Virtualization Technology | Revolution of Virtual Desktop Infrastructure

Medhat A. MOUSA*

Abstract

Virtualization technology is a vital technology in the current datacenter, and according to the rapid business growth that includes Physical Server-Client and other network devices, therefore Virtualization technology vendors have developed Virtual Desktop Infrastructure (VDI) approach to overcome this issue by simplifying integration of the management process from workstation perspective as well as increasing the end user experience. Physical Hardware consumption such as shared storage is a problematic point and hard to solve, especially in the Small Medium Business infrastructure in this paper there is a project and its proposed solution, the solution has conducted by an experiment in order to show VDI development process. The paper show a significant Result compared to the traditional solutions such as Microsoft Remote Desktop Services. Also there are some simple recommendations regarding shared storage replacement with the local storage.

Keywords: VMware vSphere 4.1, View 4.6, Microsoft Hyper-v, CITRIX, VDI-In-a-Box, RDS, TCO, Hardware Resources Management, FT and H.

Introduction

At its simplest level, virtualization is a technology that fakes out hardware (Hsieh, C.), making an operating system thinks that it is running on a standardized hardware configuration. The software that handles this abstraction layer is called a hypervisor. An operating system runs inside of a virtual machine, which is just a container Managed by the hypervisor. The hypervisor manages and distributes the processor, memory and I/O resources between multiple running virtual machines.

Virtual Desktop Infrastructure (VDI) approach is most vital topic nowadays due to the rapid growth in the business operations, therefore management of the infrastructure has become more complicated, VDI has developed to overcome issues of the traditional session sharing "Microsoft Terminal Services or Microsoft Remote Desktop Services" RDS, over the last years when VDI has revealed by different Vendors Such as VMware view 5.0, CITRIX and Microsoft, whereas there have been some important issues that were under question such as the shared storage, which means in order to implement an VDI structure effectively, there should be an expensive shared storage, Solid State Disk (SSD) in place, and this for some reasons, like acceleration of the boot up process/extreme performance of the server-based Virtual Machines and the critical ones, as well as Fault Tolerant (FT) which means in order to provide the hosts by High Availability(HA) there should be a centralized storage/ shared storage. In addition the overall cost of the Software, Hardware and eventually complexity level of managing and troubleshooting the whole platform that includes Software and Hardware (Margaglione, J. ,2009).

Security of The infrastructure is very important in any Datacenter and according to VMware view 4.x and 5.x there is no possibility to establish VDI's infrastructure without Microsoft Active Directory Service (MSAD) for centralization and persona purpose (Inc, K., 2010),meanwhile if there is a group of external users who are accessing the Datacenter from untrusted environment there is no way to realize like this situation because the end user's account must be saved in advance in MS Directory Service (MSDS), this paper investigated this matter by using integration of virtualization technology, as well as it investigates a dynamic cost-effective technology.

Tthe performed experiment has proved that VDI can cut down the Total Cost of Ownership (TCO) especially from the storage side, and the result shows a significant reduction of the consumed Storage disk, the storage savings by 70%, meanwhile by integration of two different platforms VMware and CITRIX there are possibilities to eliminate the shared storage, Microsoft active directory as well as there is no need to install an VDI infrastructure on an identical servers grid.

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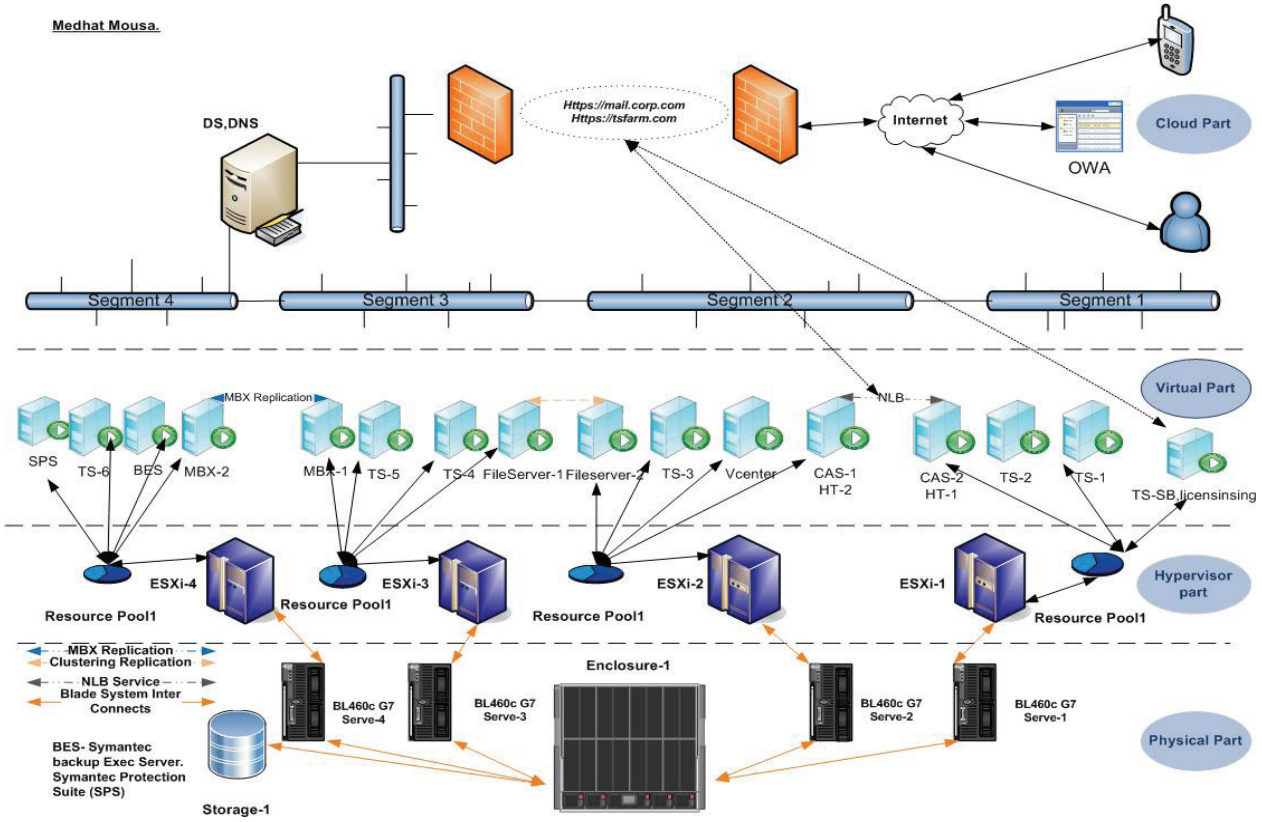

Figure 1: *Network Scheme with 4 different layers.* ***Author:*** *Medhat MOUSA (MS Visio 2010)*

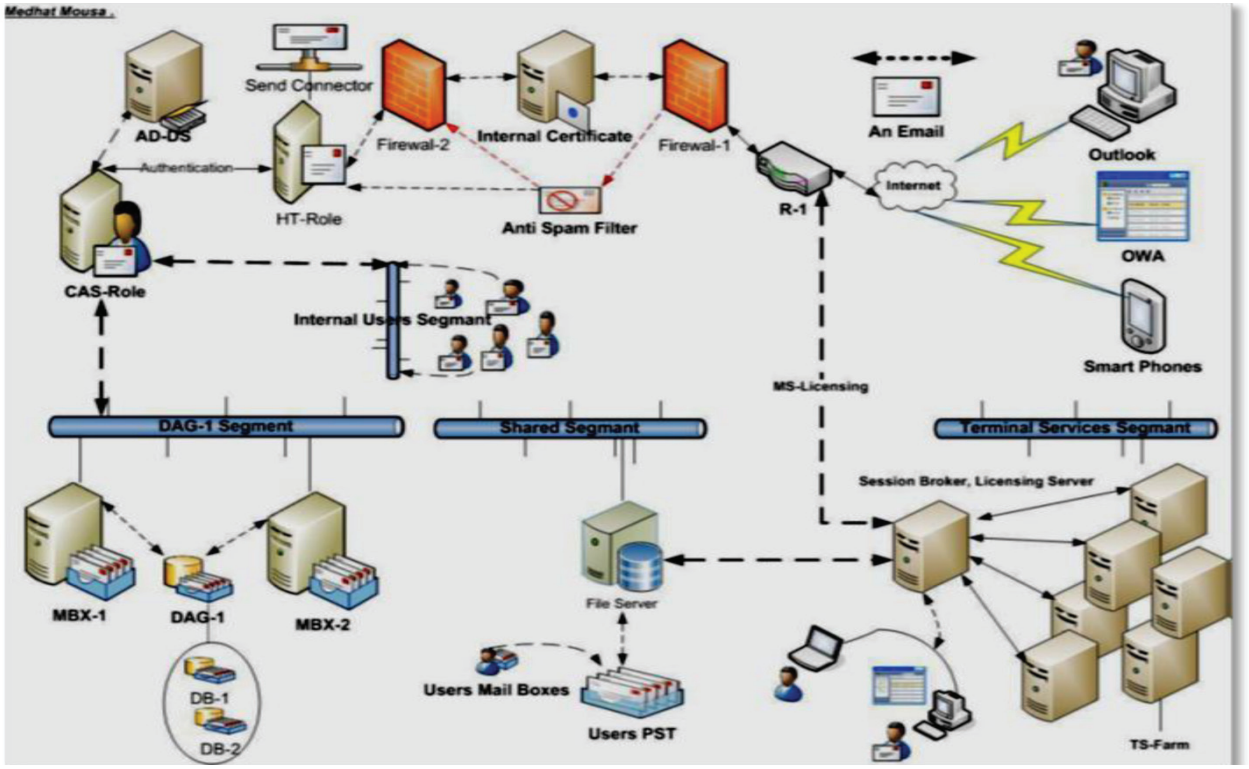

Figure 2: *Network Topology includes MS RDS farm.* ***Author:*** *Medhat MOUSA (MS Visio 2010)*

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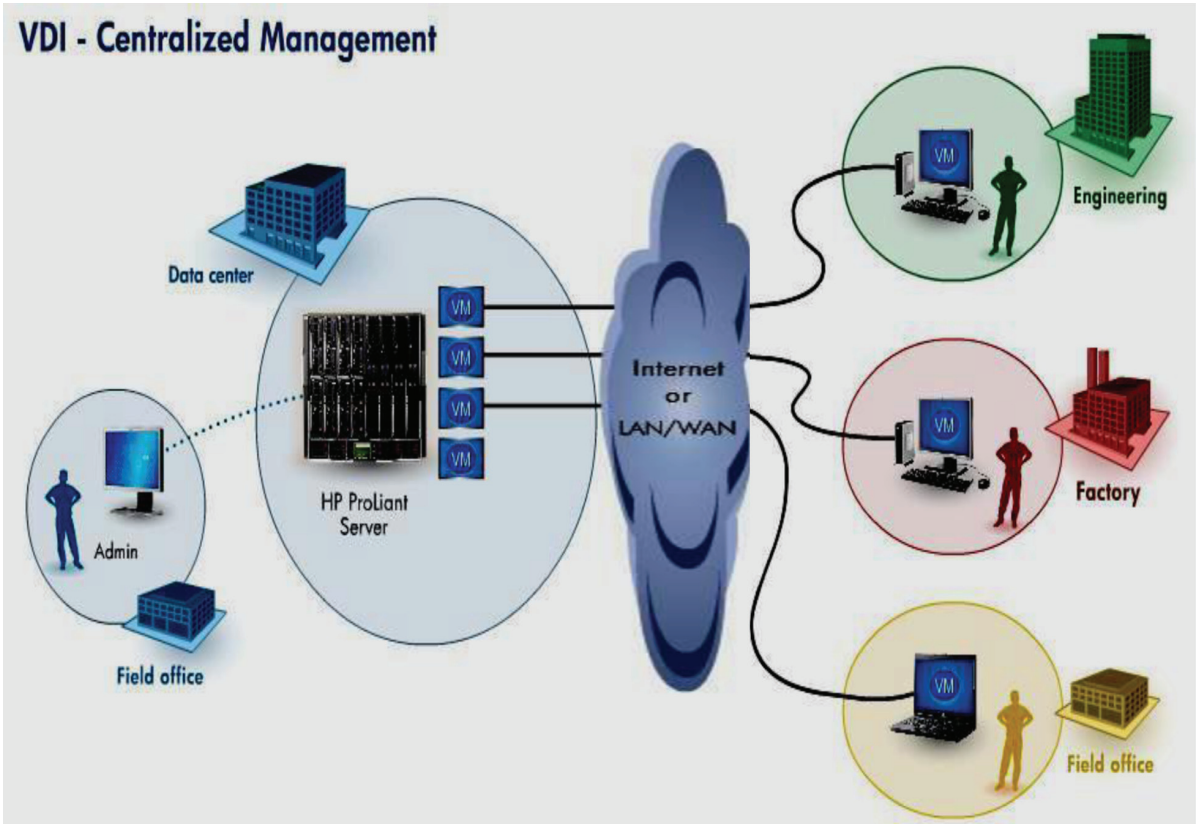

Figure 3: *Central administration of desktops by using VDI.* ***Author:*** *Medhat MOUSA (MS Visio 2010)*

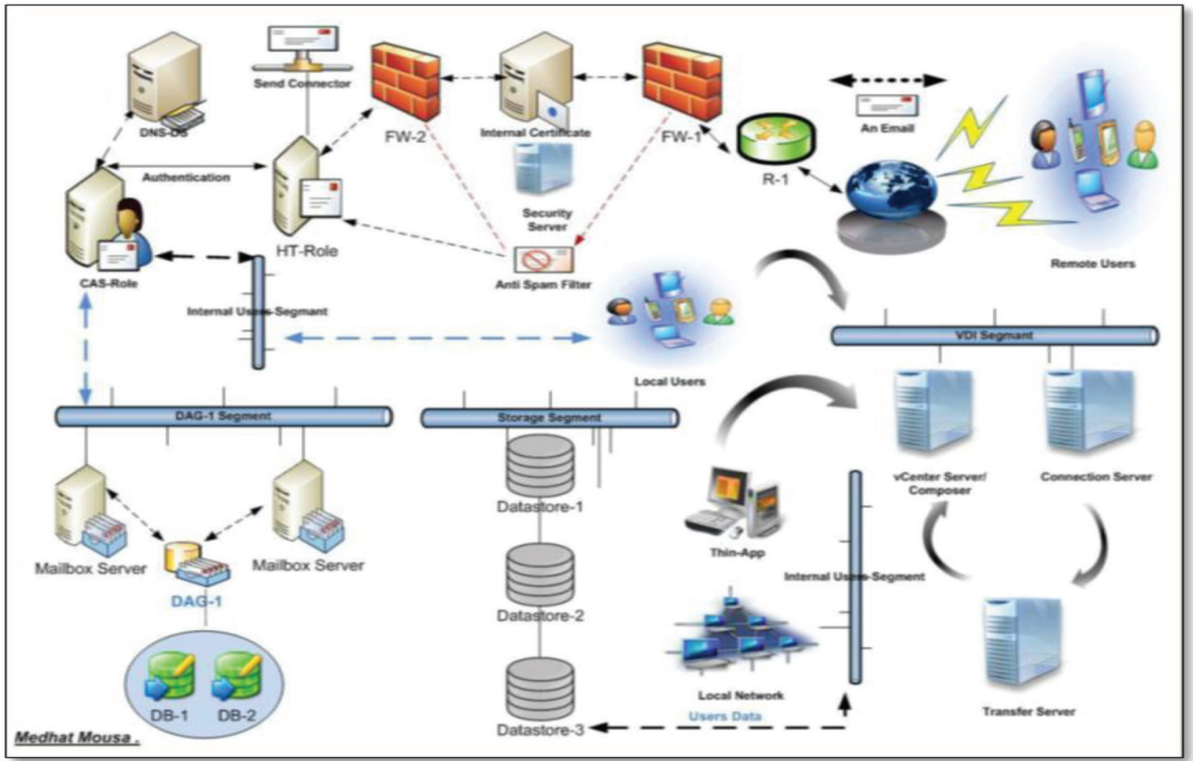

Figure 4: *Network Topology, after VDI integration and RDS farm Replacement.* ***Author:*** *Medhat MOUSA (MS Visio 2010)*

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The paper is organized as follows:

Section 1 discusses some Remote Desktop Service issues via a real project and how it is solved and developed by virtualization technology.

Section 2 presents the involved materials and the integration process.

Section 3 explains the obtained result of the performed experiment.

Section 4 as a discussion for demonstrate and clarify the previous section.

Section 5 highlights the conclusion and some simple recommendations.

1. RDS Issues

Since the Storage savings is an important area in any datacenter which means if there is an infrastructure consists of a certain number of users and almost of them using the traditional way to access their data and performing the daily business process (RDS), in such case the needed storage capacity will be increased significantly.

For instance, if there is an infrastructure which consists of many businesses operations that are based on many different applications and roles, Figure (1) Table (1), one of this important roles is TS/RDS, as The network scheme shows four layers (Physical layer, Hypervisor layer, Virtual layer, and Cloud Layer).

The physical layer consists of four servers and one shared storage, ESXis or vSphere 4.x Layer, Virtual layer that includes 16 VMs, and finally Cloud layer that includes external users and all external incoming connections.

Table 1: *The required roles in a real infrastructure.*

#Of Servers	The Desired Role
4x	Microsoft Exchange 2010
7x	RDS includes session broker
1x	Symantec endpoint protection
1x	Symantec Backup Exec
2x	file and Print Server (clustered)
1x	vCenter server

1.1 Some differences between RDS and VDI

According to figure (2) there are some considerations should be taken into our consideration such as:

- RDS sharing the same operating system, (W2k8 or W2k3).
- Every user has a profile which is located locally on the server or on a remote server such as File and print server.
- The end user is connected as a remote desktop user, not as an administrator, namely the user has not full access on the VM, rather on his profile.
- In case of the VM failure the administrator must interact to manage the issue to re connect the end user with another free VM, in case if there is no DRS farm with Network Load Balancing cluster (NLB) configured.
- TS or RDS does not consider storage cost savings but VDI does via a golden machine and the composer server with storage savings approximately 70%

1.2 Benefits and Protection of VDI

- Unified management of servers and desktops: Use a common management interface for administration of desktops and servers throughout the virtual infrastructure. Figure (3).
- Consolidated backup: Provide centralized backup for virtual desktops while helping to eliminate backup traffic from the network to improve performance.
- Automated failover and recovery: Make it easier to keep desktops running even when Server hardware goes down, and recovers quickly from natural disasters and unplanned outages.
- Dynamic load balancing: Help balance desktop computing resources automatically as User needs and application loads change over(www.hp.com).

2. Method and Materials

In order to realize VDI approach, here there is an experiment that has applied over the previous network schema figure (1) and figure (2), the Required network Scheme has changed, meaning there are some necessary servers that needed to be co-existed and integrated with the current infrastructure such as (composer Server, Security Server, transfer server, and connection server), Figure (4).

2.1 Some Major Changes

- Replace the TS Farm (7x servers) by VMware View that consists of View connection Server, Transfer Server, and security Server (3x servers in summary).
- The composer Server has installed on the vCenter Server according to VMware (VMware, I. ,2010).
- Security Server has installed on the Demilitarized Zone (DMZ) to reduce the attack surface and increase security.
- User profiles have transferred from the File/Print Server to a centralized LUN.

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● Internal and external user authentication and authorization will be done via security server in DMZ.

2.2 Materials

There are a few required servers by specific roles: (DC, DNS, DHCP, Security Server, View Manager, transfer Server, and vCenter Server).

This experiment aims to proof the following.

● Clarify how VDI is effective approach in terms of Storage reduction and manageability.

● Integration of VDI in a datacenter and how it is differ from RDS.

3. Empirical Result

In order to clarify the real consumed value of the installed shared storage, here snapshots are taken for configuration of the Logical Unit Number (LUNs)

Table 2: *Hardware Requirements*

Quantity	Specification
2x	Dell PowerEdge R610, 2P, 2.6 GHZ, 6 Cores, 24 LP, RAM ~ 40 GB
1x	PowerVault MD3200i (2 LUNs have been mounted).

Table 3: *Software Requirements.*

Quantity	Specifications
3x	MS windows 2008 R2 enterprise edition
1x	MS windows 7 32 bit edition
1x	VMware View 4.5
1x	VMware vSphere 4.1

3.1 Before Implementation

Identification	Status	Device	Capacity	Free	Type	Last Update	Alarm Actions	Storage I/O Control
Backup	Normal	naa.5000c50006...	136.50 GB	101.93 GB	vmfs3	4/19/2011 3:23:05 PM	Enabled	Disabled
Host-DS-1	Normal	naa.600508e000...	131.00 GB	99.86 GB	vmfs3	4/19/2011 3:23:05 PM	Enabled	Disabled
HOST-DS-2	Alert	naa.600508e000...	131.00 GB	9.43 GB	vmfs3	4/19/2011 3:23:25 PM	Enabled	Disabled
SoftLine	Alert	naa.6782bcb000...	299.75 GB	42.00 GB	vmfs3	4/19/2011 3:23:25 PM	Enabled	Disabled
VDI-Images	Normal	naa.6782bcb000...	999.75 GB	494.70 GB	vmfs3	4/19/2011 3:23:25 PM	Enabled	Disabled
VDI-Repli	Normal	naa.6782bcb000...	799.75 GB	799.16 GB	vmfs3	4/19/2011 3:23:25 PM	Enabled	Disabled

Figure 5: *Datastores capacities, the most important LUNs are VDI-image and VDI-Repli.*

VM	Host	Multipathing Status for VM	Space Used	Snapshot Space	Number of Virtual Disks
Trans-Ser-1	192.168.48.20	Partial/No Redundancy	254.00 GB	0.00 B	1
Security-Server	192.168.48.20	Partial/No Redundancy	48.01 GB	0.00 B	1
Gold-3	192.168.48.10	Partial/No Redundancy	25.00 GB	0.00 B	1
View Manager	192.168.48.10	Partial/No Redundancy	44.00 GB	0.00 B	1
Vcenetr-Server	192.168.48.10	Partial/No Redundancy	44.00 GB	0.00 B	1
DC-1	192.168.48.10	Partial/No Redundancy	21.00 GB	0.00 B	1
Gold-1	192.168.48.20	Partial/No Redundancy	20.00 GB	0.00 B	1
GOLD-7	192.168.48.20	Partial/No Redundancy	20.00 GB	72.38 KB	1
Gold-2	192.168.48.10	Partial/No Redundancy	25.00 GB	0.00 B	1

Figure 6*: The Golden VM (GOLD-7) has installed and configured by windows 7, 32-bit edition in addition Microsoft office 2007enterprise.*

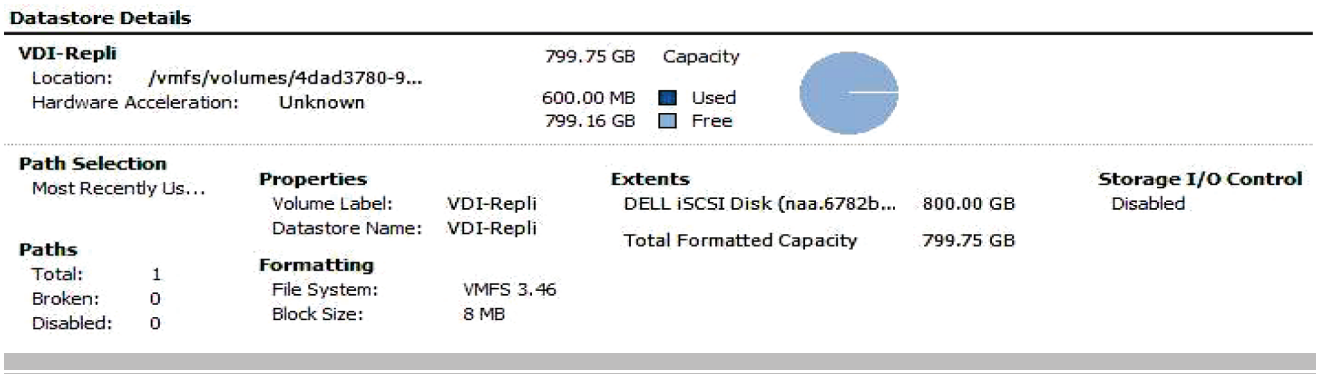

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***Figure 7**: Datastore VDI-Repli LUN capacity before the implementation.*

3.2 Result after the Implementation

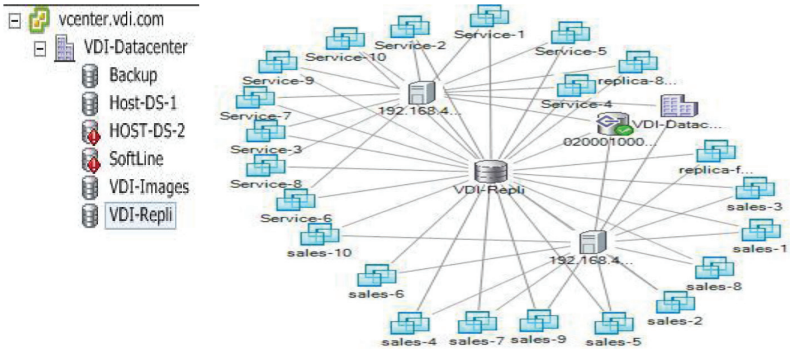

***Figure 8**: VMs relations with the datastores and 2 hosts.*

Identification	Status	Device	Capacity	Free	Type	Last Update	Alarm Actions	Storage I/O Control
Backup	Normal	naa.5000c50006...	136.50 GB	101.93 GB	vmfs3	4/19/2011 4:45:26 PM	Enabled	Disabled
Host-DS-1	Normal	naa.600508e000...	131.00 GB	100.86 GB	vmfs3	4/19/2011 4:45:26 PM	Enabled	Disabled
HOST-DS-2	Alert	naa.600508e000...	131.00 GB	9.43 GB	vmfs3	4/19/2011 4:45:26 PM	Enabled	Disabled
SoftLine	Alert	naa.6782bcb000...	299.75 GB	42.00 GB	vmfs3	4/19/2011 4:45:26 PM	Enabled	Disabled
VDI-Images	Normal	naa.6782bcb000...	999.75 GB	494.70 GB	vmfs3	4/19/2011 4:45:26 PM	Enabled	Disabled
VDI-Repli	Normal	naa.6782bcb000...	799.75 GB	725.41 GB	vmfs3	4/19/2011 4:46:13 PM	Enabled	Disabled

***Figure 9**: Datastores configuration after VDI implementation.*

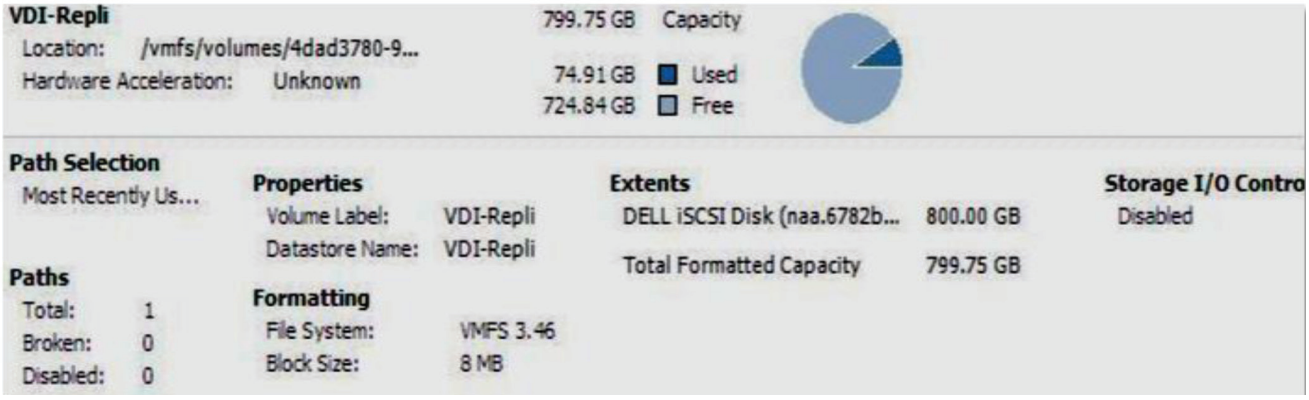

***Figure 10**: VDI-Repli LUN configuration after VDI implementation.*

4. Discussion

After the performed experiment and the obtained result, there are many points that can be taken into account such as:

- VDI has been developed for optimize administration of an infrastructure includes Server-Desktop.
- Backup and upgrade the client side has been simplified in addition batching and desktop provisioning has become simple and rapid.
- Usage and consumption of storage Disks has decreased significantly.
- Reduce desktop maintenance and expenditures.
- Improved end user experience by using Personal Computer over IP (PCoIP), Software Level Agreements (SLAs), and desktop business continuity.
- Improved security and compliance at the end user and infrastructure level of VDI. Also in order to analyze the obtained result and compare it with the theoretical approach of VDI, it is desirable to focus on the following figure (11),

According to aim of this Research, there are two layers that needed to be investigated. Replica-SSD which has initiated by creating the first Pool, and the Persistent Disk (D:\) drive which configured with 2 GB for each VM.

The performed experiment has been done by create

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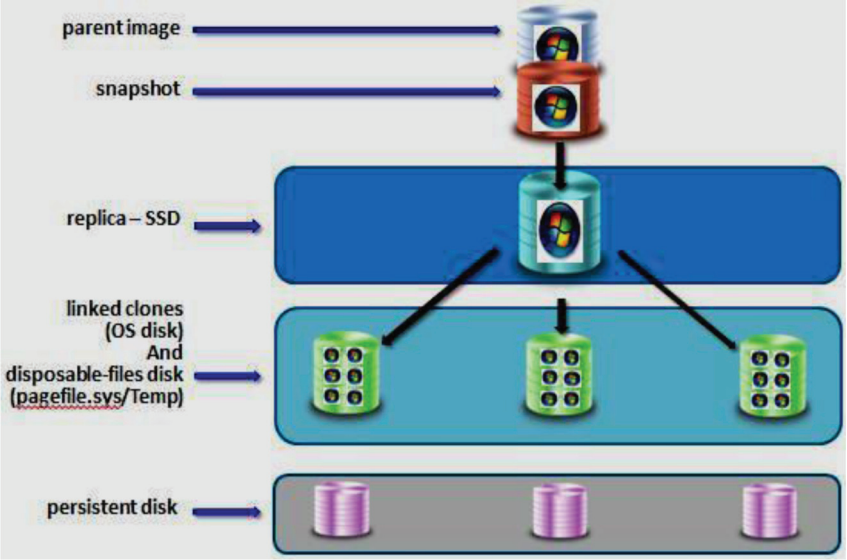

***Figure 11**: Consists of four important layers (Parent image, replica-SSD, linked clones, and persistent Disk).*

just two Pools/20 VM (Service Pool, and Sales Pool) every pool contains on 10 VM and each pool has different configuration, moreover the desired OS for the end user was windows 7 32-bit business edition with 20 GB for (C:\ ) drive which consists of (OS plus MS Microsoft office 2007).

5. Conclusion

In this paper there is a clear result from configuration of the shared storage capacity, so to subtract figure (10) form figure (7), the result could be clarified as follows:

- Consumption of storage disk for 20 VM resides on a (VDI-Repli) LUN, there is only 33.75 GB for (replica-SSD) layer therefore the remained space is about 40 GB "2*20", and has reserved for persistent disks (D:\) drive.

In order To accomplish the test scenario by any other traditional technique, regardless of the environment mechanism, the required storage space for 20 VMs approximately 400 GB, Meanwhile there are some other issues beside shared disk consumption that impacts negatively on the enterprise activity.

5.1. Recommendations

The following are some simple recommendations for organizations that are looking for a dynamic cost-effective way, platforms integration, and reducing surface attack.

- In case of reducing TCO, increasing Return on investment (ROI) and new establishment of VDI, the best way is to adopt "CITRIX VDI-in-a-Box " thereby there is no need to increase software license and hardware cost scale, especially from the shared storage perspective,
- In order to reduce the internal/external attack surface by isolating some untrusted group form VDI infrastructure's "MSAD", the best way is to implement VDI-in-a-Box.

Future Work

Future work will be connected by Security Exposure evaluation to the Virtual Machine configuration, and finding out possibility of building a robust environment that consists of multiple platforms in order to reducing the attack surface.

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