user logs into a VDI-in-a-Box site to access a virtual desktop, the web site can detect that the Citrix Desktop Receiver is absent from endpoint devices, and automatically prompt users to download and install it from the site.

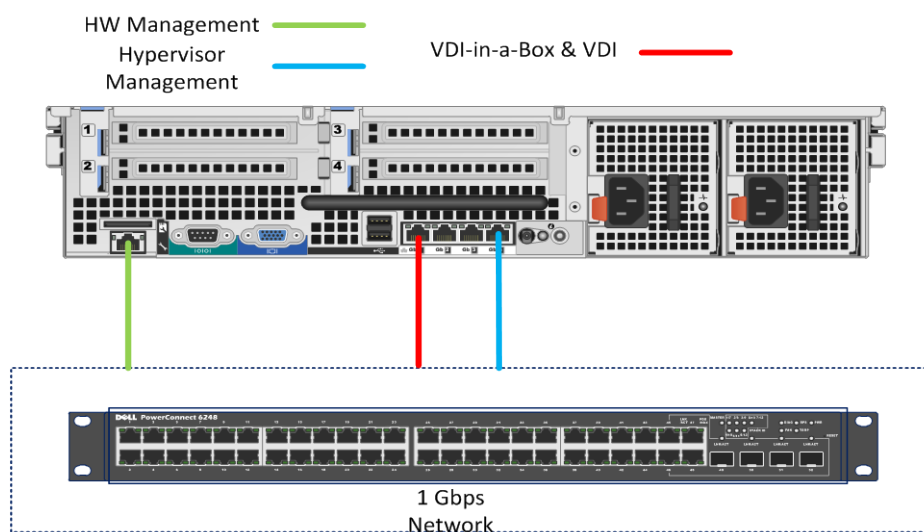
Click [HERE](#) for more information on the Citrix Desktop Receiver.

5.5 Windows Active Directory Integration

Active Directory is required for user authentication for desktops in the Windows Domain. You can use any read-only user account from AD to provide authentication. You may want to consider creating a separate account such 'VDIread' for this purpose. Active Directory is also not needed if the VDI desktops are part of a Workgroup. In this case you can maintain the list of users in the VDI-in-a-Box internal database.

5.6 Physical Network Connectivity

The network will comprise of single 1 Gbps network. The physical configuration of the network is shown below.



6 End-user Workload Characterization

It's important to understand the user workloads when designing a Desktop Virtualization Solution. The Dell Desktop Virtualization Solution methodology includes an optional Blueprint process to assess and categorize a customer's environment according to the workloads defined in this section. In the Dell Desktop Virtualization solution this will map directly to the SLA levels we offer in our Integrated Stack. There are three levels, each of which is bound by specific metrics and capabilities.

6.1 Characterization Overview

6.1.1 Basic Workload Characterization

The Basic User workload profile consists of simple task worker workloads. Typically a repetitive application use profile with a non-personalized virtual desktop image. Sample use cases may be a kiosk or call-center use cases which do not require a personalized desktop environment and the application stack is static. In a virtual desktop environment the image is dynamically created from a template for each user and returned to the desktop pool for reuse by other users. The workload requirements for a basic user is the lowest in terms of CPU, memory, network and Disk I/O requirements and will allow the greatest density and scalability of the infrastructure.

User Workload	VM Memory Allocation	VM Memory Reservation	User Data Disk Space	OS Image Notes
Basic	1GB	0.5GB	5GB	This user workload leverages a shared desktop image emulates a task worker. Only two apps are open simultaneously and session idle time is approximately one hour and forty-five minutes.

6.1.2 Standard Workload Characterization

The Standard User workload profile consists of email, typical office productivity applications and web browsing for research/training. There is minimal image personalization required in a standard user workload profile. The workload requirement for a Standard User is moderate and most closely matches the majority of office worker profiles in terms of CPU, memory, network and Disk I/O. This will allow moderate density and scalability of the infrastructure.

User	VM	VM	User Data	OS Image Notes
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Workload	Memory Allocation	Memory Reservation	Disk Space	
Standard	1.5GB	1GB	5GB	This user workload leverages a shared desktop image emulates a medium knowledge worker. Five applications are open simultaneously and session idle time is approximately 45 seconds.

6.1.3 Premium Workload Characterization

The Premium User workload is an advanced knowledge worker. All office applications are configured and utilized. The user has moderate-to-large file size (access, save, transfer requirements). There is some graphics creation or editing done for presentations or content creation tasks. Web browsing use is typically research/training driven, similar to Standard Users. The Premium User requires extensive image personalization, for shortcuts, macros, menu layouts etc. The workload requirements for a Premium User are heavier than typical office workers in terms of CPU, memory, Network and Disk I/O. This will limit density and scalability of the infrastructure.

User Workload	VM Memory Allocation	VM Memory Reservation	User Data Disk Space	OS Image Notes
Premium	2.5GB	1.5GB	5GB	This user workload leverages a shared desktop image emulates a high level knowledge worker. Eight applications are open simultaneously and session idle time is approximately two minutes.

6.2 Workload Characterization Testing Details

User Workload	VM Memory	OS Image	Workload Description
Basic	1GB	Shared	This workload emulates a task worker. - The light workload is very light in comparison to medium. - Only 2 apps are open simultaneously.



			• Only apps used are IE, Word and Outlook. • Idle time total is about 1:45 minutes
Standard	1.5GB	Shared	This workload emulates a medium knowledge working using Office, IE and PDF. • Once a session has been started the medium workload will repeat every 12 minutes. • During each loop the response time is measured every 2 minutes. • The medium workload opens up to 5 apps simultaneously. • The type rate is 160ms for each character. • Approximately 2 minutes of idle time is included to simulate real-world users. Each loop will open and use: • Outlook 2007, browse 10 messages. • Internet Explorer, one instance is left open (BBC.co.uk), one instance is browsed to Wired.com, Lonelyplanet.com and heavy flash app gettheglass.com. • Word 2007, one instance to measure response time, one instance to review and edit document. • Bullzip PDF Printer & Acrobat Reader, the word document is printed and reviewed to PDF. • Excel 2007, a very large randomized sheet is opened. • PowerPoint 2007, a presentation is reviewed and edited. • 7-zip: using the command line version the output of the session is zipped.
Premium	2.5GB	Shared	The heavy workload is based on the standard workload; the differences in comparison to the standard workload are: • Type rate is 130ms per character. • Idle time total is only 40 seconds. • The heavy workload opens up to 8 apps simultaneously



7 Solution Stack Functionality

7.1.1 Citrix TCP/UDP Port Communication

Component	Port	Notes
Citrix XenServer	TCP 80/443	Communication with XenServer infrastructure
VDI-in-a-Box VDI	TCP 1494/2598	Citrix ICA/HDX Client Communication
VDI-in-a-Box Web UI	TCP 80/443	VDI-in-a-Box Web UI for admin and user access

Click [HERE](#) for more information on VDI-in-a-Box and XenDesktop port communication.

7.2 Scaling and Sizing

The DVS Simplified 1010 solution is designed to start with as few as 50 virtual desktop users at the Basic workload. The base configuration can support to 80 basic users, and then scale up to a hundreds of users. This scaling-up of the stack is simple to accomplish and only requires increasing the number of Desktop Virtualization Host servers. It also provides the customer with several scalability increments along the way. Scaling details are below.

User Profile Type	Max Number of Golden Images*	Golden Image Size	Desktop Memory	Number of Users per Appliance w/o Persistent Desktops	Number of Users per Appliance with Persistent Desktops
Basic	5	20 GB	1 GB	80	30
	The Basic User workload profile consists of simple task worker workloads. Typically a repetitive application use profile. Sample use cases may be a kiosk or call-center use cases. The workload requirements for a basic user is the lowest in terms of CPU, memory, network and disk I/O requirements and will allow the greatest density and scalability of the infrastructure.				
Standard	5	25 GB	1.5 GB	60	20
	The Standard User workload profile consists of email, typical office productivity applications and web browsing for research/training. The workload requirement for a Standard User is moderate and most closely matches the majority of office worker profiles in terms of CPU, memory, network and disk I/O. This will allow moderate density and scalability of the infrastructure.				
Premium	5	30 GB	2.5 GB	36	14
	The Premium User workload is an advanced knowledge worker. All office applications are configured and utilized. The user has moderate-to-large file size (access, save, transfer requirements). There is some graphics creation or editing done for presentations or content creation tasks. Web browsing use is typically research/training driven, similar to Standard Users. The workload requirements for a Premium User are heavier than typical office workers in terms of CPU, memory, network and disk I/O. This will limit density and scalability of the infrastructure.				



Simplified 1010: Up to 80 Basic Users

Network



- Existing customer-provided 1GbE networking is leveraged in the DVS Simplified 1010 solution.

Mgmt. Compute



- 1 x R710 server

Storage

- Local Tier 1 storage is leveraged in the DVS Simplified 1010 solution

Simplified 1010 : Scaling to 80-500 Users

Network



Mgmt. Compute



- Add Up to 5 additional R710 servers depending on workload and scalability required.

Storage

8 Performance and Testing

8.1 Load Generation and Monitoring

8.1.1 Login VSI – Login Consultants

The Login VSI tool (developed by Login Consultants) was used to generate the desktop workloads. It is a widely-used tool for testing VDI environments and server-based computing / terminal services environments. It installs a standard collection of desktop application software (e.g. Microsoft Office, Adobe Acrobat Reader etc.) on each VDI desktop, it then uses launcher systems to connect a specified number of users to available desktops within the environment. Once the user is connected the workload is started via a logon script which starts the test script once the user environment is configured by the login script. Each launcher system can launch connections to a number of 'target' machines (i.e. VDI desktops) the launchers are managed via a Microsoft Management Console which is used to configure where the sessions are launched in parallel (sessions are created from each launcher in a round robin mechanism) or sequential (all sessions to be connected from each launcher are connected before the next launcher is used).

8.1.2 Liquidware Labs Stratusphere UX

Stratusphere UX was used during each test run to gather data relating to User Experience and desktop performance. Data was gathered at the Host and Virtual Machine layers and reported back to a central server (Stratusphere Hub). The hub was then used to create a series of "Comma Separated Values" (.csv) reports which have then been used to generate graphs and summary tables of key information. In addition the Stratusphere Hub generates a magic quadrate style scatter plot showing the Machine and IO experience of the sessions. The Stratusphere hub was deployed onto the core network therefore its monitoring did not impact the servers being tested. This core network represents an existing customer environment and also includes the following services;

- Active Directory
- DNS
- DHCP
- Anti-Virus

Stratusphere UX calculates the User Experience by monitoring key metrics within the Virtual Desktop environment, the metrics and their thresholds are shown in the following screen shot;



Machine Experience Indicators						
	Weight (%)	Good		Fair		Poor
Login Delay : Time it takes to login (sec.) 2	20	0	<= 15	<= 60	<=	unbounded
Application Load Time : Avg. startup time for applications (sec.) 2	20	0	<= 10	<= 30	<=	unbounded
CPU Queue Length : Length of CPU queue at inspection time 2	20	0	<= 3	<= 6	<=	unbounded
Page Faults : Number of page faults during inspection interval 2	20	0	<= 2,000	<= 10,000	<=	unbounded
Non-Responding Applications : Number of unresponsive applications at inspection time 2	20	0	<= 2	<= 3	<=	unbounded

I/O Experience Indicators						
	Weight (%)	Good		Fair		Poor
Disk Load : Avg. disk IO per second 2	25	0	<= 25	<= 75	<=	unbounded
Disk Queue Length : Avg. length of disk queue(s) 2	25	0	<= 1	<= 3	<=	unbounded
Network Latency : Avg. network roundtrip time (ms) 2	25	0	<= 150	<= 300	<=	unbounded
Failed Connections : Number of outgoing connection attempts that failed 2	25	0	<= 5	<= 15	<=	unbounded

8.2 Testing

8.2.1 Testing Methodology

The testing undertaken by the Dell DVS Engineering team was intended to provide a set of results that were as closely aligned with a production environment as possible within a lab based environment. In addition multiple runs for each workload were completed to allow the team to understand and record any performance differences within the environment.

Login VSI has two modes for launching user's sessions;

- Parallel
 - Sessions are launched from multiple launcher hosts in a round robin fashion; this mode is recommended by Login Consultants when running tests against multiple host servers. In parallel mode the VSI console is configured to launch a number of sessions over a specified time period (specified in seconds)
- Sequential
 - Sessions are launched from each launcher host in sequence, sessions are only started from a second host once all sessions have been launched on the first host, this is repeated for each launcher host. Sequential launching is recommended by Login Consultants when testing a single desktop host server. The VSI console is configured to launch a specified number of session at a specified interval specified in seconds

All test runs were conducted using the Login VSI "Parallel Launch" mode, all sessions were launched over an hour to try and represent the typical 9am logon storm. Once the last user session has connected, the sessions are left to run for 15 minutes prior to the sessions being instructed to logout at the end of the current task sequence, this allows every user to complete a minimum of two task sequences within the run before logging out. The single server test runs were configured to launch user sessions every 60 seconds, as with the full bundle test runs sessions were left to run for 15 minutes after the last user connected prior to the sessions being instructed to log out.

8.2.2 User Workloads

The solution has been tested against three different workloads;



- Basic
- Standard
- Premium

The tasks undertaken by the users in each of the workloads are outlined below;

- Basic Workload
 - This workload emulates a task worker
 - The light workload is very light in comparison to medium
 - Only 2 apps are open simultaneously
 - Only apps used are IE, Word and Outlook
 - Idle time total is about 1:45 minutes
- Standard Workload
 - This workload emulates a medium knowledge working using Office, IE and PDF. Once a session has been started the medium workload will repeat every 12 minutes. During each loop the response time is measured every 2 minutes. The medium workload opens up to 5 apps simultaneously. The type rate is 160 ms for each character. Approximately 2 minutes of idle time is included to simulate real-world users.
 - Each loop will open and use:
 - Outlook 2007, browse 10 messages.
 - Internet Explorer, one instance is left open (BBC.co.uk), one instance is navigated to Wired.com, Lonelyplanet.com and heavy flash app gettheglass.com.
 - Word 2007, one instance to measure response time, one instance to review and edit document.
 - Bullzip PDF Printer & Acrobat Reader, the word document is printed and reviewed to PDF.
 - Excel 2007, a very large randomized sheet is opened.
 - PowerPoint 2007, a presentation is reviewed and edited.
 - 7-zip: using the command line version the output of the session is zipped.
- Premium Workload
 - The heavy workload is based on the medium workload; the differences in comparison to the medium workload are:
 - Type rate is 130 ms per character.
 - Idle time total is only 40 seconds.

The heavy workload opens up to 8 apps simultaneously



8.3 Testing Summary

8.3.1 End User Experience Testing Summary

The Stratusphere UX by User data shows that for almost all the tests 100% of users were rated as having a Good Users experience and those users which had a fair user experience were only just outside the Good category. It should be noted that total number of users for each test run typically exceeds the number of desktops available, the reason for this is that the Dell team found it was necessary to configure the Login VSI tool to launch more sessions than were actually needed since there is always a percentage of the users that fail to fully connect in every run, this is something that was noted by Login Consultants in their documentation.

VDI UX is based on the following 9 metrics:

- User login
- Application load time
- CPU Queue
- Page faults
- Disk IOPS
- Disk Queue
- Network latency
- Non responding applications
- Incomplete connection

Each time the ConnectorID(CID) in the VDI sessions sends a report, Stratusphere associates a VDI UX score to the machine and the user logged in at the time.

The final VDI UX label (good/fair/poor) associated with a user or a machine in a report is calculated based on all the VDI UX ratings observed during that time period, not on the individual average metrics observed during that time period. This explains why a single user could be labeled as fair while no average for the 9 metrics used to calculate VDI UX is above the “Good” VDI UX profile. This can be the case when usage is calculated over short period of time and when observed metrics are close to the threshold.

VDI UX classification for a time period is compiled based on the VDI UX ratings received for each CID (agent) report. So a few peaks could move a user overall rating from good to fair although the average values observed for that same time period are below the fair threshold.

Good VDI Performance - By
User



	Average Login Duration	Average App Load Time	Average CPU %	Average Memory (MB)	Average Graphics Intensity	Average Disk IOPS	Average Network I/O (KB/s)	Total ANR
Averages	29.2	45.75	4.84%	734.71	32.34	7.82	3.72	0
Maximum	48	99.57	6.31%	806.03	57.11	18.09	6.14	0
Minimum	19	15.00	3.54%	684.84	20.03	1.83	0.68	0

8.4 Testing Results

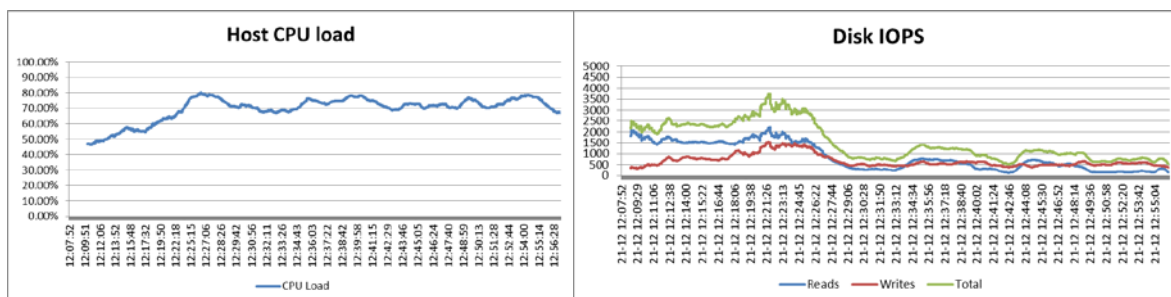
8.4.1 DVS Simplified 1010 – 80 Basic Users

Good VDI Performance - By Machine

Fair VDI Performance - By User								
	Average Login Duration	Average App Load Time	Average CPU %	Average Memory (MB)	Average Graphics Intensity	Average Disk IOPS	Average Network I/O (KB/s)	Total ANR
Averages	30.33	46.93	5.93%	740.52	29.06	18.83	5.33	0.00
Maximum	44	71	11.87%	822.29	64.48	55.39	14	0
Minimum	23	15	3.80%	662.28	4.3	5.58	0.65	0

	Average CPU %	Average CPU Queue	Average Context Switches (s)	Average Memory (MB)	Average Graphics Intensity	Average Disk IOPS	Average Disk Queue	Average Network I/O (KB/s)	Machine ANR
Averages	4.89%	3.88	1334.58	737.10	33.05	7.64	0.01	3.99	0.00
Maximum	6.31%	5.49	5215.00	806.03	57.11	18.09	0.21	6.14	0.00
Minimum	3.86%	3.09	979.00	684.84	20.03	1.83	0.00	0.68	0.00





8.4.2 DVS Simplified 1010 – 60 Standard Users

Good VDI UX – By Machine									
	Average CPU %	Average CPU Queue	Average Context Switches (s)	Average Memory (MB)	Machine Page Faults	Average Graphics Intensity	Average Disk IOPS	Average Network I/O (KB/s)	Machine ANR
Averages	5.03%	4.03	1,165.88	769.87	20,665.60	27.42	9.32	20.05	0.00
Maximum	12.71%	6.35	1,463.00	846.71	232,531.00	53.39	15.94	38.24	0.00
Minimum	2.66%	2.82	747.00	663.63	2,878.00	4.29	3.98	2.48	0.00

Good VDI Performance - By User

Fair VDI Performance - By Machine									
	Average CPU %	Average CPU Queue	Average Context Switches (s)	Average Memory (MB)	Average Graphics Intensity	Average Disk IOPS	Average Disk Queue	Average Network I/O (KB/s)	Machine ANR
Averages	5.29%	4.72	1600.19	741.59	32.55	12.65	0.08	4.18	0.00
Maximum	6.59%	6.01	5479.00	806.22	57.26	19.74	0.32	7.31	0.00
Minimum	3.80%	3.24	1009.00	691.36	20.88	1.50	0.00	0.65	0.00



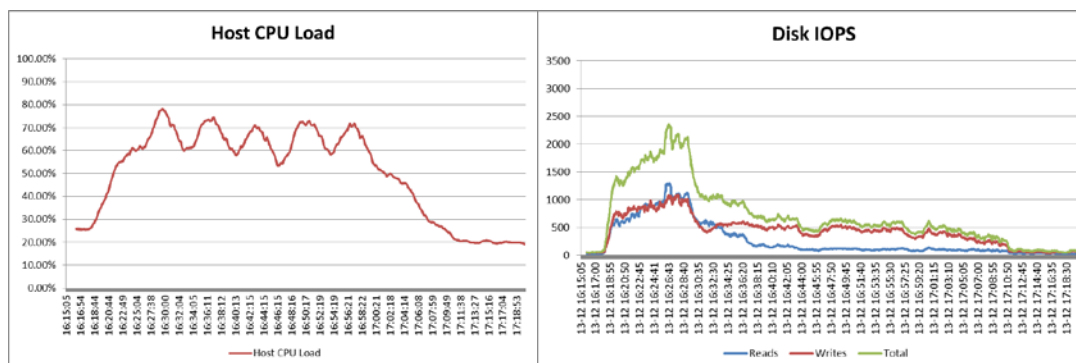
	Average Login Duration	Average App Load Time	Average CPU %	Average Memory (MB)	Average Graphics Intensity	Average Disk IOPS	Average Network I/O (KB/s)	Total ANR
Averages	8.48	64.08	4.64%	766.13	26.763	8.7274	20.32	0
Maximum	15	147.5	7.19%	856.42	58.69	33.19	84	0
Minimum	5	30	2.03%	656.82	4.27	0.73	0	0

Fair VDI UX - By Machine

	Average CPU %	Average CPU Queue	Average Context Switches (s)	Average Memory (MB)	Machine Page Faults	Average Graphics Intensity	Average Disk IOPS	Average Network I/O (KB/s)	Machine ANR
Averages	4.88%	5.11	1165.91	755.92	15693.73	22.44	11.73	25.98	0.00
Maximum	5.66%	5.98	1328.00	811.69	23857.00	37.13	17.03	38.14	0.00
Minimum	4.04%	4.64	925.00	707.59	9564.00	4.29	9.81	15.20	0.00

Fair VDI Performance - By User

	Average Login Duration	Average App Load Time	Average CPU %	Average Memory (MB)	Average Graphics Intensity	Average Disk IOPS	Average Network I/O (KB/s)	Total ANR
Averages	9.7273	72.62	6.14%	751.5	12.727	17.928	43.582	0
Maximum	17	93.33	7.83%	811.69	37.13	31.05	81	0
Minimum	7	42.25	4.04%	696.69	4.3	4.78	4	0



8.4.3 DVS Simplified 1010 – 36 Premium Users

Good VDI Performance - By Machine



	Average CPU %	Average CPU Queue	Average Context Switches (s)	Average Memory (MB)	Machine Page Faults	Average Graphics Intensity	Average Disk IOPS	Average Network I/O (KB/s)	Machine ANR
Averages	3.36%	3.51	1094.81	823.78	16357.03	28.31	4.97	15.93	0.00
Maximum	7.06%	4.85	2224.00	1006.00	146388.00	108.73	8.07	65.50	0.00
Minimum	1.77%	2.00	696.00	737.54	2626.00	4.29	0.61	0.00	0.00

Good VDI Performance - By User

	Average Login Duration	Average App Load Time	Average CPU %	Average Memory (MB)	Average Graphics Intensity	Average Disk IOPS	Average Network I/O (KB/s)	Total ANR
Averages	5.6111	58.062	3.19%	801.33	13.189	6.2971	12.245	0
Maximum	7	109	6.11%	932.63	43.66	23.85	84	0
Minimum	4	38.75	1.76%	737.54	4.28	0.61	0	0

Fair VDI Performance - By Machine

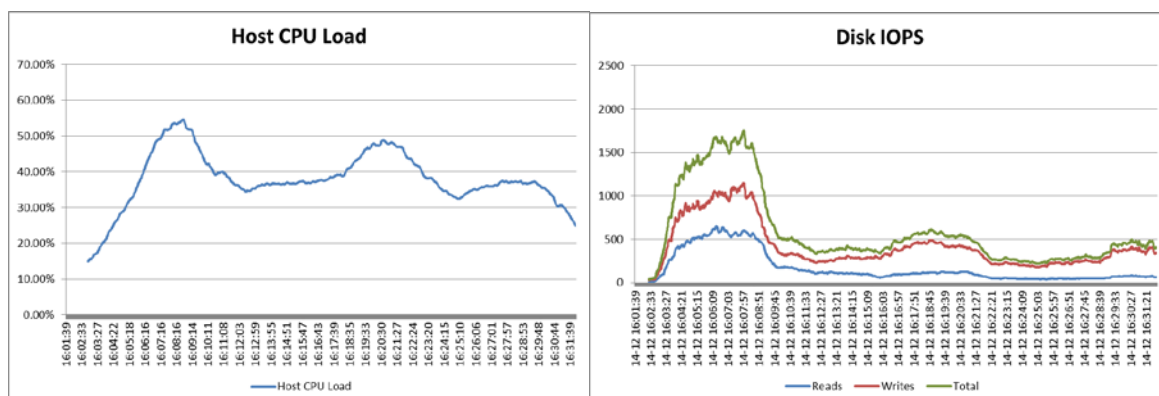
	Average CPU %	Average CPU Queue	Average Context Switches (s)	Average Memory (MB)	Machine Page Faults	Average Graphics Intensity	Average Disk IOPS	Average Network I/O (KB/s)	Machine ANR
Averages	3.62%	5.27	1051.00	854.15	14047.00	37.63	7.23	13.67	0.00
Maximum	3.86%	5.56	1082.00	856.22	16950.00	41.00	7.47	14.38	0.00
Minimum	3.37%	4.97	1020.00	852.07	11144.00	34.25	6.99	12.96	0.00

Fair VDI Performance - By User

	Average Login Duration	Average App Load Time	Average CPU %	Average Memory (MB)	Average Graphics Intensity	Average Disk IOPS	Average Network I/O (KB/s)	Total ANR
Averages	5.3333	54.805	4.67%	883.3	21.994	14.438	38.875	0
Maximum	6	84.75	6.15%	926.76	41.72	25.24	85	0



Minimum	4	40.67	3.30%	834.22	4.3	3.02	10	0
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9 High Availability

9.1 DVS Simplified 1010 Resiliency

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. These multiple grid servers can be linked together to automatically provide this high availability as well as the brokering and load management of all the connections across the grid.

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. To avoid data loss, network file sharing is recommended. Additionally, in instances where data is mission critical, additional HA protection solutions may be implemented.

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.



10 Customer Provided Stack Components

10.1 Customer Provided Switching Requirements

When a customer provides his or her own rack network switching solution for a DVS Simplified 1010-based solution, the following minimum hardware requirements must be met.

Feature	Minimum Requirement	Notes
Switching Capacity	180Gbps	
10Gbps Ports	None Required	The DVS Simplified 1010 solution is based on 1Gbps network connectivity.
1Gbps Ports	1x for Hypervisor Management 1x for Hardware Management 1x for Virtual Desktop Access	
VLAN Support	IEEE 802.1Q tagging and port-based VLAN support.	
Stacking Capability	Optional	



11 Conclusion

Dell's Desktop Virtualization Solutions Simplified (DVS Simplified) Solution is a simple, practical VDI Appliance designed specifically to address the business and technical needs for mid-sized virtual desktop deployments so you can unlock innovation in the Virtual Era. The appliance integrates pre-configured hardware with factory installed software simplifying implementation and accelerating your time to value. The Dell Team is with customers every step of the way to ensure extremely high levels of performance that meet or exceed end users legacy desktop experience. Your Dell sales representative will help you work through any remaining questions or provide any additional information.



12 Acknowledgements

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