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# VDI-IOmark

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**Hitachi Data Systems**

**BlueArc Mercury 110**

Test Report: VDI- 120117-c

Test Report Date: 20, January 2012

**Evaluator Group, Inc., Boulder, CO 80303 USA [www.evaluatorgroup.com](http://www.evaluatorgroup.com)**  
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## 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 far easier and faster to create, since the actual application is no longer needed.

## 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<sup>1</sup> have set benchmark criteria. Currently the performance values are established as follows:

- For the steady-state workload:
  - 80% of response times for I/O's must not exceed 50ms
  - All storage must reside on the storage system under test
  - The value reported corresponds directly to actual users
- 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](http://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.

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<sup>1</sup> VDI-IOMark foundation membership information available at [www.vdi-iomark.org](http://www.vdi-iomark.org)

## VDI-IOmark Result Details

For the tested configuration, the following data is provided

Item	Value
Testing Identifier:	VDI- 120117-b
Test Sponsor:	Hitachi Data Systems - BlueArc
Auditor:	Evaluator Group

**Table 1: Test Identifier Information**

Item	Value
VDI-IOmark Version:	Version: VDI-IOmark 1.0.5
Testing Completed:	January, 2012
Equipment Availability:	January, 2011
Audit Certification Date:	17, January 2012
Report Date:	20, January 2012

**Table 2: Test Revision and Dates**

## VDI-IOMark Results

In Tables 3 and 4 below, the results for a “Knowledge 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.”

VDI Mode	VDI-IOMark Users	Tested Useable Capacity	Total Price	Price / User
No Clones	Not Run	N/A	N/A	N/A
Linked Clones	Not Available	Not Available	N/A	N/A
Storage Clones	768	17 TB	\$224,546	\$292.38

**Table 3: VDI-IOMark Workload Summary for Knowledge Worker**

VDI Mode	VDI-IOMark Users	Tested Useable Capacity	Total Price	Price / User
No Clones	Not Run	N/A	N/A	N/A
Linked Clones	Not Available	N/A	N/A	N/A
Storage Clones	1,536	17 TB	\$224,546	\$146.19

**Table 4: VDI-IOMark Workload Summary for Standard Worker**

## Benchmark Overview

### VDI Workload

1. View steady state operation
  - a. Knowledge Worker Profile (100% heavy – 12 iops avg.)
  - b. Standard Worker Profile (50% heavy – 6 iops avg.)
2. Booting of all VDI users simultaneously

### Benchmark Criteria:

- 80% of I/O response times must not exceed 50ms
- All storage utilized must reside on/within the storage system under test
- Amount of time to provision storage volumes and create virtual desktop images

### VDI Benchmark Parameters

- Operating System disk size is 20 GB
- 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)
- Knowledge 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 70% of the transfers
  - The average I/O rate per user is 12.3 IO/s
  - The average throughput is 2.43 MB/s
- Standard 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 70% of the transfers
  - The average I/O rate per user is 6.2 IO/s
  - The average throughput is 1.21 MB/s

## Tested Configuration Details

Connectivity, configuration and pricing information for the SUT are provided.

### 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:	2
Connectivity to the storage system:	10 Gb Enet
ESX Access protocol used:	NFS
Thin provisioning:	Utilized
Total amount of RAM and other cache in SUT:	8 GB RAM for read and write caching
Storage Media Utilized:	48 @ 15K HDD
VDI Linked Clones:	Not utilized
Storage system clones:	Utilized
Type of storage system clone:	Redirect on Write
VAAI:	VAAI was not used during testing
Total raw capacity of SUT:	18.43 TB (44 data drives * 450 GB)
Total capacity of system allocated to VDI-IOMark:	17TB
Automated tiering within the storage system:	Not utilized
Deduplication or compression of data:	Not utilized

**Table 5: Test System Configuration Parameters**

### Connectivity

The storage connectivity used during testing was NFS, utilizing 2, 10 Gb Ethernet connections.

Backend connectivity between the BlueArc Mercury M110 system and backend storage was 4 Gb FC connections.

### Configuration Diagram

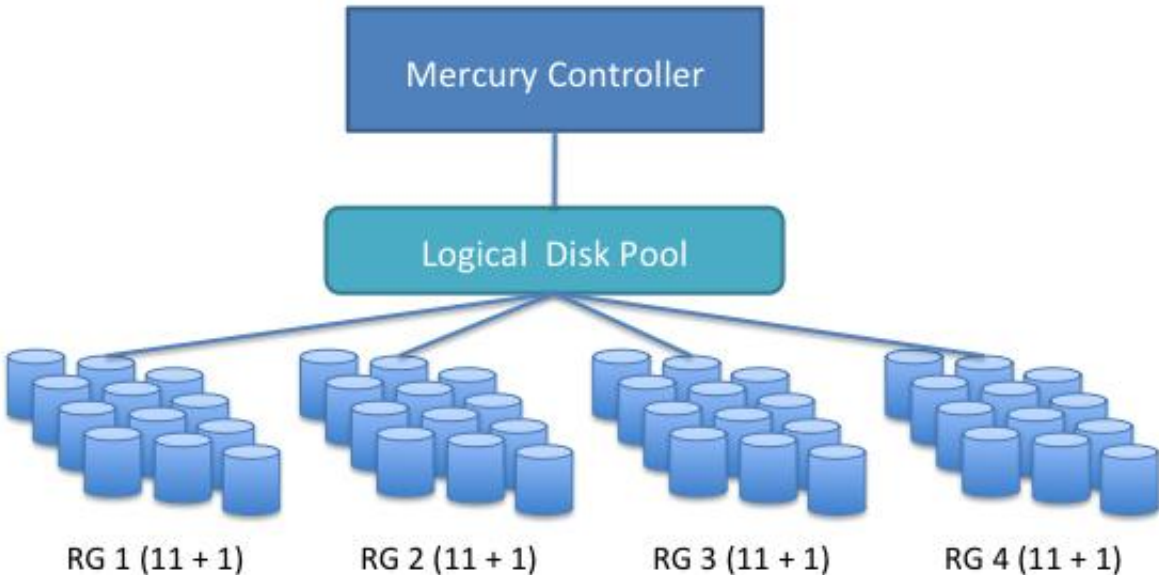


Figure 1: Logical Data Layout

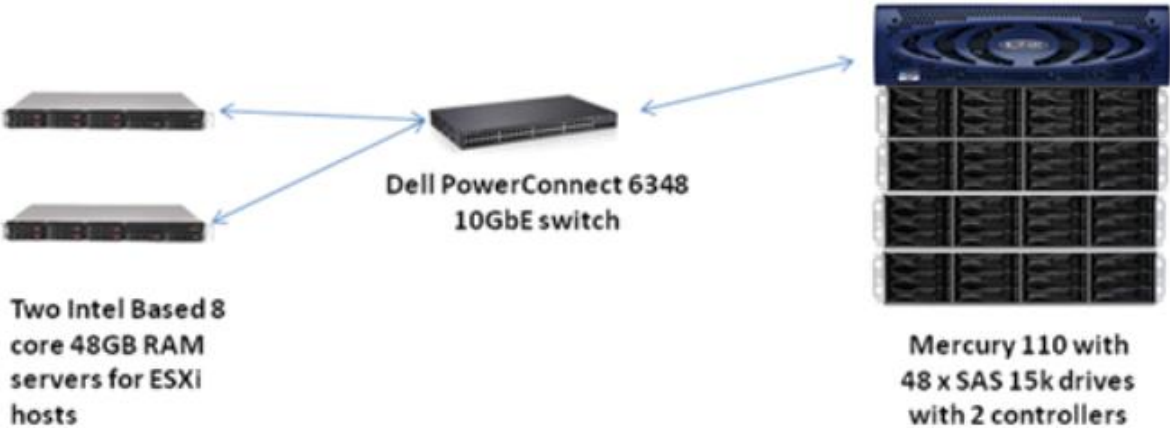


Figure 2: System Connectivity

### Tested Configuration Pricing

Item	Description	Qty	Price
1	BlueArc Mercury M110 Controller	1	\$65,000
2	Storage Array 450 GB – 15k rpm HDD	48	\$106,682
3	Feature Licenses	1	\$49,500
4	Network	1	\$3,364
Total			\$224,546

**Table 6: VDI-IOMark Price Information**



### Detailed Results

Response	50 ms	60 ms	70 ms	80 ms	90 ms	100 ms
Max	50 ms	60 ms	70 ms	80 ms	90 ms	100 ms
% of Clients	86.30%	92.64%	96.19%	97.97%	98.86%	99.43%

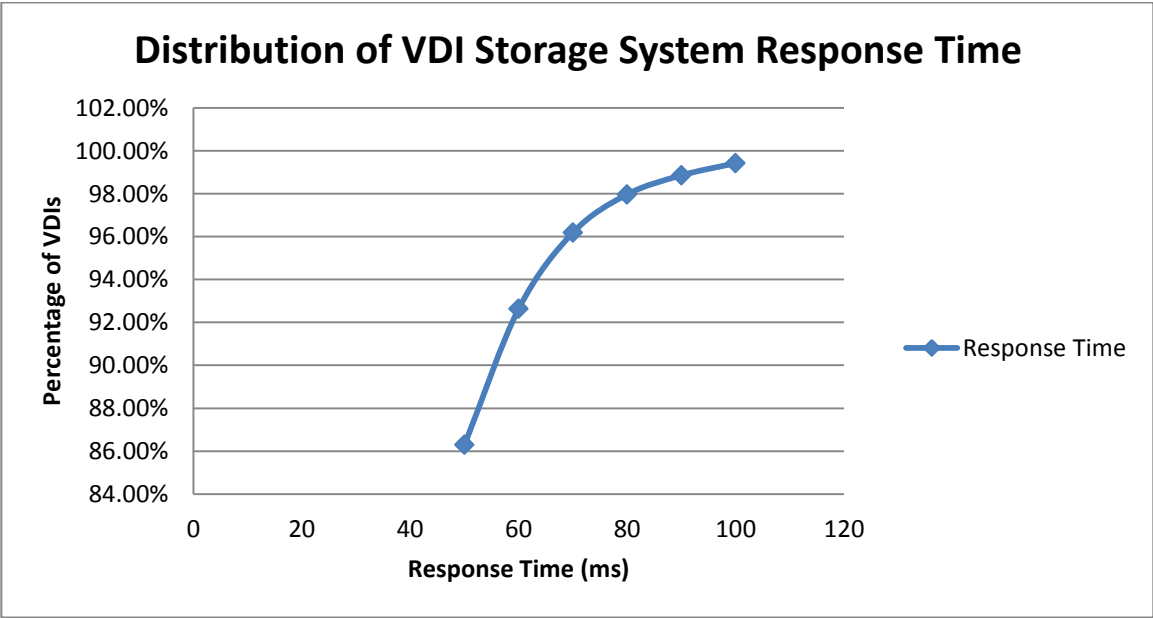


Figure 3: Cumulative Distribution Graph of Response Times

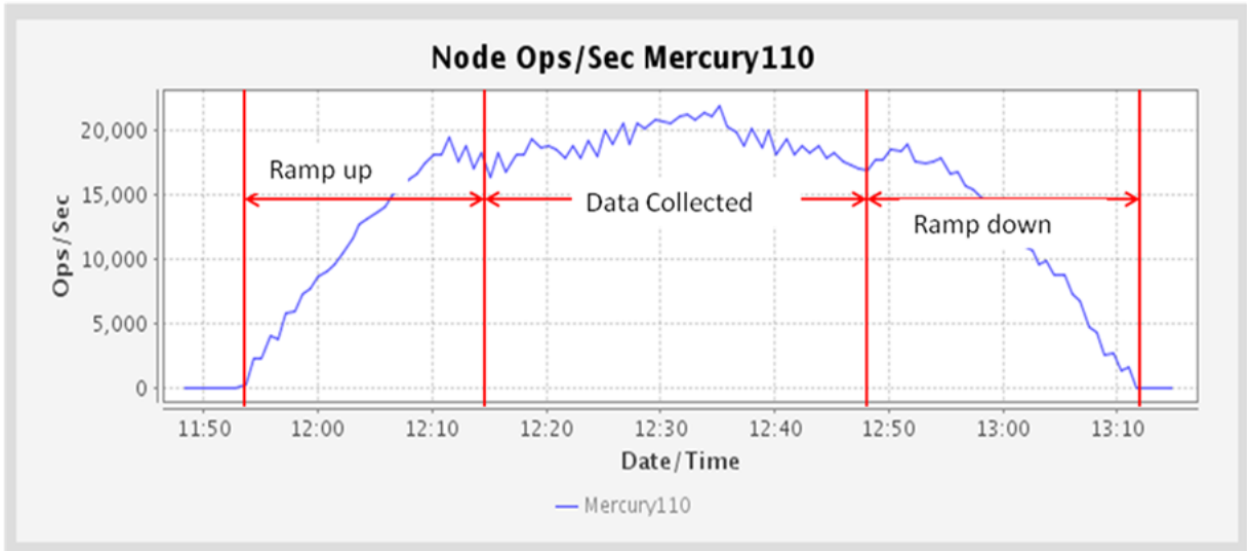


Figure 4: System Load & Benchmark Measurement

**VDI-IOMark.cfg file contents:**

<b>Hostname</b>	<b>NumberOfJobs</b>	<b>WorkloadType</b>	<b>WorkloadClass</b>	<b>Iterations</b>	<b>Delay</b>
177.177.177.71	8	steadystate	heavy	1	0
177.177.177.72	8	steadystate	heavy	1	90
177.177.177.73	8	steadystate	heavy	1	180
177.177.177.74	8	steadystate	heavy	1	270
177.177.177.75	8	steadystate	heavy	1	360
177.177.177.76	8	steadystate	heavy	1	450
177.177.177.77	8	steadystate	heavy	1	540
177.177.177.78	8	steadystate	heavy	1	630
177.177.177.79	8	steadystate	heavy	1	720
177.177.177.80	8	steadystate	heavy	1	810
177.177.177.81	8	steadystate	heavy	1	900
177.177.177.82	8	steadystate	heavy	1	990