

Datacenter Virtualization with Optimization and Customization

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Abstract

The paper provides a way to provide virtualization administration as a service and also ways to customize, optimize and improvise the performance of latest available virtualization techniques. Till now virtualization provides utilization from 60-70% for hypervisor but there is no technique available to optimize the server and client associated with it. The paper delivers a solution which is oriented for VM administrators and VM providers. The solution once implemented will provide a secure, economical, interoperable, storage platform independent solution for virtualization setup for administrators. The implementation can be done in a few minutes but it will provide a boost to management of virtual machines from the base level. The security techniques discussed in paper can be improvised i.e. VPN and encryption can be implemented in place of port forwarding although it might affect performance.

Keywords: Virtualization, Virtual Machine, VM Administration, VM Optimization

1. Introduction

A huge transformation within the manner information and technology departments work has place their administrators and managers at completely different paths. Like one aspect, they have pressure to respond to higher authorities of service and be additional alert to enabling a step ahead in competition. While the opposite aspect, information industry square measure equally need to confined to to limit budgets, “do other and new things at no extra cost”, and show good return on investment from optimization view point. Major leaders of computer industry have started to solve either side of this collision by reviewing their time sharing i.e. virtualization methods. On real grounds thought-about the easiest method to drastically improve efficiency of physical machines i.e. infrastructure, virtualization has been used to show all the knowledge bases into self-enforcing, agile, services oriented architectures. These architectures will currently shoot up business goals and aggressiveness. Datacenter virtualization may be a totally different chance for IT.

The ability of price savings provides measure to a great level. Economical sharing of physical machine, disk, and connection resources interprets to so much lower capex and in operation's expenditure. Application silos square measure eliminated. Now virtualization on the info center position, knowledge bases will currently be compatible with additional applications and enforce them quicker, and maintain trusted level among clients. Information center virtualization additionally provides IT hands-on and administration and useful new ways for available resource programming, knowledge safety, and DR. Now, with the use of cloud computing being close to the horizon, Information and technology (science also) organizations additionally encounter other transformative scene: however best available knowledge centered virtualization as a platform to either request to use third-party cloud services PRN or, instead, make their own non-public cloud support — with several of an equivalent feasible and efficiencies introduced by third or more party cloud suppliers. For few organizations, complete knowledge center virtualization provides the foremost profit and a

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few corporations take information center virtualization even additional and build an extremely machine-driven, extremely standardized and deployable cloud model. Anyway, information and technology should change to additional economical and fast to satisfy rising business requirements and stay up-to-date and strategic beneficial to the business. By not virtualizing across the datacenter, a company can even risk losing profits in one space to disadvantages in another. It additionally make risky making operation challenges as virtualization shoot up. Virtualization was earlier and now also the simplest method to boost usage of physical servers. currently it is used to show complete datacenters into dynamic and efficient. In the project we are deploying virtual machines through VMware ESXi with Windows Server 2012 as the guest operating system and analyze their performance over different workloads. Also the vSphere client is made available remotely through Microsoft remote app, which makes the datacenter being available over the internet. Also iSCSI is implemented over this virtualized environment which made the datacenter robust enough to handle disaster by backing the data over secondary iSCSI storage platforms. Several customizations are also made to ESXi to make it compatible over the available resources. Virtual machines are not only deployed but managed and administered and complete data flow is optimized and analyzed. Efforts are made to exploit the capabilities of virtualization servers with minimum resources available so as to maximize performance and report the performance over different environment with limitations.

2. Problem and System Requirements

2.1 Optimum Maintenance and Modernization of PC-based Control Systems

Apart from the maintenance of the hardware platform, maintenance and updating of the installed software components are particularly crucial for the lifecycle costs of a PC-based control system.

The customer needs are concentrated especially on the following items:

- Optimum use of existing hardware

- Simple system expansions/updates
- Central administration and maintenance
- Fast and competent service
- Solutions from a single source
- High plant availability

The efficient updating, maintenance, and modernization of the system components used therefore include a substantial potential for optimization.

2.2 Requirements

- Minimum hardware requirements for Simple Install deployment of vCenter Single Sign-On, the vSphere Web Client, vCenter Inventory Service, and vCenter Server
- Host Hardware for Simple Install Deployments
- Processor- Multiple cored processor with minimum frequency of 2GHz
- Memory -12 GB.
- Requirements increase in case of database installed on vCenter server.
- Disk storage - 40-60 GB
- Actually it is based on number of virtual machines and there specifications
- Network speed 1 Gbps

2.3 ESXi Hardware Requirements

We need to ensure that all of these prerequisites are in place before proceeding with a new installation or an upgrade.

- DNS – Ensure that resolution is working for all system names via fully qualified domain name (FQDN), short name (host name), and IP address (reverse lookup).
- Time – Ensure that time is synchronized across the environment.
- Passwords – vCenter Single Sign-On passwords must contain only ASCII characters; non-ASCII and extended (or high) ASCII characters are not supported.
- Passwords – vCenter Single Sign-On passwords must contain only ASCII characters; non-ASCII and extended (or high) ASCII characters are not supported (Windows Installation Minimum requirements)

Installing vCenter Server 6.0 on a Windows Server

requires a Windows 2008 SP2 or higher 64-bit operating system (OS). Two options are presented: Use the local system account or use a Windows domain account^{1,2}. With a Windows domain account, ensure that it is a member of the local computer's administrator group and that it has been delegated the "Log on as a service" right and the "Act as part of the operating system" right. This option is not available when installing an external Platform Services Controller.

From VMware vSphere deployment guide we can conclude that:-

- The major problems that arise while installing, configuring and managing vSphere are: -
- ESXi 5.0 supports PCI Express network interface card (for realtek) but ESXi 5.5 does not support it. Also there are several legacy hardware which are unsupported by newer ESXi(s).
- As only 1 vCenter server can be installed on one machine thus there is a need of manually configuring all vCenters. Also the machine with vCenter can only run one instance of it and thus the performance of that machine is under-utilized.
- For each and every machine vSphere needs a different license so that it could run on multiple machines.
- iSCSI storage is supported by ESXi 5.5 and later but no proper solution is provided to deploy iSCSI storage over server.
- Also because of the lack of vCenters on single machine they need to be monitored manually from each machine and they can also not share their workload.
- vSphere has its client version but it is confined to local machine. While vSphere web client which can be accessed through internet keeps all the required ports open and it is not selective during port usage.
- vCenter once installed cannot be transported to other machines i.e. it lacks portability.

2.4 VMware vCenter Server

As the area of use and requirements of the vSphere client platform grows, tractability has been made even as necessary because everyday performance of programs. Enhancements created within the client platform and vCenter Server provide back end offer to flexibility to monitor and manage and scale the biggest virtualization framework. vSphere has improved benchmarks^{3,4}. Changes in the vSphere client and hypervisor has

phenomenally improved the benchmarks and value of this amazing platform with users being able to act many times quicker than they were able to do in vSphere's earlier versions. Major sectors and areas that define the new vSphere is single signing, improved HA and improved virtual NICs and better third party benchmarks, and one click actions. Also, information retrieval was abstracted, that additionally works to remove the load over vCenter Server. The conclusion is that the vSphere is a completely new expertise and ready to use than older editions of the vSphere. The vCenter server (VCSA) with database of postgres information currently compatible up to 1 thousand hosts and three thousand virtual machines. In vSphere five, support was restricted to little deployments of 0-400 host only and three thousands virtual machines⁵.

2.5 VCenter benchmarking

vCenter server five and six performance was checked on totally distinguishable lengths of infrastructure for an important employment of particular vCenter Server operational with a MSSQL Server 2012 information. Performance in operational turnover (measured in VMs operations per minute) was accumulated for all infrastructure sizes:-63- low sized infrastructure, 67-mid sized infrastructure, 73 for oversized one.

2.6 VSphere core

vSphere's core platform for the software structured datacenter is frequently being improvised to make sure it is still the very best acting platform to make all of your enterprise-level applications work. Changes in vSphere edition 4.0 embody support for even a lot of virtual processors and hosts, permitting administrator to consolidate a lot of programs on a number by stretching up (including more processors to each virtual machine) or contracting (excluding multiple processors). different add-ons to the core platform paid the way for future options Cloning and better graphics practicality through virtual ram. 128 processors and 4 terabytes of graphic memory^{6,7}. vSphere's sixth edition introduces the flexibility to run dinosaurs sized virtual machines with compatibility and support for 128 processors and 4 terabytes of graphic memory. This doubles the quantity of processors compatible with the earlier version and will increase the quantity of memory by four times. This feature (new one) permits you to handle giant workloads than earlier versions in an extremely big virtual machine

2.7 Storage

The elasticity of software-structured storage requires that performance of the Input and output stack is optimized for the quickest and lesser latency storage within the consumer region⁸.

2.7.1 vSphere Storage Optimization

Changes are created at the kernel level to scale back extra load and increase capabilities to smartly use flash storage. For virtual solid state storages, the vSphere service program in vSphere six was increased to form finishing stage for each thread. This interprets into bigger inputs and outputs per second . For now , Samsung virtual storage in vSphere six tackled two-forty thousand input outputs per second. Presently, in vSphere six not only one but all virtual machines make one million input outputs. Devices in this category within the method of being standardized. For PCIe solid state drives, postponed input output process resources were enforced within the vSphere's virtual kernel while not changing the service program. With this, it can additionally profit all flash storage area architectures. for instance, Associate in Nursing EMC XtremSF device antecedently drove to a couple of thousand input outputs per second, and currently handle a half of million per host. In each case, vSphere six is handling inputs and outputs at close to native system performance, achieving ultra levels, whereas implementation these days seldom need quite a couple thousand input outputs per host.

3. Our Solution

- Centralized licensing for Windows Server 2012 and no further network connections with VM because vCenter is a local machine by using Hyper-V.
- ESXi 6.0 is customized with vib files and thus increases the interoperability of hypervisor.
- Storage is not confined to local storage but VM can be transported to Iscsi client.
- DRS is not confined to VM but also vCenter servers are resource balanced and isolated not only by vSphere but also by Hyper-V in Windows Server 2012. Also because of vCentre as a VM it is portable to use.
- vSphere is transported through remote desktop file and only particulars ports are forwarded thus securing the network by closing unnecessary ports.

4. Implementation

- ESXi customization :
- The need to customize ESXi comes from a variety of regions , here we have customized it to make it compatible with Realtek Network Interface Card .
- This is made possible by using 'vib' files and integrating these files to ESXi through customizer .
- Here we have used ESXi customizer 2.7.1 to customize ESXi 5.5 .
- Steps :-
- Open ESXi customizer
- Select the iso image with path to be customized; here we have used image for ESXi 5.5 .
- Select the vib file to be integrated .
- Download the appropriate vib file for the required hardware from VMware website or the third party hardware driver website.
- Place it in the folder where ESXi customizer is installed.
- Select the path for the new image of customized ESXi to be stored .Note: It is a must to specify the same folder as that of customizer.
- Press enter and wait for the process to complete.
- After 5-10 minutes the process completes and the new customized ESXi image is ready in the source folder i.e. the customizer folder.
- Open this iso image with Power ISO and burn to appropriate media device i.e. either bootable USB drive or CD/DVD drive .
- Now the media is ready to be installed on the corresponding server with ESXi 5.5 .
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- Install and configure ESXi over the server (VMware vCenter Server™ 6.0 Deployment Guide) :-
- Choose the boot device option in server corresponding to the media available.
- ESXi boot screen will load and notify that all drive space will be formatted. Select and proceed with installation.
- After some time (according to hardware available) the ESXi will show dialog box with successful completion.
- Now provide the username and password to login to esxi in future.
- Once the ESXi is installed successfully it will reboot and later show the welcome window.

- By default the network configuration in ESXi is DHCP enabled but we can provide static IP address also.
- Also we can reset the configurations (including password and network) at a later stage.
- This is all we can do through in ESXi.
- Install and configure vSphere client with VM provisioning.
- Download the vSphere client 5.5 from VMware website.
- Run the setup file and follow the instructions to install vSphere.
- Once the installation is complete, run the application and enter the credentials used while logging in ESXi.
- The application will authenticate, load the plugins and inventory and later display the client window of vSphere 5.5.
- Now we can use the application, click on inventory.
- Right click on datastore and select new VM.
- Follow the steps by giving the name of VM to specifying the hardware configurations, username(with password).
- While asked for OS select the iso image of Windows Server 2012.
- Download the iso of server-12 from Microsoft website.
- Save it in base machine and upload it to the datastore by clicking configuration in client application.
- Select storage from menu in left.
- And now right click on datastore and select browse datastore.
- Provide the path of iso of server-12 in base machine.
- Wait for the iso to be uploaded.
- Install the OS server-12 as required by the user.
- Now we have deployed Win-Server-12 over ESXi.
- Remote desktop of VM with server OS
- Port forward the ports with number 902,203 to enable remote desktop for vSphere client .
- Also port forward HTTP, HTTPS to access the VM.
- Obtain the IP of VM through any means, here we have used whatmyip.com to obtain the IP address.
- Now with other machine with server OS and RDP enabled generate the RDP file and this RDP file can be used by any remote system.
- Now this RDP file once connected on any remote system will provide access to the VM having Windows Server 2012 stored on the local ESXi machine.

- iSCSI implementation over ESXi through client application (VMware Virtual SAN 6.0 Requirements (2106708))

Install any iSCSI agent on any of the required system other than that of ESXi machine.

- Now open vSphere client.
- Select the datastore and click on configuration in the menu.
- Select the storage adapter from menu in left and select new storage adapter from menu.
- Now enter the configuration of the iSCSI agent and click ok to confirm.
- Now other datastore will be available in the storage menu and VMs can be migrated to this iSCSI storage.

vCenter server provisioning and web client remoteapp implementation

- Now on the second system with 8GB ram install Windows Server 2012.
- Configure hyper-v and administrative domain services over it and create a VM with server OS over it. (9)
- Now promote the server to domain controller and add the VM to that domain.
- Install DNS services in server and add the name of VM to it which may happen automatically after ADDS role installation.
- Now the prerequisites for vCenter server installation are fulfilled and now install it over VM.
- Now install the vSphere web client.
- While accessing web client enter the credentials with suffix @vSphere.local in username and password as given during vCenter installation.
- Now port forward 9090 and 9443 through the modem and access the web client remotely by the procedure explained earlier.

4.1 Benefits Associated

- The Single DNS ,single time sync and single signon because different servers are residing over same machine.
- Centralized licensing for Windows Server 2012 and no further network connections with VM because vCenter is a local machine by using Hyper-V.
- ESXi 6.0 is customized with vib files and thus increases the interoperability of hypervisor.

- Storage is not confined to local storage but VM can be transported to Iscsi client.
- DRS is not confined to VM but also vCenter servers are resource balanced and isolated not only by vSphere but also by Hyper-V in Windows Server 2012.
- vSphere is transported through remote desktop file and only particulars ports are forwarded thus securing the network by closing unnecessary ports. (Loss of network connectivity when Cisco port security. (Loss of network connectivity when Cisco port security))
- Simple implementation of a virtualization solution, with prefabricated, configured, ready-to-use, tested systems
- Cost-effective and fast expansion of system components with ready-to-run templates.
- Optimum use of existing hardware resources
- Greater system flexibility and availability
- Lower expense and effort for system upgrades & updates
- Easy system management and all-inclusive support in conjunction
- Reduction of lifecycle costs of the system through improved energy efficiency.

5. Conclusion

The solution thus provides a number of benefits related to customization, optimization and utilization which are stated as follows:-

- Cost benefit as multiple vCenter servers are installed on same machine and thus increase utilization.
- *Ease of administration and monitoring as vSphere is available remotely and all vCenter servers are placed as VM.

- Interoperable ESXi with customization
- Secure vCenter Server because of limited port forwarding
- iSCSI support for VM storage

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