Dell Wyse Datacenter for Citrix XenDesktop and ATLANTIS ILIO Whitepaper

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Phase 1
Version 1.4

Contents

1 Introduction

1.1 Purpose

The purpose of this white paper is to introduce the Atlantis ILIO® software solution from Atlantis Computing that integrates with Dell Wyse Datacenter for Citrix XenDesktop to provide a compelling persistent high IOPS VDI solution. The solution architecture, software and hardware components will be discussed. We will also present the test results of this technology and its benefits in a VDI environment.

1.2 Atlantis ILIO Storage Optimization Overview

Atlantis ILIO is a VDI storage and performance optimization software solution that integrates with Dell Wyse Datacenter for Citrix XenDesktop to optimize Tier 1 storage utilization, boost desktop performance, and enable large, highly scalable VDI deployments. Atlantis ILIO is a unique and innovative storage optimization technology that fundamentally changes the economics and performance characteristics of VDI by intelligently optimizing how virtual machines interact with storage systems.

2 Executive Summary

This document describes the deployment architecture for Dell Wyse Datacenter for Citrix XenDesktop that is designed to provide virtual desktop environments that allow for highly resource-intensive desktops and applications for fully persistent virtual desktops. The architecture extends the standard Dell Wyse Datacenter for Citrix XenDesktop architecture with the Atlantis ILIO storage optimization solution from Atlantis Computing®. The architecture has been validated in the Dell test labs by running various industry-standard testing tools, such as Login VSI.

Atlantis ILIO simplifies virtual desktop deployments by reducing the necessary amount of Tier 1 storage by up to 95%, allowing VDI environments to scale much further while using less storage. The Atlantis ILIO In-Memory Storage™ technology allows the virtual desktops to use Dell Server RAM as primary storage, providing an excellent user experience.

Additionally, Atlantis ILIO provides powerful automated deployment and desktop provisioning capabilities that allow companies to easily deploy VDI projects at large scale and provide High Availability and Disaster Recovery capabilities.

Solution Components

- Atlantis ILIO Storage Optimization Software
- Citrix XenDesktop 7.1
- Dell R720 12G Servers
- Dell Force10 and PowerConnect networking switches
- Dell EqualLogic PS6100E storage

Summary of Benefits

- Integrates with both existing or newly deployed Dell Storage
- Dramatically increase IOPS and desktop performance required by VDI
- Cuts cost and complexity by reducing Tier 1 storage requirements by up to 95%
- Creates an extremely scalable VDI environment
- Best fit for situations where high IOPS and scalability are critical requirements
- Provides deployment automation and virtual desktop provisioning capabilities to rapidly deploy large virtual desktop configurations

Solution Test Results Summary

Dell Wyse Datacenter for Citrix XenDesktop with Atlantis ILIO	
Number of Desktops	500 (persistent)
Dell EqualLogic Tier 2 Storage Capacity used ***(per desktop)***	0.18 GB per desktop
Available IOPS per desktop	489 IOPS with 0.43ms latency
Boot storm duration (75 desktops)	2 minutes 50 seconds
Shared Storage IOPS reduction	96%

3 Solution Architecture Overview

3.1 Solution Components

The Dell and Atlantis Computing VDI solution consists of the following components:

Desktop Virtualization Broker – The architecture described in this implementation guide is agnostic to which VDI broker is used to connect users to their persistent virtual desktop. Testing was done with Citrix XenDesktop 7.1

Hypervisor – The architecture was tested using VMware vSphere 5.5, but the customer may choose a different preferred hypervisor on which to run the persistent virtual desktops on.

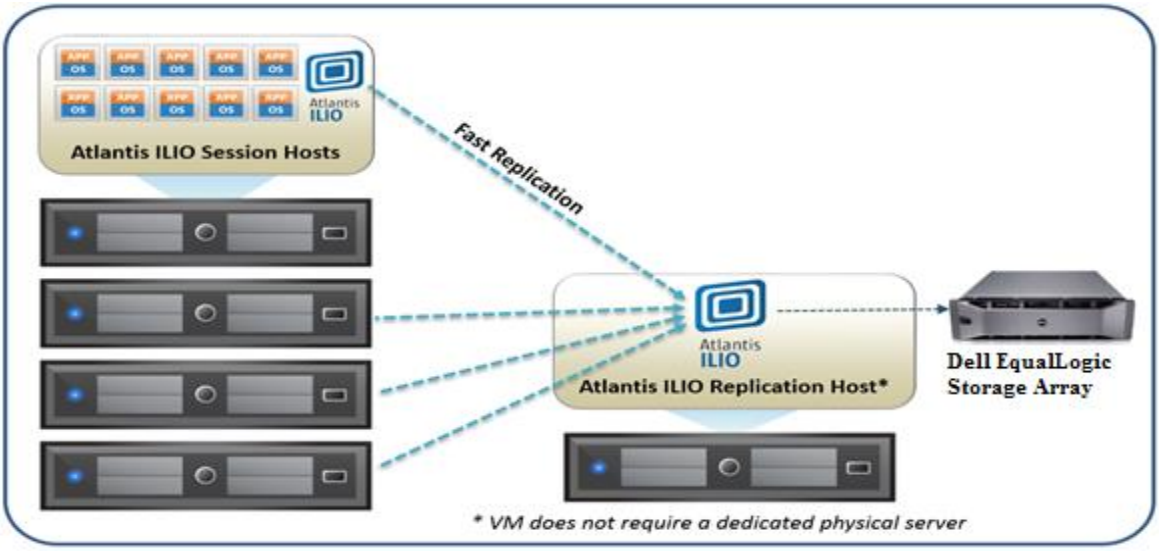
Storage Optimization Solution – Atlantis ILIO provides application analysis, IO processing, inline deduplication and compression of persistent virtual desktops at the host level to terminate unnecessary IO operations before reaching the storage system, increasing storage scalability and reducing storage network traffic.

Dell Hardware – The server, storage and networking components used are discussed in section 4.

3.2 Atlantis ILIO Introduction

Atlantis ILIO In-Memory Storage technology is a software product that employs host-based IO optimization technology to handle read and write IO's at memory speeds. Through a combination of patent-pending technologies, Atlantis ILIO helps reduce the IO and storage capacity requirements for VDI deployments of any scale. The Dell EqualLogic Storage Array with Atlantis ILIO delivers a cost-effective storage architecture for persistent virtual desktops that would normally consume 30-80GB using as little as 1.5GB of Dell EqualLogic storage per desktop.

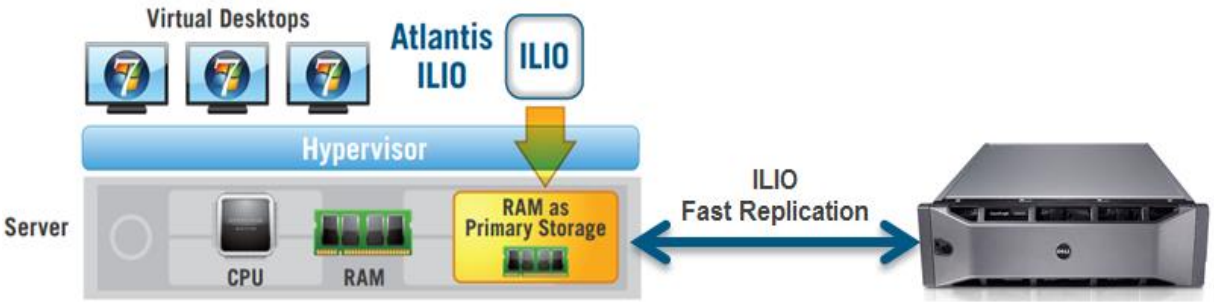
Atlantis ILIO In-Memory Storage technology places all primary storage in server RAM, with only a very small amount of external shared storage required to store the optimized persistent virtual desktop images. Atlantis ILIO deploys as a dedicated virtual machine on each host, presenting a conventional NFS Datastore that all the virtual desktops on that host use. This makes Atlantis ILIO deployment transparent, preserving administrative processes and procedures that may already be in place.



As storage traffic enters the Atlantis ILIO VM, it is analyzed, deduplicated, and compressed in-Memory. Next, the Atlantis ILIO Replication Host consolidates the storage traffic across all Session Hosts in the Session Cluster. Finally, the highly optimized IO is written to the Dell EqualLogic storage array.

This end-to-end Atlantis ILIO and Dell EqualLogic IO operation occurs at wire speed without impacting Atlantis ILIO's ability to service IO at server RAM speeds.

The Atlantis ILIO storage optimization technologies used include content-aware IO optimization, in-line deduplication, wire-speed compression, real-time write coalescing, and Fast Replication.



3.2.1 Atlantis ILIO Storage Optimization Technologies

The Atlantis ILIO storage optimization technologies include content-aware IO optimization, in-line deduplication, wire-speed compression, real-time write coalescing, and Fast Replication.

Content-Aware IO Optimization

The Atlantis ILIO content-aware IO optimization engine focuses on the minimization of IO and the resulting operations on backend storage. In Windows NTFS (and other file system environments), a lot of the IO generated is transient. Atlantis ILIO uses its intelligence to differentiate between transient and stateful operations that require shared storage. When IO enters the Atlantis ILIO VM and is processed, transient IO is processed at the hypervisor host layer itself, while stateful IO is deduplicated and compressed before being sent to the Dell EqualLogic storage array. This reduces the amount of IO going to shared storage, thereby helping reduce storage cost per desktop. The data integrity is maintained throughout this process.

In-line Deduplication

With virtual desktop infrastructure, most VMs have a significant amount of redundant data. Atlantis ILIO efficiently identifies redundancies in the data stream across each hypervisor, and deduplicates data at the block level in-line in real time at the host level.

Wire-Speed Compression

Atlantis ILIO applies compression, which is applied to the deduplicated IO stream before it is written to server memory. Atlantis ILIO uses an enhanced, patent-pending implementation that performs the compression out of band, significantly reducing IO latency typically added by compression. Atlantis ILIO performs all compression in real time at wire speeds to provide its space-saving benefits, while at the same time significantly improving overall desktop performance relative to physical PCs. When operating together, the in-line deduplication and wire-speed compression can help reduce the size of a persistent virtual desktop by up to 95%.

Real-Time Write Coalescing

With real-time write coalescing, small block random IO writes that are so common in virtual desktop IO are re-ordered into a much more sequential stream of large block IO writes. In concept, this is very similar to the IO optimizations that the Windows desktop OS performs but the difference is that Atlantis ILIO performs it at the level of the entire host, not individual desktop images. This coalescing will undo the fragmentation that typically happens at the hypervisor layer, commonly called the 'IO Blender Effect'.

Fast Replication

Atlantis ILIO Fast Replication is the protocol that provides the backup and recovery of persistent virtual desktops. Unique deduplicated data in each virtual desktop on a host is mirrored to an Atlantis ILIO instance running in a "Replication Host". The Replication Host is on the same LAN as the physical hosts and has a dedicated ILIO VM acting as the replication target. While this unique data does traverse the LAN, there is very little of it—generally only about 5% of the IO for a given desktop image is unique. The writes occur on the Replication Host and are acknowledged back to the physical host at memory speeds. Writes on the Replication Host then are immediately but asynchronously committed to network storage (SAN/NAS). Duplicated data is never replicated to the Replication Host, saving significantly on network bandwidth with virtual desktop workloads. Fast Replication maintains a consistent, recoverable copy of the designated desktops on this shared storage without impacting the blazing performance that Atlantis ILIO delivers.

Desktop Provisioning with Atlantis ILIO Fast Clone

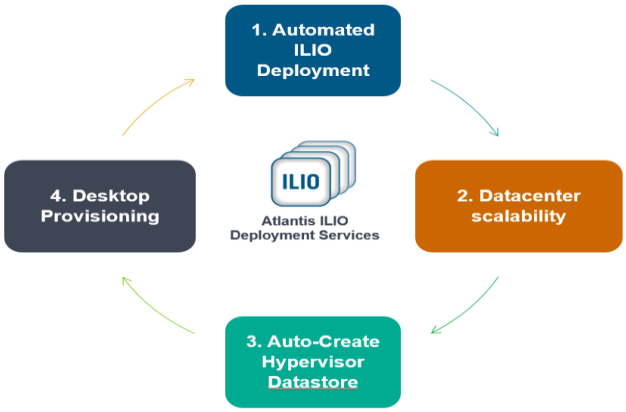
Atlantis ILIO Fast Clone provisions full, independent virtual desktops in as little as 4 seconds without network or storage traffic. Fast Clone operations are parallelized across multiple servers in a datacenter, enabling customers to provision thousands of desktops in as little as 10 minutes.

High Availability and Disaster Recovery

Atlantis ILIO Persistent VDI seamlessly integrates with the High Availability (HA) capabilities of the virtual desktop hypervisor to provide fully automated recovery and bring back all affected desktops when a server or rack encounters a failure. In addition, Atlantis ILIO enables highly efficient Disaster Recovery (DR) for all your virtual desktops across data centers as it minimizes the amount of data that needs to be replicated.

Automated VDI Deployments with Atlantis ILIO

Atlantis ILIO provides push-button, fully automated deployment, configuration, sizing, and datastore creation for thousands of persistent virtual desktops across multiple racks of servers. Atlantis ILIO virtual machines are automatically created and registered as NFS data stores that are ready to use by VDI broker to complete the desktop provisioning process.

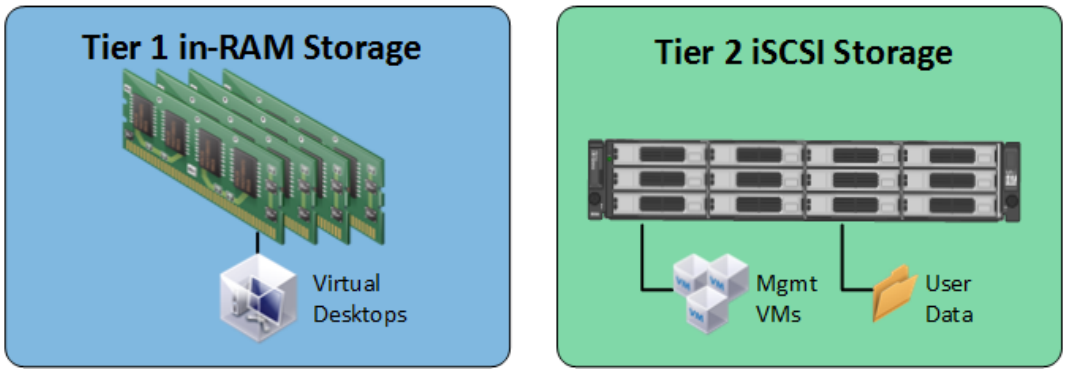


4 Hardware Components

4.1 EqualLogic Dell Storage

Built on an advanced, peer storage architecture, EqualLogic storage simplifies the deployment and administration of consolidated storage environments. Ideal for your growing storage needs, the PS6100E iSCSI array is part of the Dell Storage portfolio that offers a virtualized architecture, enterprise software and easy administration at an affordable price.

All VDI desktops execute from compute host RAM functioning as Tier 1, while all infrastructure management and user data executes from shared Tier 2 on the EqualLogic PS6100E.



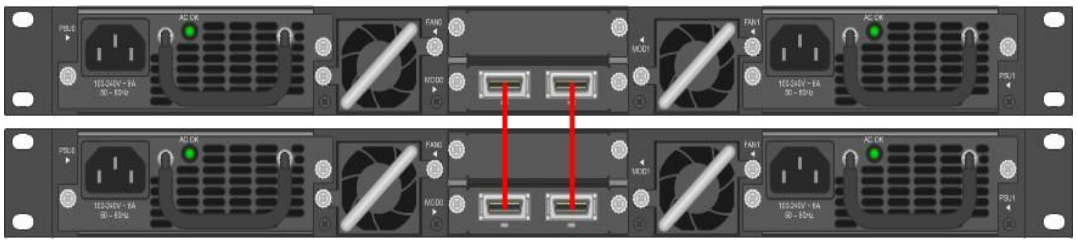
4.2 Dell Servers

The rack server platform for the Dell Wyse Datacenter for Citrix XenDesktop solution is the best-in-class Dell PowerEdge R720 (12G). This dual socket CPU platform runs the fastest Intel Xeon E5-2600 family of processors, can host up to 768GB RAM, and supports up to 16 2.5" SAS disks. The Dell PowerEdge R720 offers uncompromising performance and scalability in a 2U form factor. For more information please visit: Link

The blade server platform for the Dell Wyse Datacenter for Citrix XenDesktop solution is the PowerEdge M620. This half-height blade server is a feature-rich, dual-processor platform that offers a blend of density, performance, efficiency and scalability. The M620 offers remarkable computational density, scaling up to 24 cores, 2 socket Intel Xeon processors and 24 DIMMs (768GB RAM) of DDR3 memory in an extremely compact half-height blade form factor. This solution was not tested but is in theory, a viable solution. For more information please visit: Link

4.3 Dell Networking

The Dell Force10 S-Series S55, Force10 S60, Force10 S4810 and PowerConnect M6348 are the recommended switches for deploying the Dell Citrix VDI solution in an iSCSI storage environment. Brocade 6510 and M5424 are the recommended switches for deploying the Dell Citrix VDI solution in a Fiber Channel storage environment.



The Dell Force10, PowerConnect and Brocade switches are recommended for Dell Wyse Datacenter for Citrix XenDesktop deployments of 6000 users or less. For over 6000 users, you can stack them with additional switches. For a bursty network, the Dell Force10 S-Series S60 is recommended since it is equipped with the industry's largest packet buffer (1.25 GB), enabling it to deliver lower application latency and maintain predictable network performance even when faced with significant spikes in network traffic. If you have applications that require 10 Gb/s speeds, the Force10 S4810 is recommended.

5 Software Components

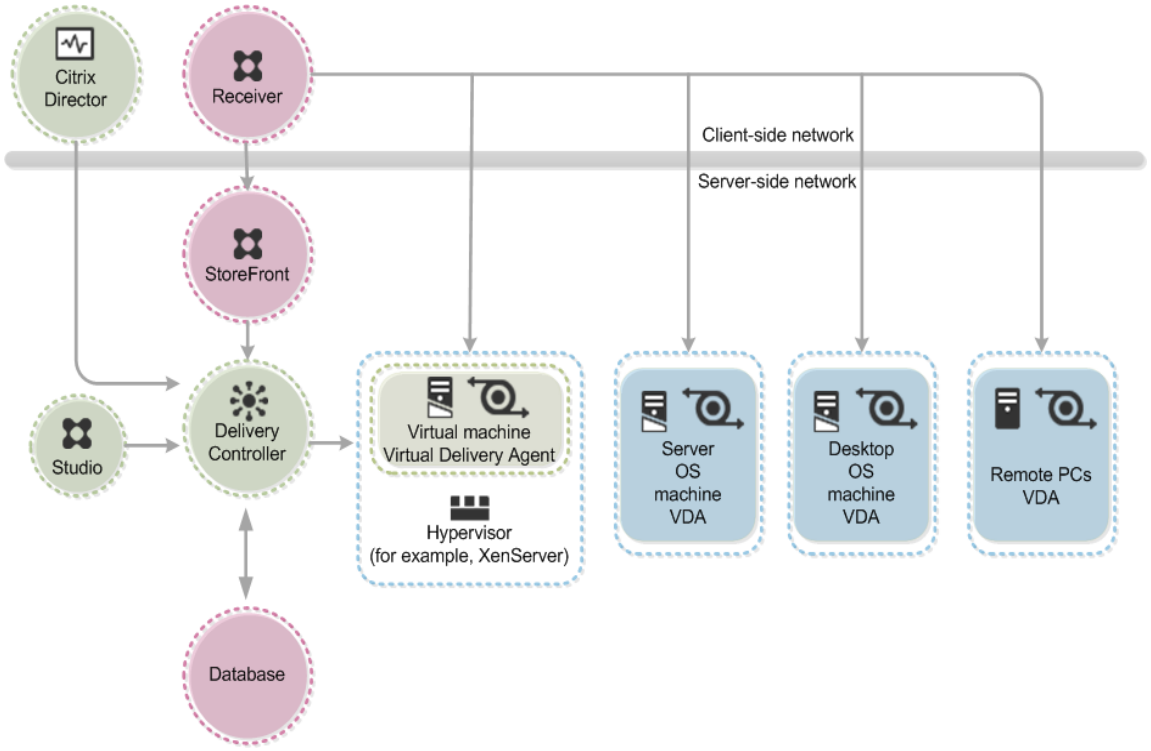
5.1 Citrix XenDesktop

The solution is based on Citrix XenDesktop 7.1 which provides a complete end-to-end solution delivering Microsoft Windows virtual desktops or server-based hosted shared sessions to users on a wide variety of endpoint devices. Virtual desktops are dynamically assembled on demand, providing users with pristine, yet personalized, desktops each time they log on.

Citrix XenDesktop provides a complete virtual desktop delivery system by integrating several distributed components with advanced configuration tools that simplify the creation and real-time management of the virtual desktop infrastructure.

5.1.1 Machine Creation Services (MCS)

Citrix Machine Creation Services is the native provisioning mechanism within Citrix XenDesktop for virtual desktop image creation and management. Machine Creation Services uses the hypervisor APIs to create, start, stop, and delete virtual desktop images.



6 Solution Performance and Testing

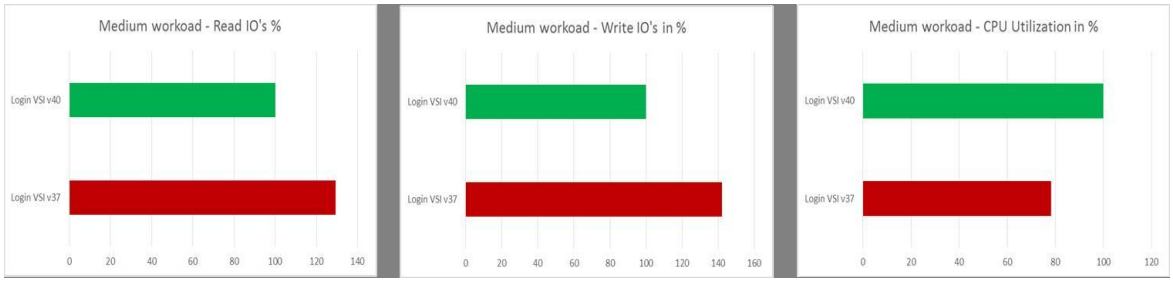
6.1 Load Generation and Monitoring

6.1.1 Login VSI 4 – Login VSI, Inc.

Login VSI is the de-facto industry standard 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) 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), with the launchers being managed by a centralized management console, which is used to configure and manage the Login VSI environment.

Login VSI 4.0 uses the parallel method of launching user sessions: Parallel Sessions are launched from multiple launcher hosts in a round robin fashion; this mode is recommended by Login VSI, Inc. 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)

It is important to note that there are some performance changes between VSI 3.7 and 4.0, namely desktop read/write IO has decreased a bit while CPU utilization has increased in 4.0.



For more information, please visit the http://www.loginvsi.com website.

6.2 Testing and Validation

6.2.1 Testing Process

The purpose of the single server testing is to validate the architectural assumptions made around the server stack. Single server testing was performed, and its test results were extrapolated to validate the architectural design of the virtual desktop deployment. Each user load is tested against 4 runs. A pilot run to validate that the infrastructure is functioning and valid data can be captured and 3 subsequent runs allowing correlation of data. Summary of the test results will be listed out in the below mentioned tabular format.

At different stages of the testing the testing team will complete some manual "User Experience" Testing while the environment is under load. This will involve a team member logging into a session during the run and completing tasks similar to the User Workload description. While this experience will be subjective, it will help provide a better understanding of the end user

experience of the desktop sessions, particularly under high load, and ensure that the data gathered is reliable.

Login VSI 4.0 uses the parallel method of launching user sessions: Parallel Sessions are launched from multiple launcher hosts in a round robin fashion; this mode is recommended by Login VSI, Inc. 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)

All test runs which involved the 6 desktop hosts 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.

6.3 Scalability

The tests in this Whitepaper were performed on a set of two servers, one as the VDI host and the second server hosting the Atlantis ILIO Replication Host. The local resource utilization on the VDI host, such as CPU and memory, will in general be very similar on any VDI server in the desktop deployment, especially when measured during the execution of a standardized testing tool such as Iometer or Login VSI. The main bottlenecks of any VDI deployment are the resources that are shared between the VDI hosts, such as the network connections and the storage system that provides the storage for the virtual desktop instances.

To validate that the solution can scale to 500 users without impacting user experience, we have calculated the performance requirements that the combination of Atlantis ILIO and Dell Equallogic need to fulfill at a scale of 500 users, based on the performance numbers we have measured at 75 users. When subjected to an Iometer test using a workload with these characteristics, the EqualLogic array provided 1,934 front-end IOPS (i.e. net IOPS. At the physical disk level, more IOPS are generated because of the RAID write penalty.).

The test results in section 7.1.4 and 7.1.5 show a maximum number of IOPS of 249 required for 75 desktops measured at the front-end of the Dell EqualLogic storage array. Scaling the virtual desktop deployment to 500 users would require a peak number of 1,660 IOPS (249 / 75 * 500) to be delivered by the Dell EqualLogic array. Since the Iometer result shows an available number of 1,934 IOPS, we conclude that the specified Dell EqualLogic array will be able to scale to 500 users with the same user experience at 75 users.

6.4 Test scenario

The following scenario has been tested:

1. High Performance Persistent Desktops – Premium workload with 35+ IOPS with Dell EqualLogic PS6100E

To emulate extremely high demanding applications, the LoginVSI tests were run while an additional workload of 38 IOPS was generated using Iometer, adding to the storage workload that Login VSI is generating. The results of this test and details of how the IOPS were generated using IOMeter are available in section 7.1.3

6.5 Test Environment Specifications

6.5.1 Windows Image specification:

Windows image specification	
OS	Windows 8
Virtual Hard Disk Size	32GB Thick provisioned
RAM Allocated / Reserved	4 GB / 2 GB
CPUs	2 vCPU
Windows Base Template has Office 2010 and the Login VSI 4.0 Target Package installed Firewall disabled and Remote Desktop Connection enabled.	
Extra workload generation of 38 IOPS per VDI session (with iometer)	

6.5.2 VDI Host spec:

VDI Host Specification	
Server Model	Dell R720
Server Count	7
Host RAM	384 GB
Host CPU	2x Xeon E5-2690v2 (10 cores @ 3.0 Ghz each)
Storage Network Connectivity	1 Gb/s Network Connection to Dell Equallogic storage
Hypervisor Version	VMware ESXi 5.5

6.5.3 Storage Specification

Storage specification	
Array Model	Dell EqualLogic PS6100E
Storage Protocol	iSCSI
Network connectivity	1Gb/sec
Number of disks	24
Total Storage Capacity provisioned	5.5 TB
Storage Configuration	NL-SAS, 7200 RPM, RAID-10 configuration
Four volumes in use	SQL Data, SQL Logs, Fileserver for user profiles & Management for system disks of Management VMs
Firmware version	6.0.6

6.5.4 Atlantis ILIO Session Host Configuration

Atlantis ILIO Session Host Virtual Machine Configuration	
Atlantis ILIO Version	Atlantis ILIO Persistent VDI In-Memory Version 4.1
Server RAM reserved per Atlantis ILIO Session Host Virtual Machine	170 GB
Atlantis ILIO vCPU Configuration	2 vCPUs (1 reserved, 1 allocated)
Type of Network Adapter	VMXNET3

6.5.5 Atlantis ILIO Replication Host Configuration

Atlantis ILIO Replication Host Virtual Machine Configuration	
Atlantis ILIO Version	Atlantis ILIO Persistent VDI In-Memory Version 4.1
Server RAM reserved per Atlantis ILIO Replication Host Virtual Machine	30 GB
Atlantis ILIO vCPU Configuration	2 vCPUs (1 reserved, 1 allocated)
Type of Network Adapter	VMXNET3

6.5.6 Login VSI Test Profile Specification

Login VSI Test Profile	
Login VSI version	4.0.8
Test Density	500
Login VSI Workload	VSI Heavy
Auto Logoff time out set	7200 Sec
Login VSI Testing time	1 hour

In addition to Login VSI heavy workload, an additional load of 38 IOPS per desktop was generated using the Iometer test tool. This extra storage load simulates a very storage intensive workload, such as a software developer or a 3D graphics designer.

7 EqualLogic – Atlantis ILIO Test results

7.1 Persistent VDI Test results – Premium

7.1.1 Storage Capacity:

Storage Provisioning Results (500 Full Clones)	
Total Storage required for 500 VMs without Atlantis ILIO	Thick: 500 * 32GB = 16 TB Thin: 500 * 16.2GB = 8.1 TB
Dell Equallogic storage allocated for 500 VMs with Atlantis ILIO	420 GB
Dell EqualLogic storage utilized for 500 VMs with Atlantis ILIO	88.73 GB
Storage capacity used per virtual desktop	0.18 GB

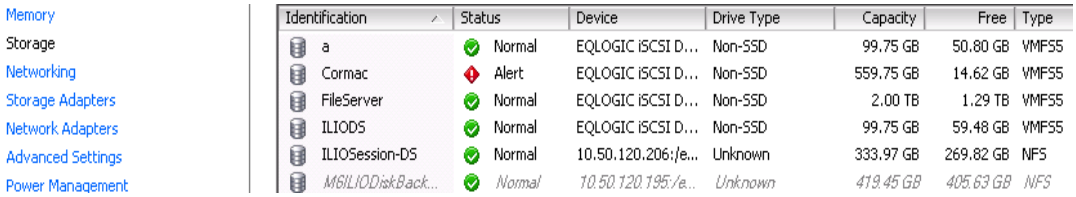
The following screen capture from VMware vCenter shows the provisioned and total size of the ILIIO data disk:

Name	Size	Provisioned Size	Type	Path
ILIODataDisk.vmdk	93,042,690.00 K	440,401,900.00 KB	Virtual Disk	[FileServer] ILIOR

7.1.2 Session Host In-Memory Storage Utilization:

Storage and Memory Provisioning Results	
Total Server RAM allocated for 500 Desktops (ILIO assigned Memory)	630 GB (over 7 hosts)
Actual Server RAM utilized	281.89 GB
RAM utilized per Desktop	0.54 GB

Screenshot of ILIO Datastore for one of the Session Hosts:

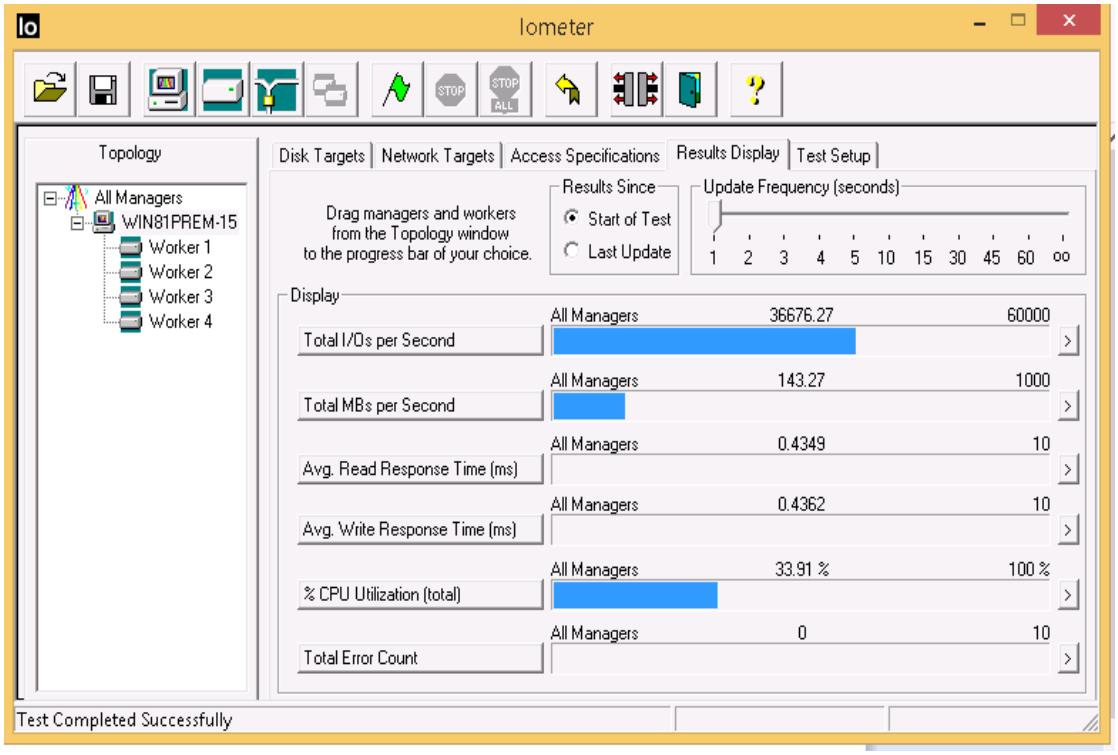


7.1.3 Iometer Testing

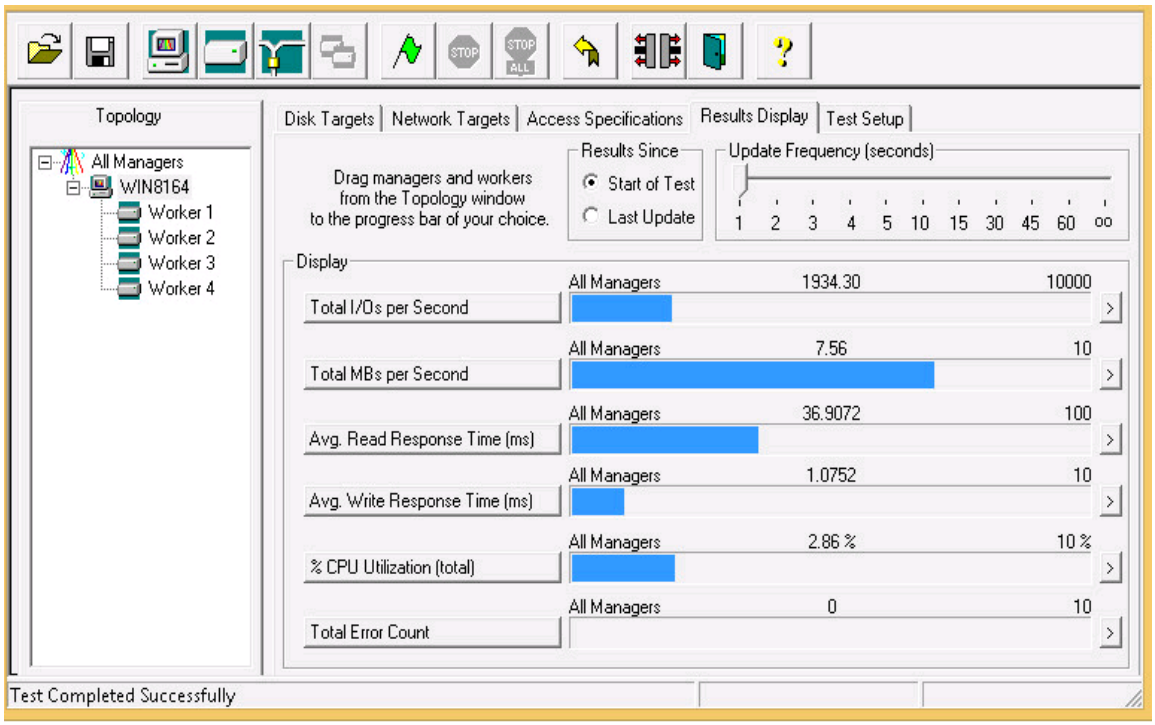
The test with the open source test tool Iometer was used to determine the maximum number of storage operations per second (IOPS) can be generated in one of the virtual desktops. The access specification is configured according to the Atlantis Computing standard VDI access pattern, as defined in this blog post: http://bit.ly/iometervdi

The results show that each virtual desktop has access to 489 IOPS per desktop with an average response time of 0.42ms, and a total number of 256,732 IOPS across all seven VDI hosts (36,676 * 7 hosts).

Screen shot of Iometer with Atlantis ILIO and Dell EqualLogic Storage:



Screenshot of Iometer with Dell EqualLogic storage:



7.1.4 How to generate extra IOPs using IOMETER during Login VSI testing

In order to measure the effect of extra IOPs during the testing IOMETER was used to generate extra write IOPS on each VDI session. This was achieved as follows.

1. Download the Windows IOMETER executables from:

   http://www.iometer.org/doc/downloads.html

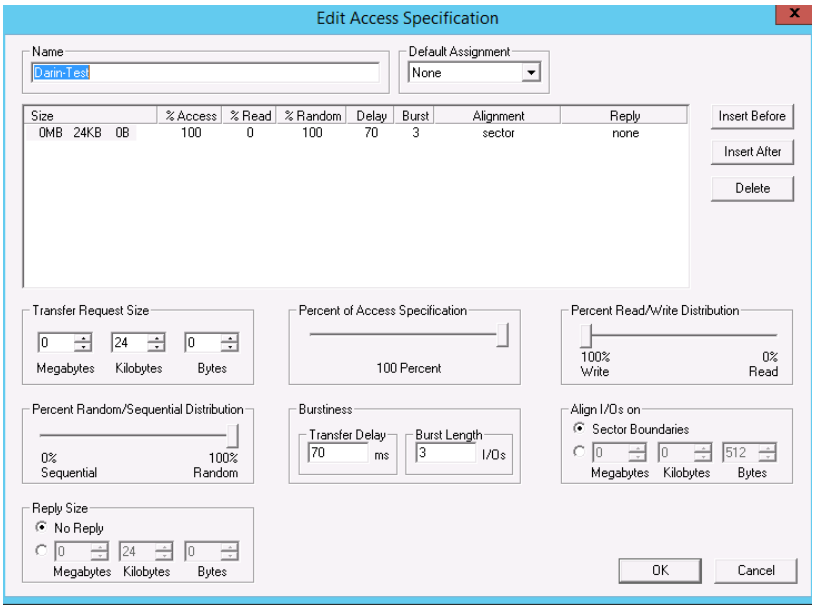
   Install IOMETER and copy the executables to a folder on the VSI Management Server, These will be copied to the VDI session when the Login VSI session starts. In addition, create a registry file with following data and save that to the same location. This will ensure that the program can be run unattended without prompts

   Windows Registry Editor Version 5.00

   [HKEY_CURRENT_USER\Software\iometer.org\Iometer\Settings]

   "Version"="2006.07.27"

2. Create a IOMETER profile to generate the number of IOPs required and save it as an IOMETER ICF File the profile following will generate a further 38 random write IOPs per session during the test,



Save the configuration file as Iometer38iops.icf in the same location on the VSI Management console

3. Modify the Login VSI user logon script to copy the IOMETER executables and execute the IOMETER workload. E.g.

md c:\iometer

c:

cd \iometer

copy "\\Sut3vsi4mgmt\vsi_VSI_Binaries\iometer.**

regedit /s \\sut3vsi4mgmt\vsi_VSI_Binaries\iometer\iometer.reg

start c:\iometer\Iometer.exe /c \\sut3vsi4mgmt\vsi_VSI_Binaries\iometer\iometer38iops.icf /r c:\iometer\results.csv /t 5

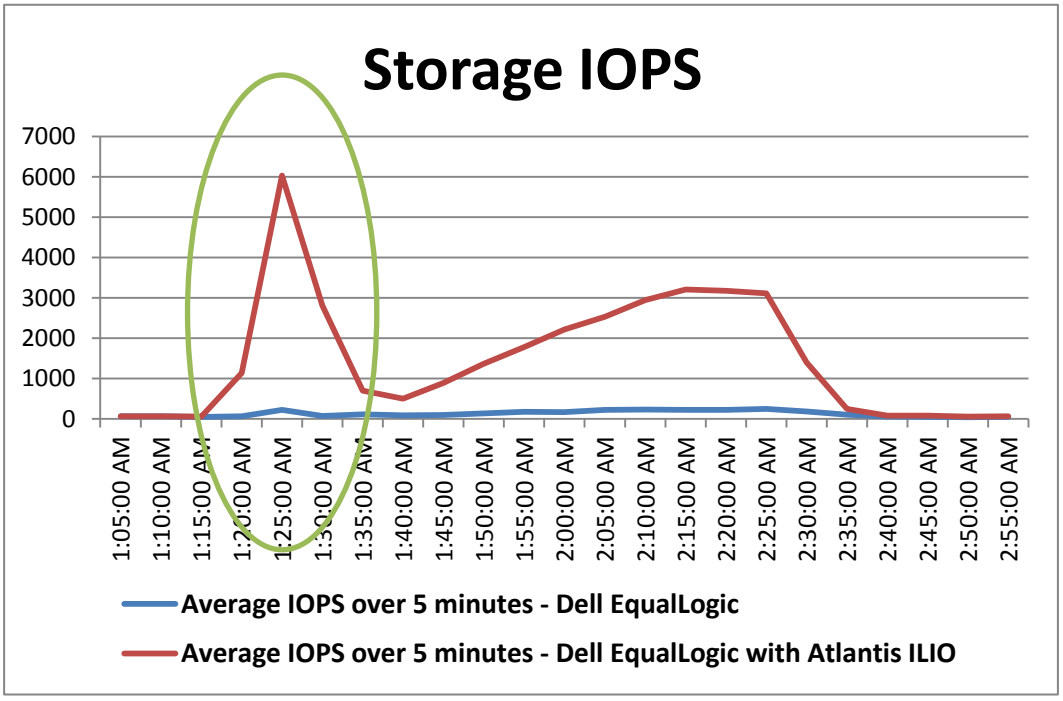
call "\\Sut3vsi4mgmt\vsi_VSI_Binaries\Target\Logon.cmd"

7.1.5 Boot storm performance testing

The first peak in the recorded IOPS graph below is generated by powering on all virtual desktops on the host at the same time. The virtual desktop broker was set up to start the desktops fairly aggressively with no limit on the number of power actions. The boot storm of 75 desktops was measured to take 2 minutes and 50 seconds from the time that the first virtual desktop was booted to the time that all virtual desktops were registered as available with the broker. A single virtual desktop measured in the same way booted in about 12 seconds.

The first peak in the recorded IOPS graph below is generated by powering on all virtual desktops on the host at the same time. The virtual desktop broker was set up to start the desktops fairly aggressively with no limit on the number of power actions. The boot of all desktops was completed within 10 minutes.

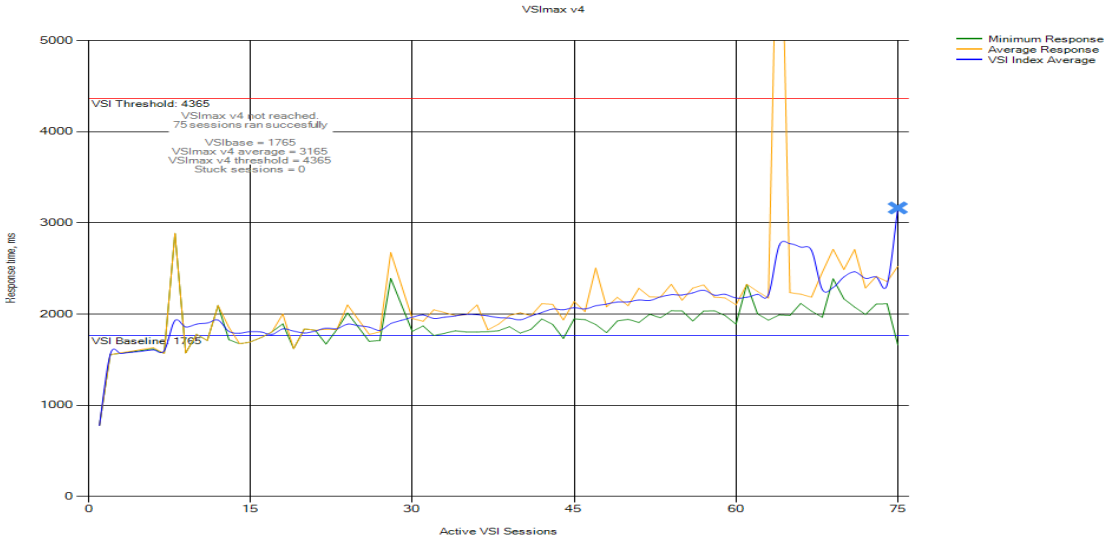
The recorded storage performance shows an average peak of 6,028 IOPS measured over 5 minutes as delivered by the Atlantis ILIO virtual machine (Tier 1), while an average of only 221 IOPS were provided by the Dell EqualLogic array (Tier 2).



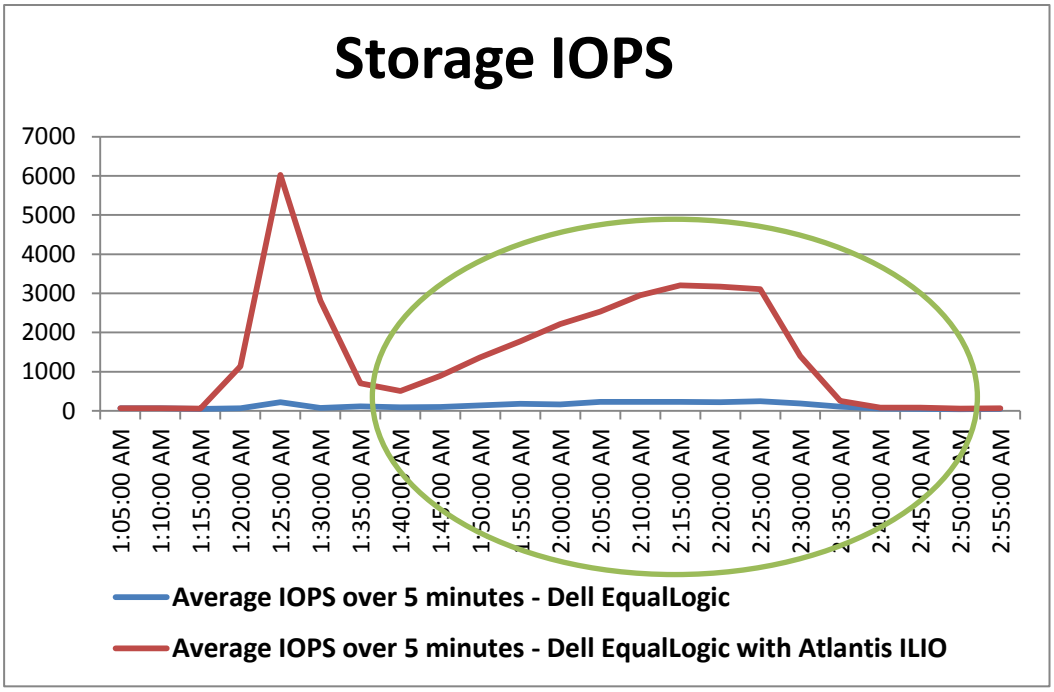
	Dell EqualLogic (Tier 2)	Dell EqualLogic with Atlantis ILIO (Tier 1)
Peak Bootstorm IOPS Recorded	221	6,028
IOPS per Virtual Desktop	3	80

7.1.6 Login VSI Test Results

The Login VSI graph shows consistent and excellent user experience while scaling up to 75 sessions on a single host, with each VDI session generating an additional load of 38 IOPS per session using iometer. The VSI baseline is determined at 1765, and VSImax was not reached. The maximum VSI Index Average remains below 3000 even when scaling up to 75 virtual desktops.



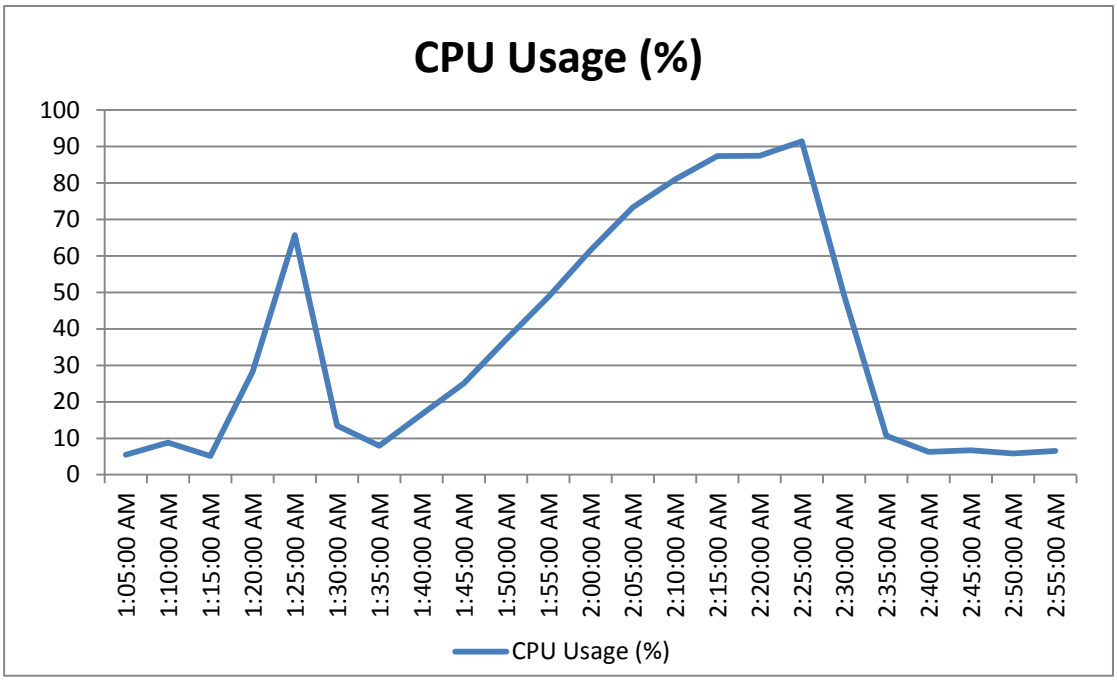
7.1.6.1 Storage Performance during Login VSI test run:



	Dell EqualLogic (Tier 2)	Dell EqualLogic with Atlantis ILIO (Tier 1)
Aggregate IOPS	2983	34531
Peak IOPS	249	3208
Statistics recorded over a time period of 1 hour 50 minutes during the LoginVSI run		

7.1.6.2 CPU Utilization

The measured maximum CPU utilization during the bootstorm of 75 desktops was around 65%. The maximum CPU utilization during the Login VSI run was just over 90%.



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