

Horizon View 6.2 on Virtual Storage Platform F800

Lab Validation Report

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Feedback

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Lab Validation Report

Hitachi Virtual Storage Platform (VSP) Fx00 series delivers superior all-flash performance for business-critical applications and guarantees continuous data availability with a combination of new high-density flash module drives (FMD) DC2. FMD DC2 drives use patented flash I/O management and specialized offload engines to maximize flash utilization. This optimization includes FMD-based compression that runs 10 times faster than other technologies, allowing a higher return on investment without impacting performance or durability.

Some of the benefits of using VSP F800 with FMD DC2 in a persistent virtual desktops environment are described in this lab validation report.

- Performance increase compared to traditional SAS 10K in virtual desktop operations
- More than 2 times the number of virtual desktops can be deployed with FMD DC2 on VSP Fx00 series

This paper is intended for storage or data center administrators who are familiar with the VMware vSphere environment.

Note — Testing of this configuration was in a lab environment. Many things affect production environments beyond prediction or duplication in a lab environment. Follow the recommended practice of conducting proof-of-concept testing for acceptable results in a non-production, isolated test environment that otherwise matches your production environment before your production implementation of this solution.

Product Features

The following information describes the hardware and software features used in testing.

Hitachi Virtual Storage Platform Fx00 Models

[Hitachi Virtual Storage Platform Fx00 models](#) deliver superior all-flash performance for business-critical applications, with continuous data availability. High-performance network attached storage with nondisruptive deduplication reduces the required storage capacity by up to 90% with the power to handle large, mixed-workload environments.

Hitachi Storage Virtualization Operating System provides storage virtualization, high availability, superior performance, and advanced data protection for all Virtual Storage Platform Fx00 models. This proven, mature software provides common features to consolidate assets, reclaim space, extend life, and reduce migration effort.

Flash Module Drive DC2

[Hitachi Virtual Storage Platform Fx00 models](#) offer a choice of FMD DC2 (second-generation flash module) capacities and include a full software suite for management, protection, and analytics.

Hitachi Storage Virtualization Operating System

[Hitachi Storage Virtualization Operating System](#) spans and integrates multiple platforms. It integrates storage system software to provide system element management and advanced storage system functions. Used across multiple platforms, Storage Virtualization Operating System includes storage virtualization, thin provisioning, storage service level controls, dynamic provisioning, and performance instrumentation.

Storage Virtualization Operating System includes standards-based management software on a Hitachi Command Suite base. This provides storage configuration and control capabilities for you.

Storage Virtualization Operating System uses Hitachi Dynamic Provisioning to provide wide striping and thin provisioning. Dynamic Provisioning provides one or more wide-striping pools across many RAID groups. Each pool has one or more dynamic provisioning virtual volumes (DP-VOLs) without initially allocating any physical space. Deploying Dynamic Provisioning avoids the routine issue of hot spots that occur on logical devices (LDEVs).

Hitachi Compute Blade 500

[Hitachi Compute Blade 500](#) combines the high-end features with the high compute density and adaptable architecture you need to lower costs and protect investment. Safely mix a wide variety of application workloads on a highly reliable, scalable, and flexible platform. Add server management and system monitoring at no cost with Hitachi Compute Systems Manager, which can seamlessly integrate with Hitachi Command Suite in IT environments using Hitachi storage.

Brocade Switches

[Brocade and Hitachi Data Systems](#) have collaborated to deliver storage networking and data center solutions. These solutions reduce complexity and cost, as well as enable virtualization and cloud computing to increase business agility.

The solution uses the following Brocade products:

- [Brocade 6520 Switch](#)

VMware vSphere

[VMware vSphere](#) is a virtualization platform that provides a datacenter infrastructure. It features vSphere Distributed Resource Scheduler (DRS), High Availability, and Fault Tolerance.

VMware vSphere has the following components:

- **ESXi** — A hypervisor that loads directly on a physical server. It partitions one physical machine into many virtual machines that share hardware resources.
- **vCenter Server** — Management of the vSphere environment through a single user interface. With vCenter, there are features available such as vMotion, Storage vMotion, Storage Distributed Resource Scheduler, High Availability, and Fault Tolerance.

VMware Horizon

[VMware Horizon](#) transforms static desktops into secure, virtual workspaces that can be delivered on demand. Provision virtual or remote desktops and applications through a single VDI platform to streamline management and easily entitle end users.

- Dynamically allocate resources with virtual storage, virtual compute and virtual networking to simplify management and drive down costs. With Horizon, reduce day-to-day operations costs with a single platform that allows you to extend virtualization from the data center to your devices.

Test Environment Configuration

Testing of the persistent desktops solution took place in the Hitachi Data Systems lab by using the following hardware and software.

Hardware Components

Table 1 describes the details of the hardware components used to test this solution.

Table 1. Hardware Components

Hardware	Description	Version	Quantity
Hitachi Virtual Storage Platform F800	<ul style="list-style-type: none"> ▪ Dual controllers ▪ 24 × 16 Gb/sec Fibre Channel ports ▪ 450.50 GB cache memory ▪ 8 × 3200 GB FMC 	83-03-01-60/00	1
Hitachi Compute Blade 500 (CB 500) Chassis	<ul style="list-style-type: none"> ▪ 8-blade chassis ▪ 2 Brocade 5460 Fibre Channel switch modules, each with 6 × 8 Gb/sec uplink ports ▪ 2 Hitachi 10GbE LAN Pass-through modules, each with 16 × 10 Gb/sec uplink ports. ▪ 2 management modules ▪ 6 cooling fan modules ▪ 4 power supply modules 	SVP: A0231-C-9652 5460: FOS 7.2.1	1
520H B2 Server Blade (Linked Clone Desktops)	<ul style="list-style-type: none"> ▪ Half blade ▪ 2 × 12-core Intel Xeon E5-2697v2 processors, 2.7 GHz 	Firmware: 04-40 BMC/EFI: 04-29/10-63	2
520H B2 Server Blade (Full Clone Desktops)	<ul style="list-style-type: none"> ▪ 256GB RAM ▪ 1 × 2 port 10 Gb/sec Emulex PCIe Ethernet ▪ 1 × 2 port 1 Gb/sec onboard Ethernet 		2
20 switch	<ul style="list-style-type: none"> ▪ SAN switch with 48 × 8 Gb Fibre Channel ports 	FOS 7.2.1a	2
Brocade VDX 6740 switch	<ul style="list-style-type: none"> ▪ Ethernet switch with 48 × 10 GbE ports 		2

Software Components

Table 2 describes the details of the software components used to test this solution.

Table 2. Software Components

Software	Version
Hitachi Storage Navigator	Microcode Dependent
Hitachi Dynamic Provisioning	Microcode Dependent
VMware vCenter server	6.0.0, Build 3018523
VMware ESXi	6.0.0, Build 3073146
VMware vSphere Client	6.0.0, Build 2997665
VMware Horizon 6 Connection Server	6.2.2, Build 3508079
VMware Horizon 6 Composer	6.2.2, Build 3505505
Microsoft® Windows Server® 2012	Datacenter Edition, R2
Microsoft SQL Server® 2014	Enterprise Edition
Microsoft Windows® 7	Enterprise Edition, SP1

Solution Infrastructure

For this testing, the infrastructure servers for VMware Horizon used for this solution are placed on separate infrastructure with dedicated resources.

Table 3 describes the details of the server components required for VMware Horizon.

Table 3. VMware Horizon Components

Server Name	vCPU	Memory	Disk Size	Disk Type	Operating System
View Connection Server	4	16 GB	40 GB	Eager Zeroed Thick	Microsoft Windows Server 2012 R2
View Composer	4	12 GB	40 GB	Eager Zeroed Thick	Microsoft Windows Server 2012 R2
Domain Controller	2	8 GB	40 GB	Eager Zeroed Thick	Microsoft Windows Server 2012 R2
Database Server	4	16 GB	40 GB (operating system) 60 GB (data)	Eager Zeroed Thick	Microsoft Windows Server 2012 R2 Microsoft SQL Server 2014

All of these virtual machines were configured with VMware Paravirtual SCSI Controller. The domain controller was deployed to support user authentication and domain services for the VMware Horizon infrastructure.

Dynamic Provisioning pool virtual volumes were mapped to the VMware ESXi hosts from each compute cluster via the same storage ports, as indicated in Table 4. The storage multipathing policy was set to *round robin*.

Table 4. Compute Clusters and Storage Ports Mapping

Compute Cluster	Number of Hosts	Number of HBAs per Host	Storage Ports (2 in each Virtual Storage Platform cluster)
Full Clones	2	2	5A , 6A , 7A , 8A
Linked Clones	2	2	5A , 6A , 7A , 8A

For these tests, this was the infrastructure configuration:

- VMware Horizon management and administration components were placed on a separate infrastructure cluster.
- The virtual desktops (Full Clones Desktop and Linked Clone Desktop) were placed on separate compute cluster.

Figure 1 gives a high-level overview of the infrastructure and component placement.

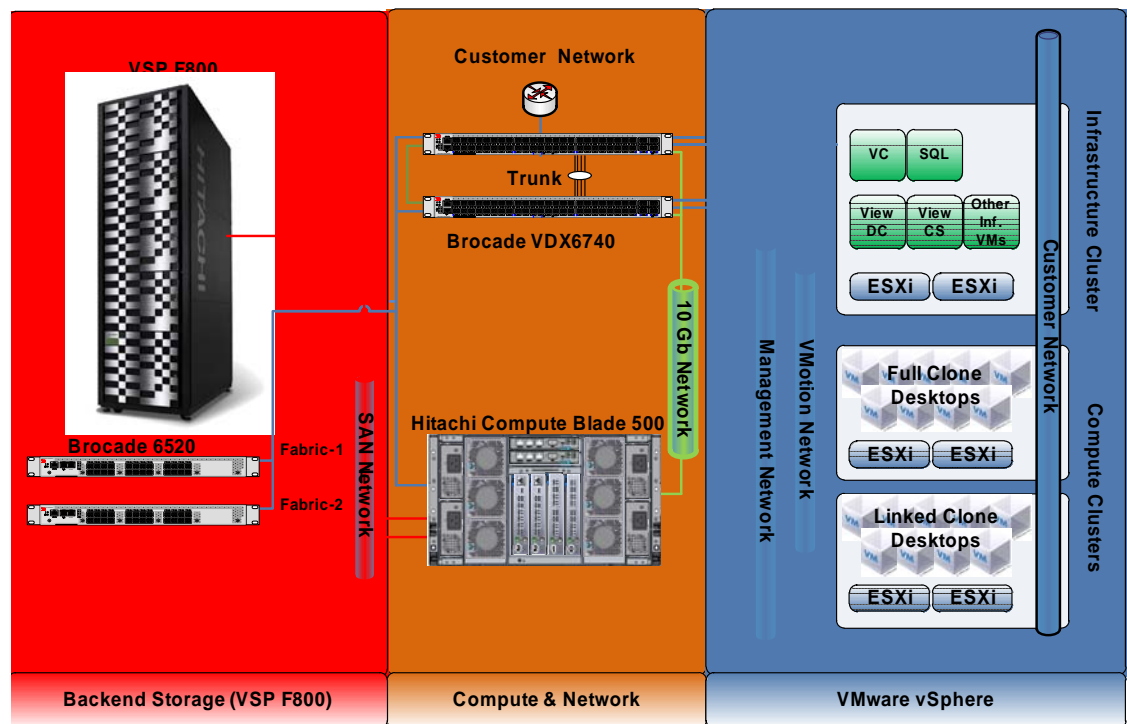


Figure 1

Test Methodology

This describes the test methodology used to test this VMware Horizon environment. The purpose of the tests were as follows:

- Show faster VDI administrator experience such as Provisioning, Boot, SvMotion, and Recompose on Flash Module Device (FMD DC2) against SAS 10K Spindles.
- Measure the amount of time of each task from vSphere web client or View Administrator.
- Measure the both compute and storage performance metrics when each task is running.

VMware Horizon Configuration

Most of the storage configuration for the VMware Horizon Full Clones and Linked Clones were based on previous tests in [VMware Horizon Desktop Workloads with Hitachi Unified Compute Platform for VMware vSphere on Hitachi Virtual Storage Platform G600 with Active Flash](#).

Desktop Pools

This test is performed with different types of desktop pools to cover different VDI admin tasks.

- Full Clone Desktop Pool for the Provision, Boot, and SvMotion scenarios
- Linked Clone Desktop Pool for the Boot and Recompose scenarios

Table 5 lists the configuration details of the Virtual Machine template used for Full Clone and Linked Clone desktops.

Table 5. Configuration Details of Virtual Machine Template for Full Clone and Linked Clone Desktops

	Full Clone Desktop Pool	Linked Clone Desktop Pool
Operating System	Microsoft Windows 7, 64-bit	Microsoft Windows 7, 32-bit
vCPU Allocation	2	1
Memory Allocation	4 GB Memory (No Reserved)	1 GB Memory (No Reserved)
Disk Size	50 GB	50 GB
Disk Type	Eager Zeroed Thick	Thin-provisioned VMDK
SCSI Controller	LSI Logic SAS	LSI Logic SAS

Storage Pool Configuration

Table 6 describes the Storage Pool Configuration.

Table 6. Storage Pool Configuration

Drive Type	Pool Type	RAID Configuration	Drive Quantity
FMD DC2	Dynamic provisioning	RAID-6 (6D+2P) × 1 parity group	8
SAS10K	Dynamic provisioning	RAID-6 (6D+2P) × 1 parity group	8

Storage Pool

Figure 2 illustrates the storage configuration used for the FMD DC2 test. The storage configuration used for SAS 10K disks is shown in Figure 2.

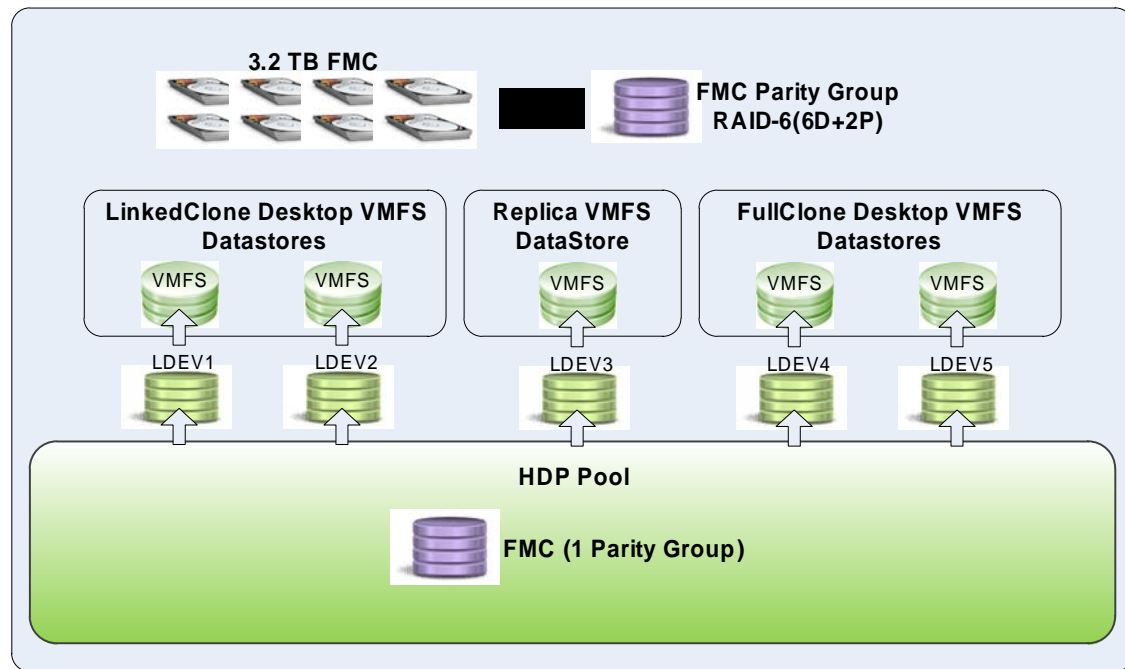


Figure 2

Test Cases

The following test cases were performed with both FMD DC2 and SAS 10K, respectively. Both Compute and Storage performance metrics were measured while the test was running.

Test Case 1: Provision

Perform a single Full Clone virtual machine deployment from the template with a single Eager zeroed thick 50 GB virtual disk from vSphere web client.

Measure the amount of time that the task took from vSphere web client.

Test Case 2: Boot

Perform a power-on of both 30 Full Clones and 70 Linked Clones desktops simultaneously from vSphere web client.

Measure the amount of time that the task took from vSphere web client.

Test Case 3: SvMotion

Perform a single Full Clone virtual machine storage migration with a single Eager zeroed thick 50GB virtual disk from one VMFS datastore to another in the same host.

Measure the amount of time that the task took from vSphere web client.

Test Case 4: Recompose

Perform a Recompose for 100 VM Linked Clone desktops with no Golden Image update from Horizon View Administrator.

Measure the amount of time that the task took from Horizon View Administrator.

Test Results

Table 7 describes the results of each test case. The entire workload is appropriate judging from storage performance metrics described in a later section. Almost all VDI admin experience in this test case is dramatically improved with FMD DC2 against SAS 10K disks. The boot test case looks equivalent from user-experience, but the backend storage performance is significantly different and improved with FMD DC2 as well.

The following are storage performance metrics while the boot test case is running:

- Average Storage Port Latency at approximately 0.8 milliseconds with FMD DC2 during boot
- Average Storage Port Latency at approximately 7.1 milliseconds with SAS10K during boot
- Average Disk Busy Rate at approximately 6 % with FMD DC2 during boot
- Average Disk Busy Rate at approximately 80 % with SAS10K during boot

Table 7. Test Results

Test Case	Number of VMs	Disk Size	Clone Type	Disk Type	I/O Characteristic	FMD DC2	SAS10K
Provision	1 VM	50 GB	Full Clone	Eager	Sequential Read/Write	33 sec	178 sec
Boot	100 VMs - 30 Full Clone - 70 Linked Clone	50 GB	Full Clone	Eager	Round Robin Read	11 sec	11 sec
		50 GB	Linked Clone	Thin			
SvMotion	1 VM	50 GB	Full Clone	Eager	Round Robin Write	42 sec	176 sec
Recompose	100 VMs	50 GB	Linked Clone	Thin	Round Robin Write	21 minutes and 18 seconds	35 minutes and 11 seconds

Average Disk Busy Rate

The average disk busy rate of FMD DC2 and SAS 10K are listed below:

- FMD DC2 was less than an average of 20 % with Provision and SvMotion.
- FMD DC2 was less than an average of 6 % with Boot and Recompose.
- SAS10K was more than an average of 80 % with all test cases.
 - This indicates that SAS10K was close to the performance limit.

Conclusion

In this validation, significant improvements were observed in the administrative tasks with Hitachi Virtual Storage Platform Fx00. It accommodates high performance with no hot spots and ensures high desktop user density with FMD DC2 flash module compression. Hitachi Virtual Storage Platform Fx00 covers all demands throughout the VDI lifecycle.

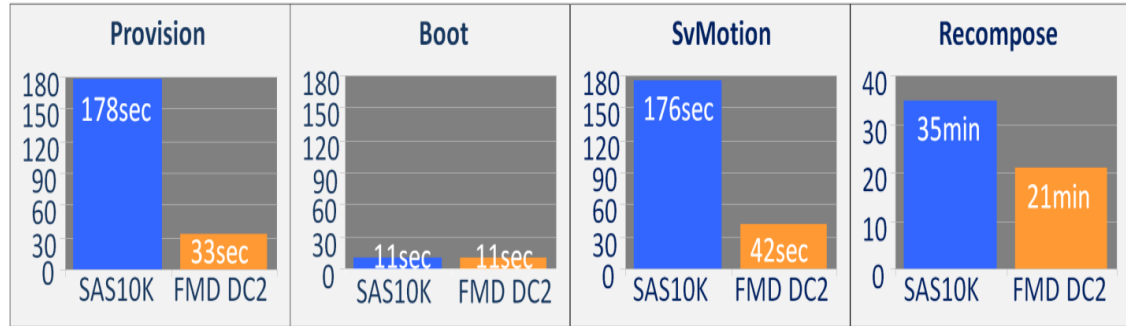


Figure 3

Appendix - VDI Sizing

This appendix shows how scalable Hitachi Virtual Storage Platform F800 is with FMD DC2 having tremendous high density, device capacity, and compression technology.

Using a power user profile with a single 20 GB virtual disk for the following estimation, the key factor affecting accommodation on the Flash device is not performance but capacity. So the key factor is inherent raw device capacity and the compression ratio comes from VDI user consumption. The compression ratio (% saving) used in this estimation was observed in the validation where Full Clone100 VM with 50 GB Eager Zeroed Thick provisioning for Test Case2 Boot was deployed.

The following points are taken into consideration:

- How many desktops can be accommodated in a single VSP F800 in terms of capacity.
- How many FMD DC2s are required for 2,500 desktops in terms of capacity.

Table 8. Number of Desktops a Single VSP F800 Can Handle in Terms of Capacity

Drive Type	FMD DC2 1.6 TB	FMD DC2 3.2 TB	FMD DC2 6.4 TB
RAID Level	RAID5 (7D+1P)		
Number of PGs	5 PG		
Number of FMD DC2s	40 FMD DC2 (at maximum configuration)		
Raw Flash Capacity	56 TB	112 TB	224 TB
Disk Size of Desktop	20 GB (full allocate)		
Saving (%)	60%		
Required Raw Flash Capacity per Desktop	11GB *		
Number of Users	5,091 Users	10,182 Users	20,364 Users

Table 9. Sizing for 2,500 Desktops in Terms of Caching and FMD DC2 Count

Drive Type	FMD DC2 1.6 TB	FMD DC2 3.2 TB	FMD DC2 6.4 TB
RAID Level	RAID5 (7D+1P)		
Disk Size of Desktop	20 GB (full allocate)		
Saving (%)	60%		
Number of Users	2,500 Users		
Required Raw Flash Capacity per 2,500 Desktops	27.5 TB *		
Number of PGs	3 PGs (33.6 TB)	2 PGs (44.8 TB)	1 PG (44.8 TB)
Number of FMD DC2s	24 FMD DC2	16 FMD DC2	8 FMD DC2

* Include a 90% margin of the savings and a 110% margin of the storage management capacity.

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