VDI-IOmark

Astute Networks

ViSX G3

Test Report: VDI- 120926-a

Test Report Date: 26, September 2012

Evaluator Group, Inc., Boulder, CO 80303 USA www.evaluatorgroup.com

Overview

VDI-IOmark is a storage specific benchmark designed to test storage systems performance with a Virtual Desktop Infrastructure (VDI) type of workload.

The workload for the first version of VDI-IOmark is VMware View specific. That is, it replicates the storage workload seen while running multiple VMware View VDI instances.

VDI-IOmark is designed to run under either Windows or Linux operating environments. Currently, Linux is the only supported OS. However, the operating system for the benchmark is irrelevant, having no effect on the I/O's issued by the benchmark.

Benchmark Methodology

VDI-IOmark uses the concept of workload replay. I/O streams are captured from actual running applications and then "replayed" so that the exact sequence and I/O commands are issued. This allows the creation of a workload that is indistinguishable from an actual workload to the system under test, while being reproducible and requiring fewer resources. Additionally, the test environment is easier and faster to create since the actual application is not required.

Understanding Results

The VDI-IOmark is a storage centric benchmark that re-creates a VMware View VDI workload on a storage system. This report is audited for accuracy and issued by Evaluator Group, Inc., an independent storage analyst firm.

Benchmark Criteria

The foundation members of VDI-IOmark[1] have set benchmark criteria. The performance requirements are established as follows:

- For the heavy-worker workload:
  - 50% of response times for I/O's must not exceed 50ms (mean)
  - All storage must reside on the storage system under test
  - The value reported corresponds directly to actual users
- For the standard-worker workload:
  - Same as heavy-worker
- For the boot workload:
  - There is no limit to maximum I/O response times
  - All boot operations must complete in less than 2 minutes
  - The value reported indicates the number of desktops able to boot

More Information

For more information on the VDI-IOmark benchmark, a theory of operations guide, published results and more, visit the official website at www.vdi-iomark.org . Some content is restricted to registered users, so please register on the site to obtain all available information and the latest results.

[1] VDI-IOmark foundation membership information available at www.vdi-iomark.org

VDI-IOmark Result Details

For the tested configuration, the following data is provided

Item	Value
Testing Identifier:	VDI- 120926-a
Test Sponsor:	Astute Networks, Inc.
Auditor:	Evaluator Group Inc.

Table 1: Test Identifier Information

Item	Value
VDI-IOmark Version:	Version: VDI-IOmark 1.0.5
Testing Completed:	September, 2012
Equipment Availability:	January, 2012
Audit Certification Date:	26, September 2012
Report Date:	26, September 2012

Table 2: Test Revision and Dates

VDI-IOmark Results

In Tables 3 and 4 below, the results for a "Heavy Worker" profile and a "Standard Worker" profile are given. The definition and workload characteristics of these workloads are provided on page 5, under the section entitled "Benchmark Overview".

A VDI user may be configured without clones, using VMware linked clones, or using storage clones. For each configuration run, the results are reported and for those not run results are shown as "Not Run."

Table 3 below shows the number of "Heavy Users" supported (as defined on page 5).

VDI Mode	VDI-IOmark Users	Tested Useable Capacity	Total Price	Price / User
Fully Provisioned	Not Run	N/A	N/A	N/A
Linked Clones	Not Available	Not Available	N/A	N/A
Storage Clones	200	2.1 TB	$30,600	$153.00

Table 3: VDI-IOmark Workload Summary for Heavy Worker

Table 4 below shows the number of "Standard Users" supported (as defined on page 5).

VDI Mode	VDI-IOmark Users	Tested Useable Capacity	Total Price	Price / User
Fully Provisioned	Not Run	N/A	N/A	N/A
Linked Clones	Not Available	N/A	N/A	N/A
Storage Clones	400	2.1 TB	$30,600	$76.50

Table 4: VDI-IOmark Workload Summary for Standard Worker

Benchmark Overview

VDI Workload

1. View steady state operation
   a. Heavy Worker Profile – Average / VDI User
      i. 12.52 iops. / User
      ii. 1.06 MBps / User
   b. Standard Worker Profile – Average / VDI User
      i. 6.26 iops. / User
      ii. 0.53 MBps / User
2. Benchmark Criteria:
   - 80% of I/O response times must not exceed 50ms
   - All storage utilized must reside on/within the storage system under test

VDI Benchmark Parameters

- Operating System disk size is 20 GB (thinly provisioned)
- All user sessions were running Windows 7 as their guest OS
- No user data disk utilized
- VMware Linked clones may be utilized (as noted)
- Storage linked clones may be utilized (as noted)
- Heavy Worker Profile:
  - The workload is non synthetic, actual I/O patterns are issued as captured
  - The size of I/O's is variable, ranging from 512, up to 2 MB transfers
  - The most common I/O size is 4 KB, accounting for approximately 50% of the transfers
- Standard Worker Profile:
  - The workload is non synthetic, actual I/O patterns are issued as captured
  - Rates are 50% of Heavy Worker profile
  - The size of I/O's is variable, ranging from 512, up to 2 MB transfers
  - The most common I/O size is 4 KB, accounting for approximately 50% of the transfers

Tested Configuration Details

Connectivity, configuration and pricing information for the system under test are provided.

Storage Configuration for VDI Clients

- 12 – iSCSI targets were created on the Astute ViSX G3
- Each iSCSI client in the hypervisor accessed 1 iSCSI target on the Astute G3
- VMFS was the datastore type, with "VMFS 5" chosen
- Each VDI client consumed approximately 3.2 GB of physical capacity on the Astute G3 (synthetic storage clones). Note: 3.2 GB is the capacity delta for a linked clone, or a storage system clone

Configuration items

Detailed configuration parameters for the system under test, including connectivity are provided below in Table 5.

Storage System Parameter	Value
Number of interfaces to the storage system:	1 (2 available, 1 utilized)
Connectivity to the storage system:	10 Gb Ethernet
Hypervisor storage protocol used:	iSCSI (Software initiator)
Hypervisor version:	VMware ESXi 5.0
Thin provisioning:	Utilized in VMFS – not on Astute G3
Datastore Access:	VMFS datastore
Datastore Filesystem:	VMFS 5 – 1 MB block size
Total amount of RAM and other cache in SUT:	2 GB controller RAM for read and write caching
Storage Media Utilized:	12 @ 200 GB – SFF SSD flash drive
VDI Linked Clones:	Not utilized
Storage system clones:	Synthetic (provisioned capacity only)
Type of storage system clone:	N/A
VAAI:	VAAI supported
Total raw capacity of SUT:	2.4 TB (12 data modules * 200 GB)
Total capacity of system allocated to VDI-IOmark:	2.1 TB
Automated tiering within the storage system:	Not available or not utilized
Deduplication or compression of data:	Not available or not utilized

Table 5: General Configuration Parameters

Detailed configuration parameters for the system under test, including connectivity are provided below in Table 6.

Storage System Parameter	Value
Thin provisioning:	Utilized in VMFS – not on Astute G3
RAID Level	RAID 5
Read Cache	Adaptive Read Ahead
Write Cache:	Writeback
IO Type:	Cached

Table 6: Storage System Configuration Parameters

Configuration Diagram

The logical data layout of the test configuration is shown below in Figure 1.

Astute Networks Configuration:

- Flash Modules
- 12 iSCSI Targets

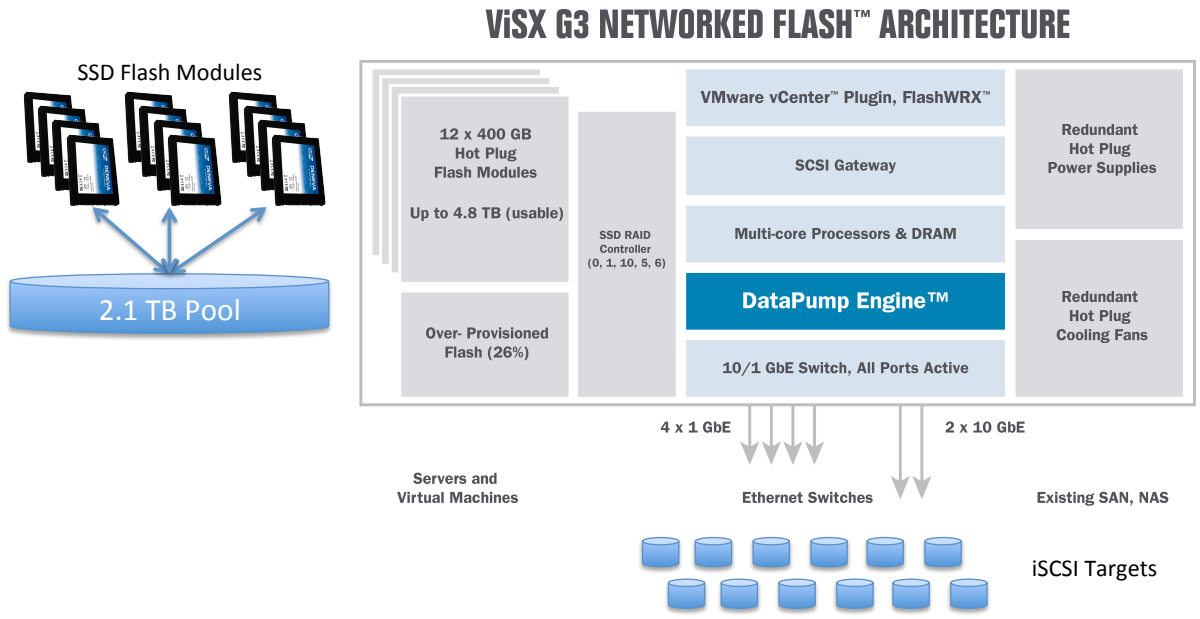

Figure 1: Logical Data Layout

Connectivity

The host to storage connectivity used during testing was iSCSI, utilizing 4 @ 10 Gb Ethernet connections between the physical hosts and switch, and 1 @ 10 Gb Ethernet between the switch and the storage system. A diagram is shown below in Figure 2.

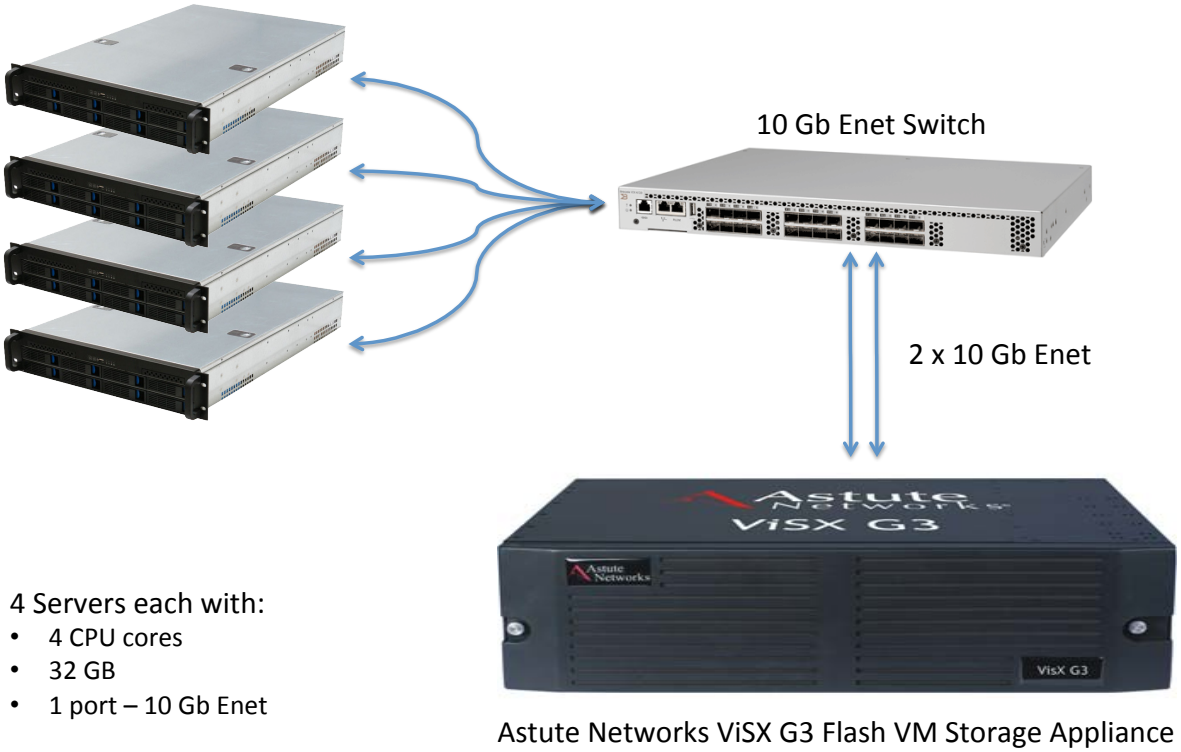

Figure 2: System Connectivity

Tested Configuration Pricing

Item	Description	Qty	Price
1	Astute G3	1	$35,000
2	Astute G3 Flash Module – 200 GB	12	Included
3	Feature Licenses	1	N/A
Sub Total			$35,000
	Channel Discount	15%	n/a
Total	Discounted Price		$30,600

Table 7: VDI-IOmark Price Information

Detailed Results

Response Average:	10 ms	20 ms	40 ms	60 ms	80 ms	100 ms
% of Clients	6.02%	45.42	85.07	91.53	93.18	94.09

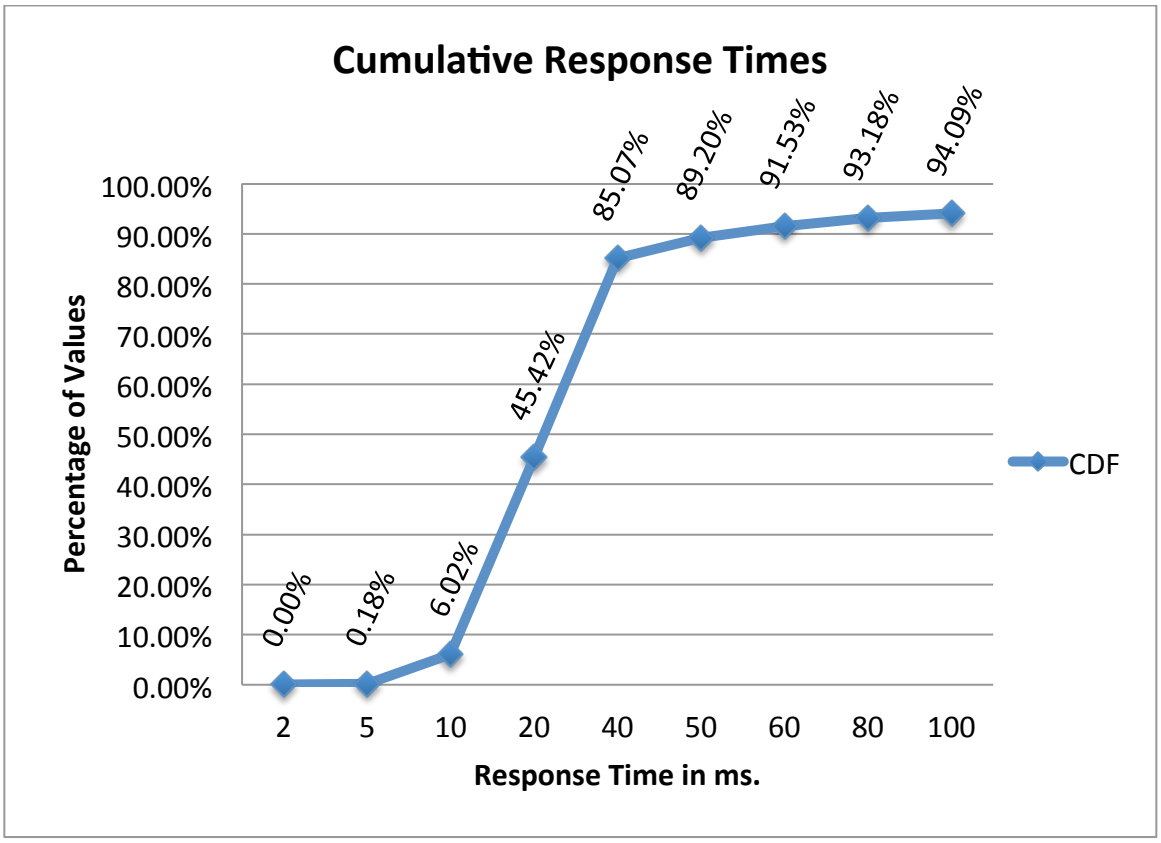

Figure 3: Cumulative Distribution Graph of Response Times

VDI-IOmark.cfg file contents:

Hostname	NumberOfJobs	WorkloadType	WorkloadClass	Iterations	Delay
10.0.7.74	2	steadystate	heavy	1	0
10.0.7.101	3	steadystate	heavy	1	80
10.0.7.76	2	steadystate	heavy	1	160
10.0.7.75	2	steadystate	heavy	1	240
10.0.7.84	2	steadystate	heavy	1	320
10.0.7.85	2	steadystate	heavy	1	400
10.0.7.87	2	steadystate	heavy	1	480
10.0.7.88	2	steadystate	heavy	1	560
10.0.7.89	2	steadystate	heavy	1	640
10.0.7.96	2	steadystate	heavy	1	720
10.0.7.77	2	steadystate	heavy	1	800
10.0.7.78	2	steadystate	heavy	1	880

Table 8: VDI-IOmark Configuration File