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Data Center Server Virtualization Solution Using Microsoft Hyper-V

Sujitha Dandu
St Cloud State University, dandusujitha@gmail.com

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Sujitha Dandu

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Dr. Dennis Guster, Chairperson
Dr. Susantha Herath
Dr. Balasubramanian Kasi

Abstract

Cloud Computing has helped businesses scale within minutes and take their services to their customers much faster. Virtualization is considered the core-computing layer of a cloud setup. All the problems a traditional data center environment like space, power, resilience, centralized data management, and rapid deployment of servers as per business need have been solved with the introduction of Hyper-V (a server virtualization solution from Microsoft). Now companies can deploy multiple servers and applications with just a click and they can also centrally manage the data storage. This paper focuses on the difference between VMware and Hyper virtualization platforms and building a virtualized infrastructure solution using Hyper.

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Chapter I: Introduction

Introduction

This chapter gives a brief introduction about virtualization and how Microsoft Hyper-V has evolved. It also discusses the problem statement and its nature and significance.

The technology of virtualization has turned into a vital part of our life. Very few non-technical individuals know about it. An important consideration of telecom organizations is that they look to enhance their IT-infrastructure. Microsoft has a wide range of products which a company can lower their total cost of ownership (TCO) and increase their return on investment (ROI). This document talks about what makes Hyper-V differ from other virtualization server based solutions, the benefits and the methodology of Hyper-V and SCVMM (System Center Virtual Machine Manager). There will be a point-to-point discussion on what virtualization is. The focus is on Microsoft Hyper-V technology and the initial steps for setting it up (Microsoft, 2017a).

Virtualization is the formation of a virtual rendition of an IT domain, including a working operating system (OS), a storage device, and so on. Virtualization happens on a similar platform of hardware subsequently introducing software - hypervisor. The hypervisor is an extra layer among the physical and virtual spheres; it deals with the hardware equipment assets so they are utilized productively among the virtual machines (VMs).

System resources are accommodated for VMs, and the hypervisor makes this delivery adaptable and contingent as well upon the current VM load and system policy approach. Guest software, which is utilized by end-clients, keeps running on the VM as if it is running specifically on the physical hardware. Both the application and the end client might be ignorant that they are working inside a virtual sphere.

Microsoft could not disregard the development of virtualization. Microsoft presented Hyper-V as a virtualization platform in 2008, and it kept on giving new Hyper-V types with new Windows server renditions. In this way, there are four variants, including Windows Server 2008 R2, Windows Server 2008, Windows Server 2012 R2, and Windows Server 2012.

Since Hyper-V's introduction, it has been a Windows Server feature, which could be introduced at any point a server administrator chose to do so. It is additionally accessible as a different product called Microsoft Hyper-V Server (Microsoft, 2017a). Fundamentally, Microsoft Hyper-V Server is a standalone and abbreviated form of Windows Server where Microsoft reduced everything immaterial to virtualization, administrations and Graphical User Interface (GUI) to make the server as efficient as possible. Also, without the additional overhead, the server requires less maintenance time and it is less vulnerable to failure.

Hyper-V is a lot easier to configure and manage when compared to dealing with Xenserver (a hypervisor platform developed by Citrix systems) to initialize configurations where they should come up with storage pools. So, for the space it has on a SAN (a dedicated network that interconnects and provide shared pools of storage devices to multiple servers) or some place to store the data, which is a common problem. But, when we deal with Hyper-V we use local storage and all our virtual machines can reside on that local storage if we want them to.

Hyper-V along with SCVMM help companies rapidly scale up their IT infrastructure and allow them to take their services to the markets more rapidly. SCVMM helps companies to rapidly provision, centrally manage and centrally patch all their servers and desktops. This is possible only when they deploy a Hyper-V server product suite, which allows companies to build and run numerous servers as virtual machines on top of Hyper-V Hypervisor. This paper mainly

focuses on how clients benefit when they move to virtualization (Server, Desktop) using Hyper-V.

Problem Statement

Many companies in today's competitive market lose their competitive advantage due to not changing rapidly with the market trends. Customers now want services faster, from anywhere and on any device. Companies have to rapidly provision, patch and recover services from any unplanned downtime. This paper also focuses on "How a company can rapidly provision and give services and manage and patch them centrally from a virtual datacenter alone".

Nature and Significance of the Problem

The problem is significant as all the issues explained in the problem statement are the same in almost every company throughout the world. Addressing the underutilization of resources, increasing the compliance and security has always been an issue for IT departments.

Summary

This research focuses on understanding the issues any company has in their IT departments. This research is focused on how solutions like Microsoft Hyper-V help companies to decrease their capital and operational costs and manage everything centrally and how the solution can address the problem statement mentioned above. Also, it discusses other research questions, which will be answered. Research questions or hypotheses are mentioned below:

1. How Hyper-V High availability works and how it is a cheapest solution for disaster?
2. How SCVMM talks to Hyper-V server, what happens in the background?
3. How Hyper-V helps in storage optimization?
4. How many virtual desktops can be built on a single Hyper-V server?

5. How should the storage be designed for Hyper-V?
6. How many IOPS (Input/output Operations per second) should a storage LUN (Logical Unit Number) be created for?

Finally, in this chapter it will be shown how Hyper-V along with SCVMM can help companies rapidly scale up their IT infrastructure as well as a brief introduction about the project.

Chapter II: Background and Review of Literature

Introduction

This chapter is about the literature review and the background of the project creating datacenter server virtualization using Microsoft Hyper-V. Microsoft is a multinational company founded in 1975; its best-known software products are the Microsoft Windows line of operating systems, Microsoft Office suite and web browsers. Hyper-V was first released alongside Windows Server 2008 and from then on it has become a staple of the Windows Server line, which focuses on virtualization, cloud computing, helping customers build robust datacenters, as well as helping customers in building a Software designed Datacenter (IEEE Xplore, n.d.-b)

Cloud Computing

Cloud computing is a way to access services over the Internet. There are three major delivery models in a cloud.

- IAAS (Infrastructure as a service): End users can get the bare metal hardware they need for their project needs. Examples of this include Soft layer, AWS (a secured cloud service platform from Amazon), Rackspace.
- SAAS (Software as a service): Software can be rented as a service from a cloud provider. Examples include Office 365 from Microsoft, Zimbra cloud suite, Google apps for business.
- PAAS (Platform as a service): A development platform with all required tools to build an application can be chosen from PAAS providers. Major players in the market include Salesforce, Microsoft Azure, and Google App engine.

All of the above services work on a pay as you go model of billing. A simplified example of a cloud service would be a cab service, which can be used for transportation but the user need not look after the cab maintenance and fuel. He pays for only what he has used (Cloud computing, n.d.).

Virtualization. Virtualization is a technology, which can help create virtual resources like servers, desktops, storage, and networks. The main goal is to transform traditional computing platforms to be more scalable and robust, by allowing running multiple operating systems on the same hardware (Techopedia, n.d.).

Types of virtualization. There are three types of virtualization: Server, Desktop, and Application (IEEE Xplore, n.d.-a.).

Table 1

Virtualization Types with Examples

Virtualization Type	Microsoft	Citrix	VMware
Server	Hyper-V	Xen Server	vSphere
Desktop	Med-V	Xen Desktop	View
Application	App-V	Xen App	ThinApp

Server virtualization. Virtualization of an operating system, which can run enterprise applications like SQL(Sever?), Oracle, Lotus Notes, Exchange Server, SharePoint, Web sphere administration server is called server virtualization. The products used are Hyper-V, Xen server and vSphere (Secure Link, n.d.).

Desktop virtualization. Virtualization of end user desktops allowing them to be run, managed and patched centrally which can help in achieving compliance and security is called

desktop virtualization. The various products used are View, Xen Desktop and Med-V (Tech Target, n.d.-a).

Application virtualization. Abstracting the application layer from an OS layer, making them run inside a bubble which has less interaction or no interaction with the OS. Benefits include running legacy applications on the latest operating systems, and also allow running any application on a single operating system even if there are conflicts. The products include ThinApp, Xen app and App-V (Application virtualization, n.d.).

Physical server types and models. There are three different server models available in the market—tower servers, rack servers, and blade servers.

Tower servers. A standalone server that is built in an upright cabinet. Models include: Dell power edge t420, HP ML 10 and IBM system X M5 tower (Tech Target, n.d.-c).

Figure 1. Dell Power Edge t420—an Example of a Tower Server (Tech Target, n.d.-c)

Rack servers. This server, also called a rack mounted server, which can be mounted on a server rack, which again has mounting slots and bays. This rack can securely mount the servers in the rack. Models include Dell Power Edge r730, HP DL 380, Cisco UCS rack.

Figure 2. View of a Rack Server from the Back End (Tech Target, n.d.-b)

Blade servers. A Blade server has a modular design, which consumes less datacenter space as well as power and is more efficient than Tower and Rack servers. Models include the HP c 7000 blade servers, Cisco UCS blade server, and Dell power edge blade servers.

Figure 3. Example of Blade Servers (Cisco, n.d.)

Microsoft Hyper-V. The Hyper-V server in Windows Server gives a chance to make a virtualized server processing environment where we can make and oversee virtual machines. It can run various operating systems on one physical device and segregate the operating systems

from each other. With this innovation, we can enhance the productivity of our computer resources and free up our equipment resources.

The Hyper-V empowers us to make and manage with a virtualized processing environment by utilizing virtualization technology that is inherent to Windows Server. Introducing the Hyper-V role configures the required segments and alternatively configures administrative tools. The required components incorporate Windows hypervisor, Hyper-V Virtual Machine Management Service, the virtualization WMI supplier, and other virtualization segments, for example, the Virtual Machine Bus (VMbus), Virtualization Service Provider (VSP) and Virtual Infrastructure Driver (VID).

The administration tools for the Hyper-V role are as follows:

1. GUI-based administration tools: Hyper-V Manager, Virtual Machine Connection, and a Management Console (MMC) snap-in which gives access to the video yield of a virtual machine so we can communicate with the virtual machine.
2. Hyper-V-particular cmdlets for Windows PowerShell. Windows Server 2012 incorporates a Hyper-V module, which gives command line access to all the functionality accessible in the GUI, as well as additional functions not accessible through the GUI.

If we utilize Server Manager to install the Hyper-V, the administration tools are added unless we explicitly reject them. On the off chance that we utilize Windows PowerShell to introduce the Hyper-V role, by default the administration tools are excluded. To introduce the tools, utilize the parameter–IncludeManagementTools.

Management tools of Hyper-V in Windows Server 2012 are intended to just deal with the Windows Server 2012 of Hyper-V. These tools cannot be utilized to deal with other versions of Hyper-V. But, the management tools of Hyper-V in Windows Server 2012 R2 can be utilized to deal with Hyper-V on Windows Server 2012 R2 and Windows Server 2012.

The Hyper-V role virtualizes equipment to give an environment in which we can run different operating systems at the same time on one physical PC. Hyper-V enables us to make and deal with the virtual machines and their tools. Every virtual machine is isolated; creating a virtualized PC framework that can run its own particular operating system. The system that keeps running inside a virtual machine is known as a guest operating system.

Hyper-V is a type 1 or bare-metal virtualization software on which multiple operating systems can be built and run simultaneously. Hyper-V has a OS kernel, which intelligently shares the resources from the hardware on which it is running to all the virtual machines. This is also called a virtual machine monitor (Microsoft TechNet, 2016b).

Hyper-V architecture. Hyper-V executes segregation of virtual machines, which is called a partition. A partition is a logical unit and supported by the hypervisor, in which every guest operating system executes. A hypervisor needs to have no less than one parent segment or parent partition, running an updated version of Windows Server 2008 or later versions. The virtualization stack keeps running in the parent segment and has access to the equipment devices directly. The parent segment then makes the child segments also called child partitions, which host the guest operating systems. A parent partition makes child partitions utilizing the hyper call API, which is the Hyper-V given application programming interface (Microsoft TechNet, 2010a).

The child partition does not have permissions to the physical processor, nor does it handle its genuine interfaces. Rather, it has a virtual perspective of the processor and keeps running in a Guest Virtual Address, which will be contingent upon the settings of the hypervisor, and may not really be the whole virtual address space. Depending upon the VM setup, Hyper-V may uncover just a subset of the processors to every segment. The hypervisor handles the interfaces to the processor, and sidetracks them to the individual segment utilizing a Synthetic Interrupt Controller (SynIC). Hyper-V can accelerate the address interpretation of Guest Virtual Address-spaces by utilizing second level address interpretation given by the CPU.

These child partitions do not have access also to equipment resources directly, yet rather have a virtual perspective of the resources, regarding virtual tools. If there is any request to the virtual devices, it is diverted by means of the VMBus to the devices in the parent segment, which will deal with the requests. The VMBus is a legitimate channel which empowers communication between inter-partitions. The results are additionally diverted by means of the VMBus. In the event that the tools in the parent segment are additionally virtual devices, it will be diverted further until it achieves the parent segment, where it will access the physical devices. Parent partitions run a Virtualization Service Provider (VSP), which interfaces with the VMBus and handles devices, which get to the access request from child partitions. The virtual devices from a child partition run a Virtualization Service Consumer (VSC) internally, which sends the request to VSPs in the parent segment by means of the VMBus. Virtual devices can likewise exploit a Windows Server Virtualization for capacity, systems administration and for graphic subsystems. This whole procedure is transparent to the guest operating systems.

Hyper-V supports isolation in terms of partition. It is a logical unit of isolation, supported by the hypervisor, in which operating systems execute. The Microsoft hypervisor must have at least one parent, or root, partition, running Windows Server 2008 64-bit Edition. The virtualization stack runs in the parent partition and has direct access to the hardware devices. The root partition then creates the child partitions which host the guest operating systems. A root partition creates child partitions using the hyper call application programming interface (API) (Microsoft TechNet, 2010a).

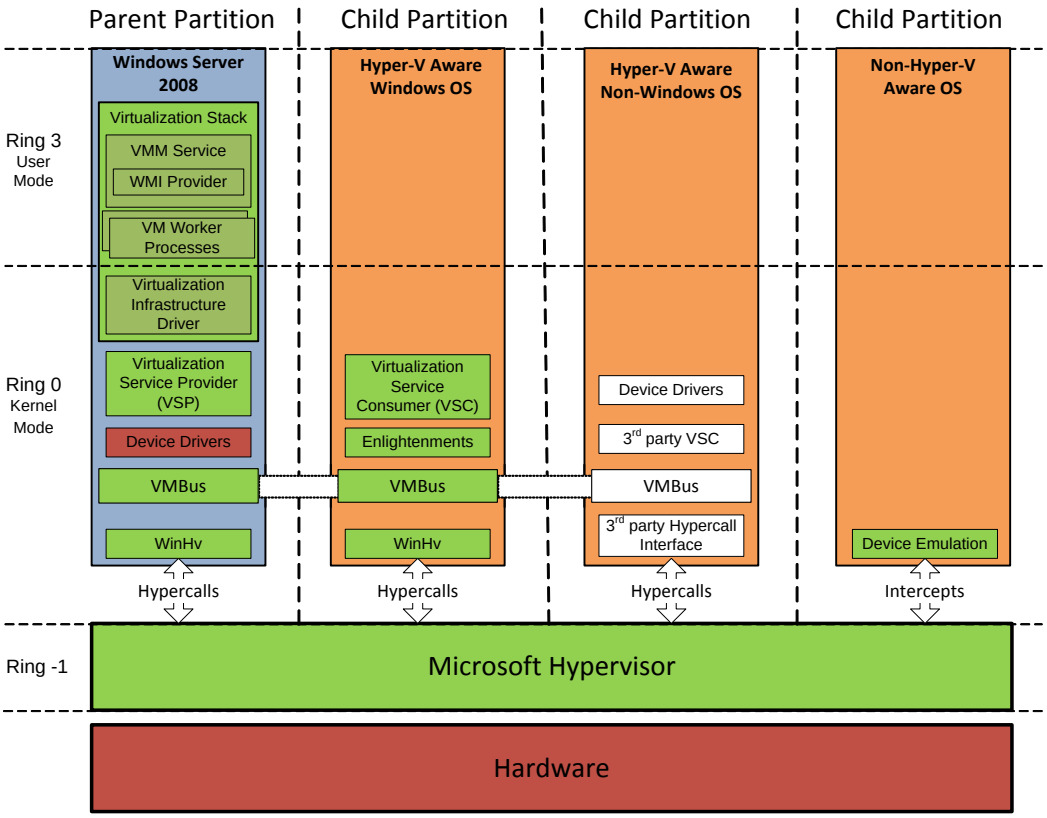


Figure 4. Hyper-V Architecture—Basic Structure of How Hyper-V Works (Microsoft TechNet, 2010a)

Virtual machine. A software computer, which is built on a Hyper-V server, which just acts a physical computer offering the same levels of performance as a physical computer (IEEE Xplore, 2016b).

Hyper-V manager. Which is used to help manage to Hyper-V standalone servers, which has got plug-in for different solutions, like create/manage Virtual missions, Network and Snapshot. Also, it can delete the virtual machines installed from it (Tech Genix, 2014). It is a tool where an Admin can manage a local host with Hyper-V in it and a limited number of remote hosts adding to a single Hyper-V manager.

Figure 5 shows the screenshot of a Hyper-V manager.

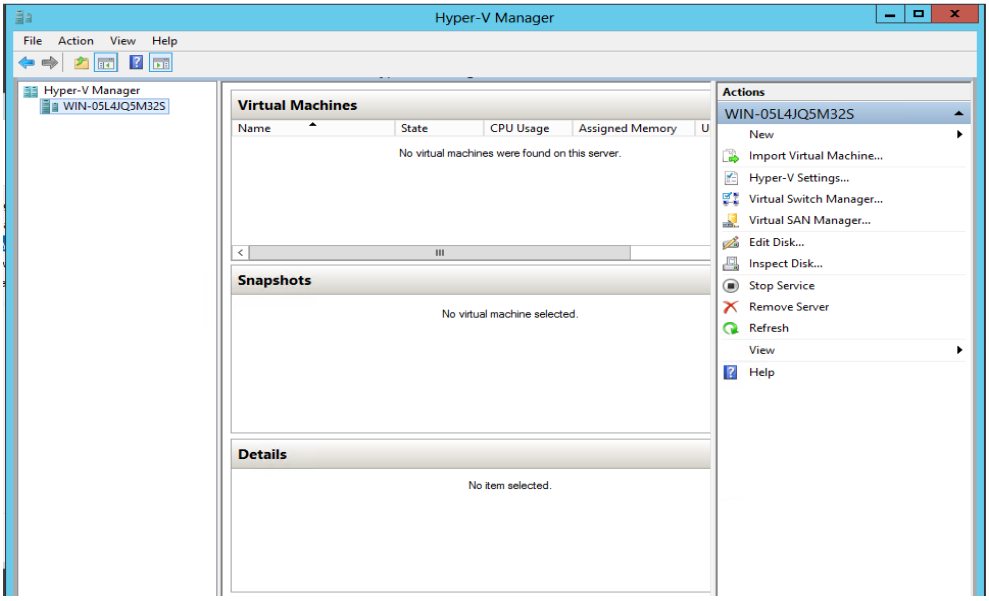


Figure 5. Hyper-V Manager—Views from Windows Server 2012

Database. A database is software, which can maintain data in a structured and tabular format. Some of the examples include SQL server and Oracle 10 G. Several components in this project require a database. SCVMM server requires a database to store all the information regarding the Hyper-V and the virtual machines it manages (Database, n.d.).

Active directory (domain controller). Active directory is also one other key component of a VMware environment. It integrates with SCVMM to provide centralized access to all the virtual machines on Hyper-V (IEEE Xplore, 2016c). It is a server running AD DS, this Active Directory Domain Services (AD DS) stores the data and manages the connection between users and domains. It maintains the authentication and user logon processes.

Live migration. Live migration is a Hyper-V feature in Windows Server 2008 R2, which requires the failover clustering feature to be added and configured on the servers running Hyper-V. Live migration allows you to transparently move running virtual machines from one node of the failover cluster to another node in the same cluster without a dropped network connection or perceived downtime. In addition, failover clustering requires shared storage for the cluster nodes. This can include an iSCSI or Fiber-Channel Storage Area Network (SAN). All virtual machines are stored in the shared storage area, and the running virtual machine state is managed by one of the nodes (Tech Target, 2006).

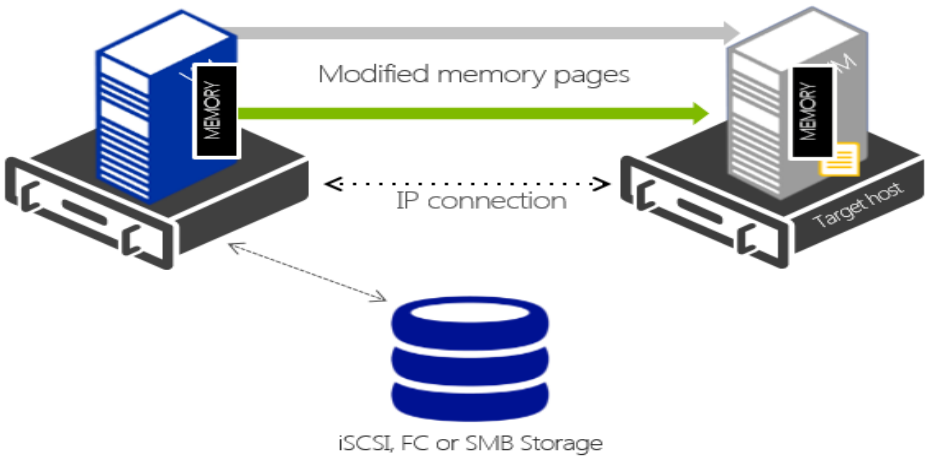


Figure 6. Live Migration (Tech Target, 2006)

Hyper-V in Windows Server 2008 does not deal with live migration of guest VMs where live migration can be characterized as keeping up network connections and continuous services during VM relocation in physical hosts. Rather, Hyper-V on Server 2008 Enterprise and Datacenter supports “quick migration”, where a guest VM is installed on one host and continued on another host. This operation happens in the time it takes to exchange the dynamic memory of the guest VM over the system from the main host to the second host (Tech Target, 2006).

With the Windows Server 2008 R2 release, live migration is upheld with the utilization of Cluster Shared Volumes (CSVs). This takes into consideration failover of an individual VM instead of the whole host having to failover (it appears that when a node which is not a VM, a Hyper-V server, comes down) then each VM running on that node may relocate to different nodes which are autonomously of different VMs on similar LUN which will be shared to the node which came down. In Hyper-V, the Hyper-V nodes will be clustered not the VMs.

Windows Server 2012’s usage of Hyper-V version 3.0 acquainted numerous new components for an increase in VM mobility, including the capacity to execute synchronous live migrations (Windows Server 2008 R2 just gives live migration on a single VM at once, as it requires a very long time to migrate the tasks). The only drawback is equipment and network bandwidth accessibility. Windows Server 2012 additionally supports shared nothing live migration setting, Windows Server 2012 which completely supports the live migration of VMs on SMB, whether it will be a live system migration.

Hyper-V under Windows Server 2012 also allows the feature to relocate a running storage of VM’s, where a dynamic Virtual Machine storage can be moved from one hardware

onto the next without the VM's workload being influenced, further limiting the connections with VM mobility.

With the release of Windows Server 2012 R2 version, SMB 3.0 was coming into existence as an option for Live Migration between clustered or non-clustered virtualized systems. This allows Hyper-V Live Migration to influence the pros that SMB 3.0 has. SMB Multichannel and SMB Direct are mostly used for having Live Migration performance increased.

Where no storage shared is required keeping complete the migration process. Likewise, Live System Migration in which shared nothing live migration will migrate a running VM and its storage starting with one Hyper-V then onto the next with no apparent downtime. Live Migration between various host OS releases is impractical, despite the fact that this is tended in Windows Server 2012 R2.

Windows Server 2012 likewise released a feature to utilize SMB shares as a shared storage alternative, easing the requirement for costly SANs. This is especially valuable for low cost situations, without the need to give up execution because of the numerous enhancements to the SMB3 stack.

Storage Migration

Storage Live Migration provides the ability to move your virtual machine storage while your VM is running. In comparison, Storage Live Migration is similar in offering to the VMware storage offering called VMotion. The virtual hard disks used by a virtual machine can be moved to different physical storage while the virtual machine remains running making it unnecessary to take a virtual machine offline to move the VMs files to different physical storage (Microsoft TechNet, 2014).

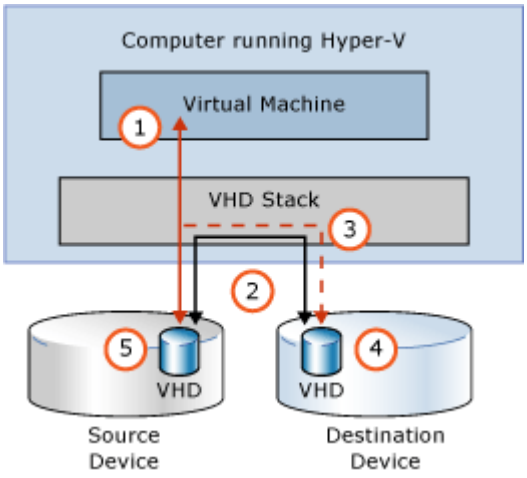


Figure 7. Storage Migration (Microsoft TechNet, 2014)

High Availability/Failover Cluster

The Failover Clustering feature enables you to create and manage failover clusters. A failover cluster is a group of independent computers that work together to increase the availability of applications and services. The clustered servers (called nodes) are connected by physical cables and by software. If one of the cluster nodes fails, another node begins to provide service (a process known as failover). Users experience a minimum of disruptions in service (Microsoft TechNet, 2010b).

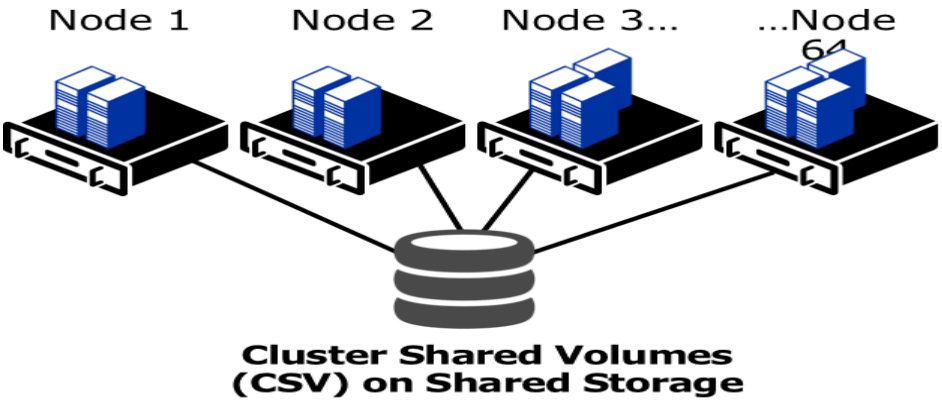


Figure 8. High Availability (Microsoft TechNet, 2010b)

SCVMM Server

System Center Virtual Machine Manager (SCVMM) is Microsoft's virtual machine supported place for Windows-based computers. SCVMM maintains Microsoft's attention on proficiency with elements to help management merge different physical servers inside a virtualized environment.

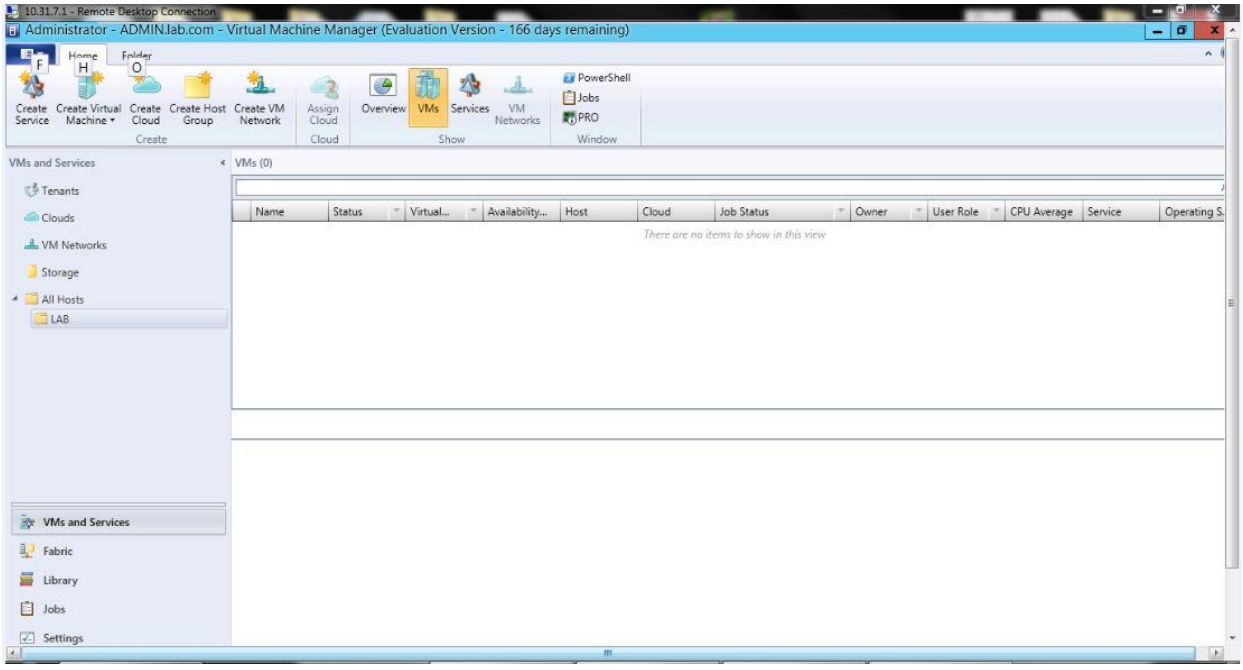


Figure 9. Virtual Machine Manager

Before Virtual Machine Manager, management utilized Microsoft's Virtual Server based products to address their issues, including the creation and administrating of virtual machines. Virtual Server came in two types, Standard and Enterprise versions in the 2004 release.

Microsoft gave the updated edition, Virtual Server 2005 R2 in 2006, which is still utilized as a part of a small business version today.

At the point when Virtual Machine Manager was sent in 2007, it turned as a go-to program for virtual machine administration from Microsoft. Initially intended to expand on Virtual Server, Virtual Machine Manager was later added to the System Center product offering and is currently a standalone system. Some of the core components like Manager Server, manager database, library server, virtual machine host and Administrator console which are advanced functionalities make up the establishment of SCVMM's.

VMM Architecture

Virtual Machine Manager (VMM) is a management solution for the virtualized datacenter, enabling you to configure and manage your virtualization host, networking, and storage resources in order to create and deploy virtual machines and services to private clouds that you have created (Microsoft, 2017b).

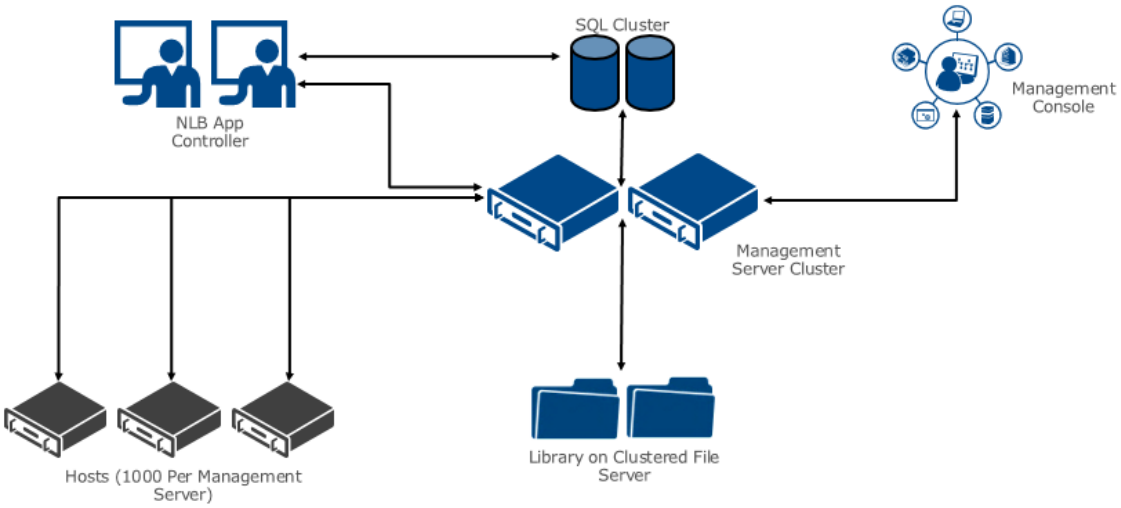


Figure 10. VMM Architecture (Microsoft, 2017b)

VMM is the management solution for virtualized resources. In the context of cloud computing, virtualization now encompasses three disciplines. In addition to server virtualization which many IT professionals are familiar with, network virtualization and storage virtualization are included as the three resource pools to together form the so-called fabric (Microsoft, 2017b). There are numerous components that we need to aware of before starting the process.

The first important component is the VMM Management Server. This is the segment that does the majority of the work in SCVMM. It is the center Virtual Machine Management Server part that oversees command processing and for running the VMM services. The management server is likewise maintaining coordination between different components.

The next is the VMM database. The VMM database is a SQL Server database that saves all the settings that are utilized by System Center Virtual Machine Manager. This database additionally stores things like profiles and templates that are requested.

The third part is the VMM console. The VMM console is the graphical UI for System Center Virtual Machine Manager. At the point when working with System Center Virtual Machine Manager, we will complete most of our work on this project.

Summary

This chapter summarizes the Cloud computing and types of virtualization available. It illustrates the Hyper-V architecture and how it empowers companies to make and manage changes with a virtualized processing environment by utilizing virtualization technology.

It also discussed the important component of the VMM library server, the library gathers components that can be utilized for virtual machine configurations. These components can incorporate things like virtual hard disks and service templates.

Chapter III: HYPER_V vs. VMware

Introduction

In this chapter, it mainly focusses on Microsoft Hyper-V technology and why it is better when compared with other virtualization technologies such as VMware. It introduces VMware technology and discusses the advantages and disadvantages of using HYPER-V and VMware virtualization.

Virtualization continues to be one of the hottest areas in business IT. Gartner (Red Hat Enterprise Linux, n.d.) reported that segment of all server workloads is presently virtualized. Whether an enterprise has most of its servers in the cloud or is thinking about a first-time migration, it is important to consider the role of a hypervisor.

A hypervisor is a software, firmware, or equipment that makes and runs virtual machines. The hypervisor presents virtual or guest OS's to virtual machines and deals with the execution of these virtual workstations, which can be comprised of various operating systems. The optimal hypervisor can guarantee usability, adaptable allocation of resources, and limited interruption to each of the operating systems being used.

Two of the most well-known options for hypervisors are vSphere, a VMware designed product, and Hyper-V, developed by Microsoft. The is by the professionals discussing the pros, cons, and costs of Hyper-V and vSphere (Red Hat Enterprise Linux, n.d.).

Microsoft Hyper-V

Microsoft Hyper-V is intended to offer enterprise grade virtualization for organizations with onsite servers or in the cloud. This choice is a typical one for enterprises who need to

virtualize workloads, set up a private cloud, scale benefits through an open cloud, or all three together.

Hyper-V is incorporated into Windows Server, or can be configured as a standalone server, known as Hyper-V Server, both of which can facilitate the gathering of information for virtualization management of Microsoft affiliated products. It offers a set of integrated tools, for enterprises to migrate to physical servers, a private cloud, an open cloud, or all three choices at the same time.

Table 2

Pros and Cons of Microsoft Windows Hyper-V

Hyper- V Pros	Hyper-V cons
1. Can send new virtual servers within few seconds.	1. Hyper-V 2012R2 can only support a set number of guest OS decisions
2. Upkeep does not give results about downtime	
3. Easy live migrations	2. Requires Windows OS updates during lifetime of the product
4. Simple backups	
5. Exhaustive security through Windows Active Directory	3. Does not have the ability to back up for RemoteFX and Service Templates in System Center Virtual Machine Manager 2012 R2
6. Lowered cost of operation	

VMware vSphere

VMware vSphere is a mainstream hypervisor option for enterprises planning to accomplish some level of virtualization. Currently on version 6.0, vSphere is exceptionally configurable, which can make it an appealing option for organizations that are either going completely virtual or deciding to create a hybrid approach.

There are a few distinct versions of vSphere available, and are based upon administrative needs of the organization. VSphere Standard, Enterprise Plus, and Operations Management Enterprise Plus offer components that will differ and degrees of fault tolerance, permitting enterprises to choose the best version for their needs and development objectives.

Table 3

VMware vSphere Pros and Cons

VSphere Pros:	VSphere Cons:
1. Most utilized platform. 2. Accessibility of high-quality support 3. May be an ideal fit for large enterprises 4. Wide OS support 5. Offers access to administrative abilities 6. Straightforward page sharing 7. Higher guests per host are offered (512 versus 384)	1. Free and trial versions do not offer full functionality 2. Reported steep learning curve

A numerous number of different factors must be taken into consideration when it comes to the comparison of Microsoft's Hyper-V versus VMware's vSphere. To begin with, the objective of the enterprise and the features required for various sizes of configurations. The necessities change broadly depending upon the number of virtual machines and these requirements will drive the design and setting decisions. Second, there is the subject of management, which is also dependent upon the extent of the installation. Though we should consider various issues, including cost, execution, adaptability, and convenience.

At one time, Microsoft's solution was for smaller business and VMware's was for larger organizations, yet that is no longer the case. VMware services can also appeal to smaller business, and Microsoft now has the components to compete at the larger enterprise level. Microsoft and VMware both make it simple to begin small while allowing to scale up as the virtualization environments develop. But they both take divergent ways to meet this objective.

Consistent or accurate with the operating system, Microsoft groups the full extent of virtualization abilities into it. With Windows Server 2012, or the free Hyper-V Server 2012, we can make high-availability Hyper-V clusters and can utilize advanced features, for example, storage migration, VM replication, and even system virtualization. As numerous hosts and VMs are created, we can increase the management and mechanism capacities by installing System Center 2012.

In contrast, VMware vSphere incorporates the central management system, vCenter Server, as a feature of the setup. While we can virtualize servers to our heart's content utilizing the free VMware ESXi hypervisor, the vCenter Server is expected to develop high-availability and open features, for example, live migration, replication, and the conveyed virtual switch. These capacities and more are accessible on a sliding scale as you move up each step of vSphere version.

Focusing on the Small Business Client

Regardless of the size of the organization, our main requirement should be to keep our servers running. High availability (HA)—which includes distinguishing when a physical host is down and rebooting its guest VMs on another host—is a feature that will matter to an enterprise of any size. Both Microsoft and VMware put HA into their small business versions.

The capacity to make high-availability clusters is not given in either Windows Server 2012 Hyper-V or the free Hyper-V Server 2012; however, Hyper-V can now influence new capacities in SMB 3.0 that give even the smallest business the capacity to stand up a HA cluster utilizing minimal cost servers and product SAS circle drives. There is no longer a need for Fiber Channel or an iSCSI SAN.

With Windows Server 2012 Microsoft introduced Hyper-V Replica. Hyper-V Replica provides boundless host-to-host replication of virtual machines without shared storage. As such, we needn't bother with grouping, however it is possible to recreate to a cluster on the off chance that you have one. To enable replication is relatively easy, and it's completely configurable from the Hyper-V Manager customer.

VMware conveys high availability to small businesses with the vSphere Essentials Plus version, which gives us a chance to make a HA cluster of three hosts. For those who need to reduce the expenses of a costly SAN or NAS, Essentials Plus incorporates the vSphere Storage Appliance (VSA). Software that permits us to execute HA by transforming the internal storage of three vSphere instances into a solitary, excess, and shared storage pool. Essentials Plus likewise incorporates host-to-host VM replication.

As essential as high availability is, it is also important to have live VM migration. The capacity to move running virtual machines from host to host, without disturbing applications and clients, live migration can mean a huge difference among uptime and downtime when the time wants hardware support or upon the gradation.

If we automate live migrations in view of resource utilization and thresholds, we can adequately balance the VM workload over most of the virtualization hosts. This is an element

that gets to be essential as we create a high number of hosts and the number of VMs per each of the hosts. Computerized VM load balancing is accessible in VMware's Enterprise and Enterprise Plus releases, and it requires System Center 2012 to be executed with Hyper-V. VMware can likewise computerize workload balancing over different storage devices; storage load balancing is accessible just in the Enterprise Plus version.

Management Tools

As per to the technologist's surveys of Windows Server 2012 Hyper-V and VMware vSphere 5.1, they tried vSphere together with vCenter Server, also Windows Server 2012 Hyper-V without System Center 2012. They did not inspect the higher-end administration and automated tools, instead they centered on the administration tools that smaller businesses would depend on.

At the low end, Microsoft gives us an essential arrangement of tools in Hyper-V Manager, which comes as an installation choice with Windows Server 2012. VMware's customized management tool, the VMware vSphere Client, is free and should be installed on a Windows PC. Both offerings interface with remote hosts, permitting us to deal with any framework we can reach over the network.

A few functions are not possible in the basic administration tools for either of the products. The advantage here is for Microsoft as Hyper-V Manager can, for instance, if a VM is exported, then it can do an import to clone or duplicate the VM. With VMware, it should be associated with vCenter Server keeping in mind the end goal to clone a VM. However, the VMware vSphere Client gives significantly more data about both the host servers and the customer VMs. VMware also scores a point here for a clear graphical presentation.

The most recent release of vCenter Server (5.1) adds a Web client, giving the capacity to deal with our VMware foundation and allows management remotely. Both VMware and Microsoft give support in automated administration utilizing Windows PowerShell. VMware offers an add-on called PowerCLI that incorporates a not insignificant amount of custom PowerShell cmdlets for dealing with the vSphere base.

Operating system support. VMware guest operating systems that are supported are Asianux 4 SP4, Solaris 11.2, Ubuntu 12.04.5, 14.04.1, FreeBSD 9.3, Oracle Linux 7, Mac OS X 10.10, Oracle Unbreakable Enterprise Kernel Release 3 quarterly update 3.

Hyper-V can support. Centos, Red Hat Enterprise Linux, Debian, Oracle Linux, SUSE, Ubuntu, and FreeBSD in addition to Windows operating systems.

Performance and Scalability

Choosing how to measure execution and adaptability requires a test when looking at these two products. Microsoft has made various upgrades in Hyper-V 2012 that now again exceed the limits of vSphere. On the off chance that we need to gauge scalability in crude numbers like nodes upheld in a cluster where they have 64 for Hyper-V 2012 versus 32 for vSphere 5.1 or VMs in a cluster where we come across 8,000 for Hyper-V 2012 versus 4,000 for vSphere 5.1, they finally concluded that Microsoft has the more adaptable scalability[21a]. However, measuring the true limit of capacity goes beyond the fundamental numbers. A valid example: Both now support the idea of dynamic memory management, though in differing ways. With Hyper-V 2012, we can arrange individual VMs with a starting memory allocation and permit the hypervisor to conform the measure of memory relying upon current needs. This is not the default choice while making another new VM but a design setting. VMware has had dynamic

memory management for quite a long while, and unlike Microsoft, its memory administration applies to all guest operating systems, not simply Windows.

At the individual VM level, we utilized the Sandra 2013 benchmarking device to decide basic quantity of execution from a single VM running Windows 7 SP1. This VM was configured to have 2GB of memory and two virtual CPUs. They ran four unique benchmarks utilizing Hyper-V 2008, Hyper-V 2012, vSphere 5.0, and 5.1. According to the technologists we can see from the table that Hyper-V 2012 performed superior to vSphere, in any event concerning running Windows VMs. Take note of the fact that they did not test the hypervisor under load or the execution of Linux VMs, as was done in InfoWorld's 2011 virtualization shootout (Red Hat Enterprise Linux, n.d.).

Table 4

Windows Hyper-V and VMware VSphere Features Comparison

Features	2008 R2	2012	vSphere 5.0	5.1
Cryptographic bandwidth(MBps)	79	597	370	378
Dhrystone whole number(GIPS)	12.52	16.86	11.76	12.21
Whetstone twofold(GFLOPS)	6.92	13.25	6.76	6.89
Intercore data transmission(GBps)	1.71	1.44	1.15	1.12

Summary

At long last, a standout amongst the most troublesome factors to look at is cost. In this case, we are creating fewer virtualized servers running Windows Server 2012, we currently get them by making a purchase of the operating system. Windows Server 2012 Standard allows for two virtual instances, while Windows Server 2012 Datacenter allows for a limitless number of

VMs on one machine. If we are as of now putting money into Windows Server 2012, it does not make sense to get an extra virtualization product for a less than a medium level deployment.

All things considered, in the event that we are beginning small and want to scale up our way of development, it allows for that. The vCenter Server is effectively created as a virtual machine, and it serves as a single provider of each vSphere administration capacity: host provisioning and design administration, VM templating and cloning, wellbeing and execution observation, automated load balancing of VMs and capacity, and so on.

By differentiation, the management capacities of System Center 2012 traverse various devices and archives. These begin with Virtual Machine Manager (VMM), for overseeing Hyper-V hosts, clusters, and virtual machines, and stretch out to Operations Manager (which coordinates with VMM to automate load balancing and provide wellbeing and execution monitoring), Configuration Manager, Data Protection Manager, Orchestrator, and App Controller.

On one hand, the performance of System Center segments expands the administration overhead and quality, which is in contrast with vCenter Server.

We can certainly go much further with Microsoft hypervisor than with VMware’s. At the higher version levels VMware still has some capabilities that Microsoft cannot match. But making the choice between Microsoft and VMware has never been harder, which is great news to potential clients.

Chapter IV: Methodology

Introduction

This chapter will briefly illustrate the hardware and software requirements and also the steps taken to implement the project. To complete this project a Hyper-V datacenter was built. For building a Hyper-V datacenter, Hyper-V should be installed on a piece of compatible hardware. The processor should have either an Intel-Virtualization technology or AMD-Rapid virtualization indexing capability. Below are the steps to build a vSphere datacenter (Microsoft TechNet, 2013).

1. Install 2 Hyper-V on a compatible hardware.
2. Create luns on a supported storage box and add them as data store.
3. Create virtual network with v- switches.
4. Create 3 windows server 2008 r2/2012 machines for Domain controller/Active Directory and SQL database.
5. Install SCVMM server and add Hyper-V servers to SCVMM.
6. Configure Datacenters and clusters in SCVMM Server.
7. Enable HA/Failover Cluster for availability and load balancing respectively.
8. Check whether the site is fully functional or not.

Once the Hyper-V datacenter is fully functional, VMM should be implemented on top of it as console serves as a computer and network layer for Hyper-V environment.

Hyper-V and SCVMM architecture. SCVMM will have the success installed which is a tool used to connect to the Hyper-V environment. After launching VMM, an end user should put in their AD logon credentials to login. The request first hits the load balancer configured to

balance the load on to multiple connection servers. Then the request passes through a firewall and security servers which help block unwanted access to the view connection servers and then authenticates it against active directory.

SCVMM server can be used to deploy virtual machine and work on it locally without any need for network connectivity. Hyper-V servers can be created with Failover cluster for high availability. Hyper-V helps to build linked mode servers where all the servers built will be pointing to a common disk which will help save a lot of storage space. Once everything is setup and running it looks as shown in Figure 11 below.

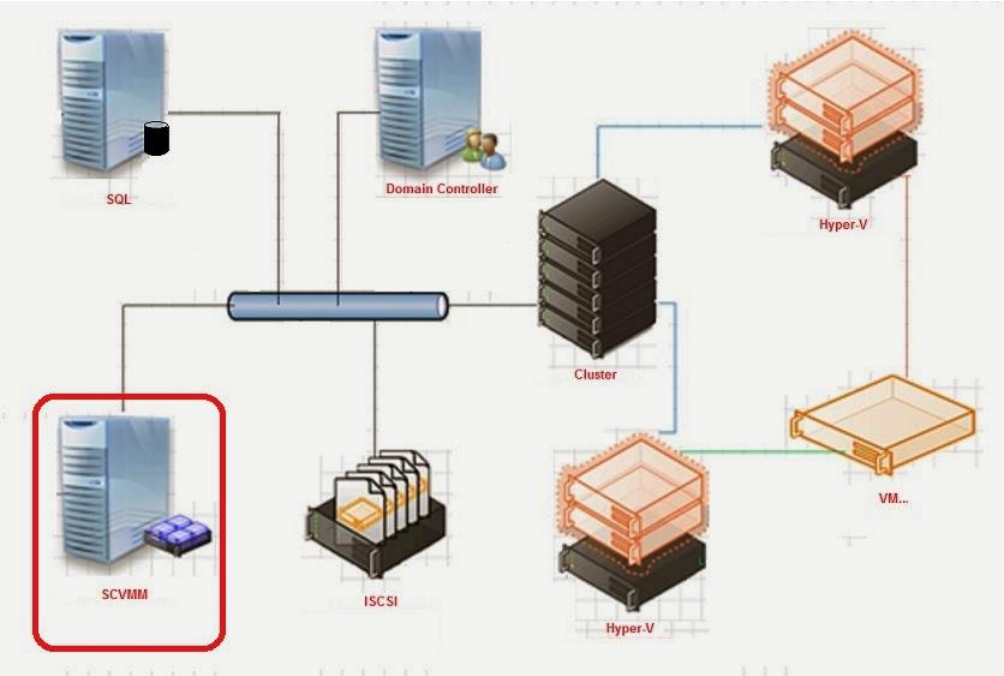


Figure 11. Hyper-V and SCVMM Architecture (Microsoft TechNet, 2016a)

Benefits of Server Virtualization

1. Centralized administration of server.
2. Centralized data management.
3. Better IT compliance.

4. IT security compliance.
5. Easy administration and patching.
6. Rapid provision as per demand.
7. Connect from anywhere any device.

Security

Server virtualization allows a company to be on par with security compliance. As the Servers are now being managed centrally and the data disks of all the servers are now on a shared Lun, data is more secure than a traditional data center scenario. Hyper-V has the Data Execution Prevention (DEP) security feature that prevents the execution of instructions in areas of a program that is defined as containing only data.

Hardware and Software Requirements

1. Two physical Servers each with 32 GB ram and one client machine to connect to these physical servers.
2. Two Hyper-V hypervisors.
3. SCVMM Server.
4. SQL server database to store SCVMM configuration and inventory data.

Product Costing

Hyper-V and SCVMM licenses are sold in two ways as outlined below in Figure 12.

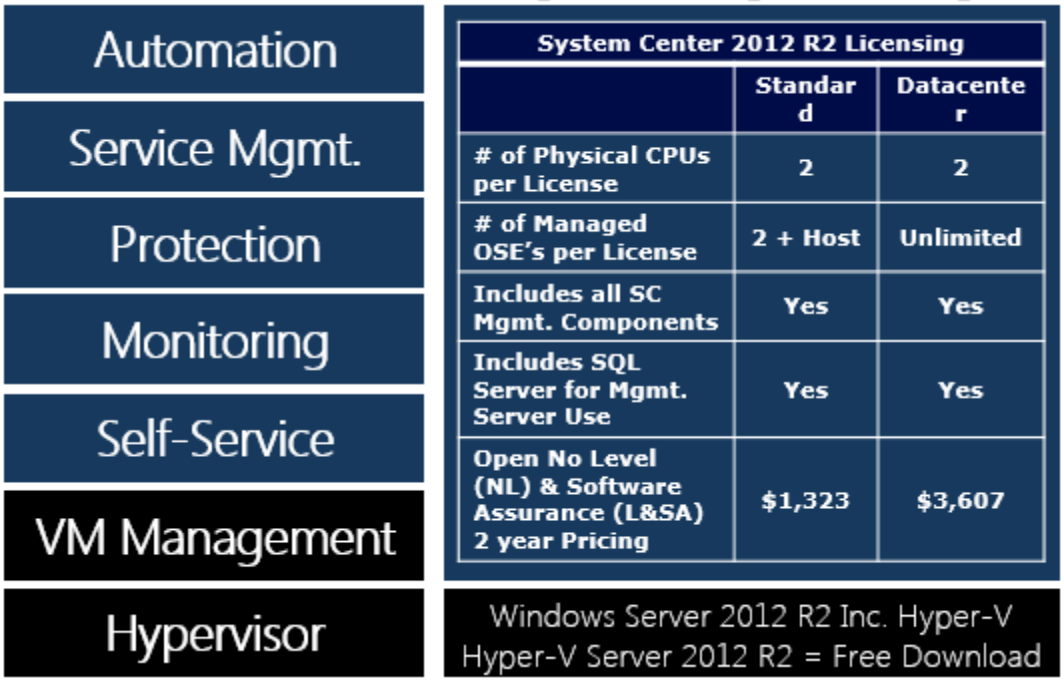


Figure 12. Software Pricing

Firstly, we will be looking at the hypervisor layer, which are key technology focused areas with Hyper-V (IEEE Xplore, 2016a).

- VM management. This deals with how we perform the day-to-day tasks of managing the virtual machines running on the platforms, with deployment and migration, as well as templating and cloud creation.
- Self-service. Access can be obtained to the infrastructure through self-service, and application owners, VM, and service owners get the ability to access the resources they require, in a controlled manner.
- Monitoring. The Operations Manager can be used to gain visibility into the virtualized infrastructure, obtaining levels of permissions into both Microsoft, and heterogeneous infrastructures, from the metal, into the applications running inside the VMs, from both inside and outside of the infrastructure walls.

- Back-up**.** Data Protection Manager plays a vital role in protecting Hyper-V virtual machines, and in workloads and applications inside the infrastructure.
- Service Management. The introduction of the ability for users to request resources, infrastructure components, virtual machines, cloud space, automating all the technologies into a powerful private cloud, and more is done in this service management which can keep costs low, and make administrator time to work on using the technology to move the business forward.

Summary

From the licensing perspective, both VMware and Microsoft have made significant roles in access their portfolios, with Microsoft obtaining a single licensing approach for System Center, which gives organizations to choose for this as other organizations will have separate license for every software. Hyper-V, which is available as a separate download, or purchase, also can be obtained with System Center as a combination, reducing the cost for the customers. Thus, this chapter discussed what hardware and software are required; project cost and explained about the hypervisor layer, which are key technology areas within Hyper-V.

Chapter V: Implementation

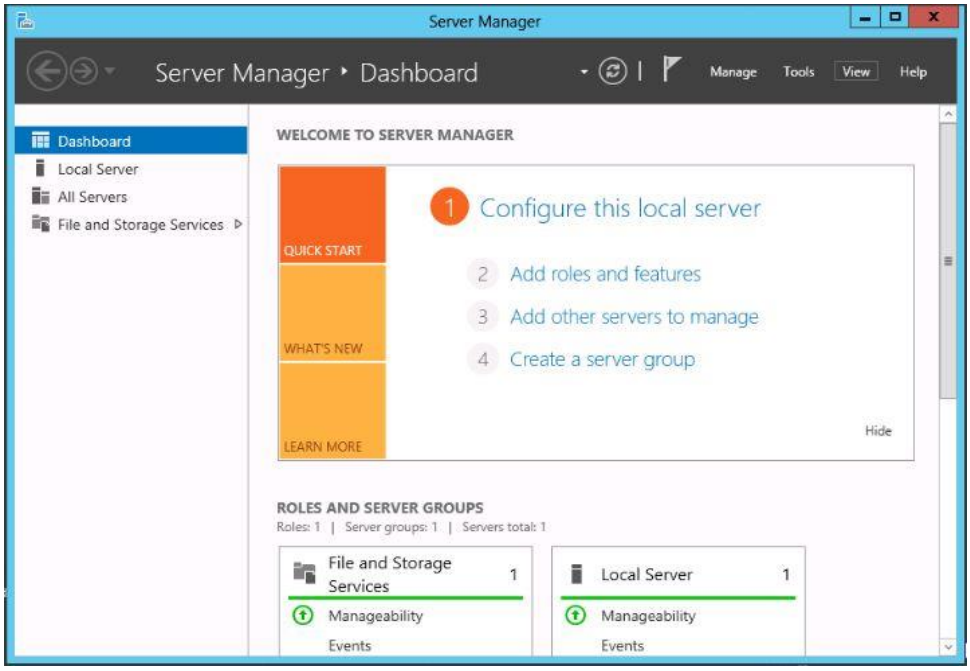
Introduction

This chapter will give a brief description of how the methodology mentioned in the previous chapter was implemented and what all of the steps followed to install the required tools.

Installation of Hyper-V

Install the Hyper-V role in Server Manager or by utilizing Windows Power Shell. Now we will see the steps for installing the Hyper-V with the help of Server Manager:

1. In Server Manager, click on the Manage menu and go to “Add Roles and Features”.



Screenshot: Server Manager Outlook

2. In the “Before you begin” page, check that our end server and system environment are set up for the role and feature needed to do the installation. Then click Next.
3. In the “Select installation type” page, select Role-based or feature based installation and after that click Next.

4. In the “Select destination server” page, select a server from the server pool and afterward click Next.
5. In the “Select server roles” page, select Hyper-V.
6. To include the tools which are used to create and manage virtual machines, click Add Features. In the Features page, click Next.
7. In the “Create Virtual Switches” page and Default Stores page, select the proper choices that are needed.
8. On the “Confirm installation selections” page, select Restart the destination server if needed, and after that click Install.
9. When installation is complete, confirm that the Hyper-V installation was done effectively. Go to the All Servers page in Server Manager; select a server on which you installed Hyper-V. Check the Roles and Features tile on the page for the chosen server, you should then find the Hyper-V installed in it.

Installation of the Hyper-V Role by Utilizing Power Shell

1. Open a Windows Power Shell session with elevated user rights. To do this, go to the Windows Start icon and type Power Shell. Right-click Power Shell and click on Run as Administrator.
2. Run the following command where the computer name corresponds to a remote PC on which you need to install Hyper-V. To install Hyper-V from a console session, type exclude—Computer Name <computer name>. Install-Windows Feature–Name Hyper-V - ComputerName <computer name> - IncludeManagementTools - Restart

3. When the installation is done, run the Get-WindowsFeature to confirm that every installation was completed effectively. In the event that you installed Hyper-V remotely, also include the ComputerName parameter (Get-WindowsFeature -ComputerName <computer_name>) to see a rundown of roles and features installed on the server.

NOTE: In Windows PowerShell, except for the Add Roles and Features Wizard, management tools and snap-ins for a role are excluded by default. To incorporate management tools as a component of a role installation, include the IncludeManagementTools command parameter to the cmdlet. Management tools and snap-ins cannot be installed on servers that run the Server Core installation choice of Windows Server. In the event of trying to install the management tools for the Hyper-V role on a server that runs the Server Core installation choice of Windows Server 2012, it attempts to change the installation choice to one that permits the management tools to run.

Creating a Virtual Machine with Hyper-V Manager

We can create a virtual machine by utilizing the wizard in Hyper-V Manager or by utilizing Windows Power Shell. To make a virtual machine in Hyper-V Manager

1. Open Hyper-V Manager.
2. From the navigation page of Hyper-V Manager, go to the PC running Hyper-V.
3. From the Actions window, click New > Virtual Machine.
4. Go to Next in the New Virtual Machine wizard.
5. On the Specify Name and Location window, give a proper name.

6. On the Assign Memory window, allocate enough memory to begin the guest operating system.
7. On the Configure Networking window, the virtual machine needs to be connected to the switch that we created while installing Hyper-V.
8. On the Connect Virtual Hard Disk and Installation Options window, pick the option that will match your plan to install the guest operating system.
    a. If we install the guest operating system from a DVD or from an image file (an .ISO file), pick Create a virtual hard circle. Click Next, and after that tap the icon that depicts the type of media that will be utilized. For instance, to utilize an .iso file, click Install an operating system from a boot CD/DVD and after that mention the path to the .iso file.
    b. If the guest operating system is now installed in a virtual hard disk, choose Use an existing virtual hard disk and click next. Afterwards, choose Install an operating system later.
9. On the Summary page, check the options chosen while configuring and afterwards navigate to and click Finish.

For virtual machines installation with Windows power shell commands. We can utilize the New-VM cmdlet to create a new virtual machine in Windows Power Shell. For instance, we can run the accompanying command to create a virtual machine named “web server” with 1 GB of startup memory and utilize a current virtual hard disk in which a guest operating system has already been installed.

New-VM –Name “web server” –MemoryStartupBytes 1GB –VHDPath d:\vhd\BaseImage.vhdx

Installing the Guest Operating System

This installation assumes that we configured the boot media for the virtual machine when the virtual machine was created. It cannot be automated or done in a Windows Power Shell session. Below are the steps to follow for the guest operating system installation:

1. From Hyper-V Manager, in the Virtual Machines section of the results window, right-click the name of the virtual machine and go to Connect.
2. From the Action tab in the Virtual Machine Connection window, click the Start icon.
3. Now proceed through the installation.

Upgrading Integration Services

Hyper-V includes a software package for supported guest operating systems that enhances integrations between the physical PC and the virtual machine. This package is referred to as integration services. As we used Window Server 2012 r2, which is a new version only upgrading is enough there is no need for the installation process.

This installation cannot be automated or done in a Windows PowerShell session. To install integration services:

1. Go to Hyper-V Manager. From the Server Manager Tools menu, click on Hyper-V Manager.
2. Connect to the virtual machine. Right-tap the name of the virtual machine and go to Connect.
3. From the Action menu of Virtual Machine Connection, click Insert Integration Services Setup Disk. This activity stacks the setup disk in the virtual DVD drive.

Depending upon the guest operating system installed, it may be necessary to start the manual installation.

4. After the installation completes, all integration services are present for use.

Active Directory Installation in Windows Server 2012

We will have Simplified Administration with the help of active directory domain services.

Windows Server 2012 represents the upcoming era of Active Directory Domain Services Simplified Administration, and is the most radical space re-imagining from Windows 2000 Server. AD DS Simplified Administration learned from twelve years of Active Directory and makes it more supportable, more adaptable, and a more instinctive authoritative experience for planning and for administrators. This implied making new versions of existing technologies and in addition developing the capacities of components released in Windows Server 2008 R2.

AD DS Simplified Administration: Active directory DS Simplified Administration is a reconsidering of domain deployment. Some of those components include:

1. AD DS role deployment is presently part of the new Server Manager Architecture and permits remote installation.
2. The AD DS deployment and design engine is primarily through Windows PowerShell, unless when utilizing a graphical user interface.
3. Promotion now incorporates requirement checking that validates forest and domain checks for the new domain space controller, which brings down the possibility of failed promotions.

4. The Windows Server 2012 forest functioning level does not execute new elements and domain functional level is required just for a subset of the new Kerberos features, diminishing chairmen or administrators of the frequent requirement for a homogenous domain controller environment.

Used and benefits. These progressions may seem more unpredictable, not less complex. In updating the AD DS deployment process however, there was a chance to combine numerous means and best practices into fewer and less complex activities. That means, for instance, that the graphical design of another replica domain controller is presently eight dialogs as opposed to the previous twelve. Creating another Active Directory forest requires a solitary Windows Power Shell command with standout contention: the name of the domain.

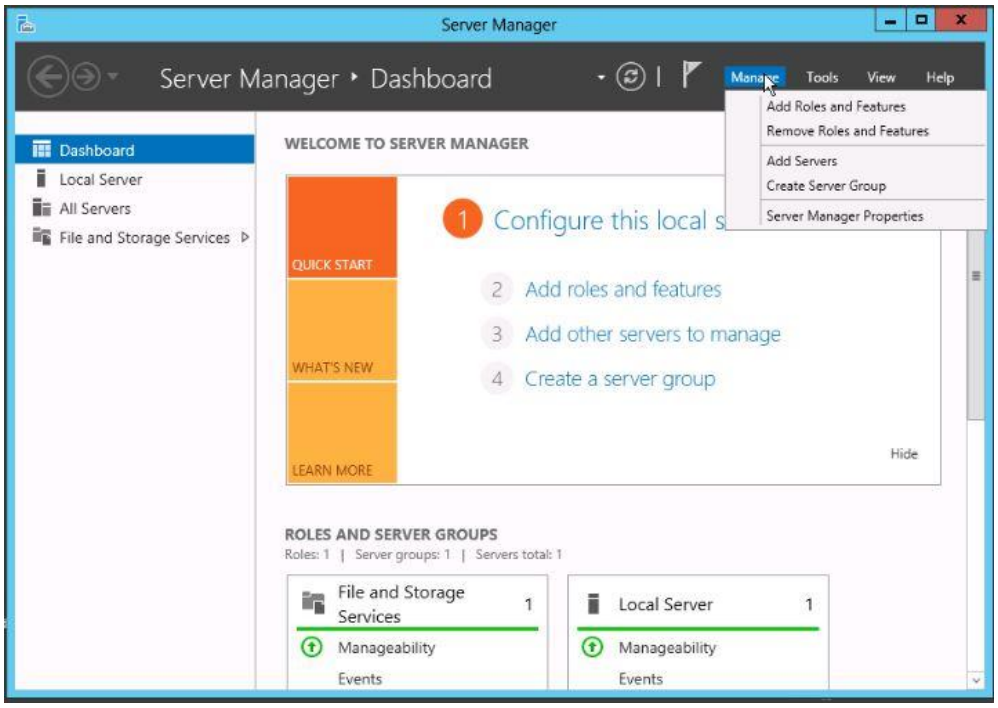
Why is there such an accentuation on the use of Windows Power Shell in Windows Server 2012? As distributed computing advances, Windows Power Shell permits a solitary engine for configuring and maintenance from both graphical and command line interfaces. It allows completely featured scripting of any segment. As cloud-based computing becomes even more pervasive, Windows Power Shell has brought the capacity to remotely regulate a server, where a PC with no graphical interface has the same administration abilities as one with a screen and mouse. Basic prerequisites are (a) 1.4 GHz 64-bit processor, (b), 512 MB RAM, and (c) 32 GB Disk space.

After Server 2012 was installed on a server, we must next get the system interfaces configured. It is recommended to utilize static IP addresses for the server. Since the server will be acting as a DNS server, for DNS server field we can utilize neighborhood host address

127.0.0.1. It is advised to use the full name as the server name. In this case, I renamed it as "Hyper-v1."

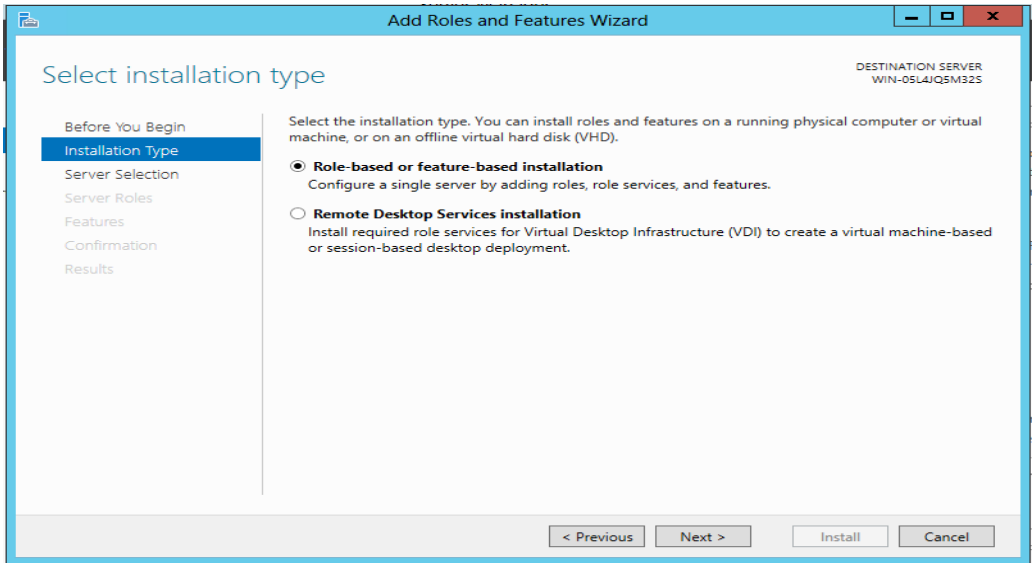
After this we are prepared to begin the AD install. We additionally can install DNS while the AD install is done. As is recommended, and as a best practice I generally want to include DNS installation as well. For this we should begin "Server Manager" it can be opened another way on the task bar or from Start > Server Manager and follow the steps mentioned below:

1. In Server Manager window click on <add roles and features> option.



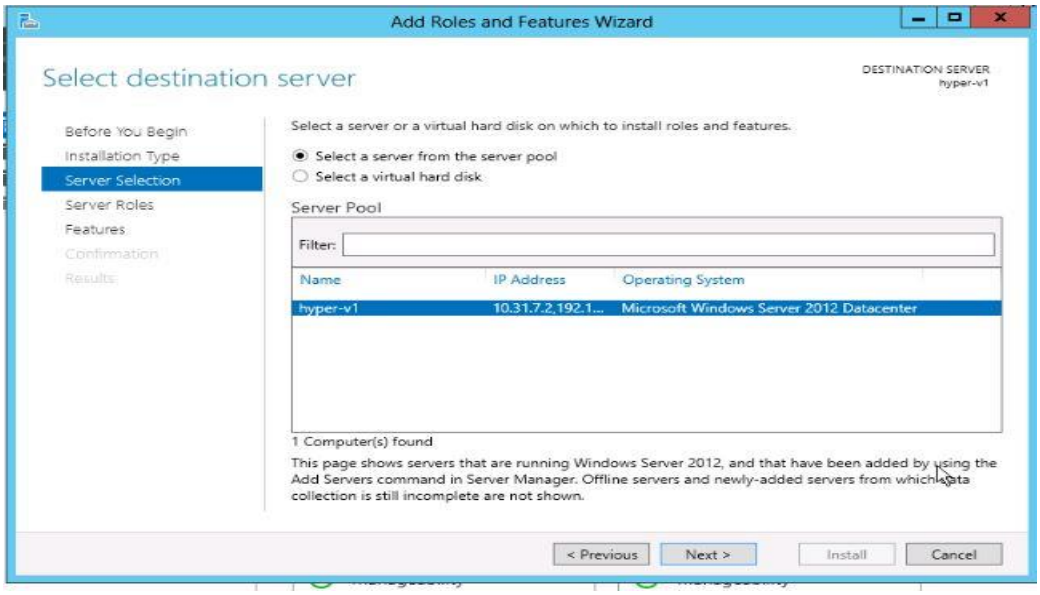
Screenshot: For Option Add Roles and Features

2. At this point it will come up with the <Add Role Wizard>, Click next to proceed. In next tab keep <Role based or feature based installation> default option and click next.



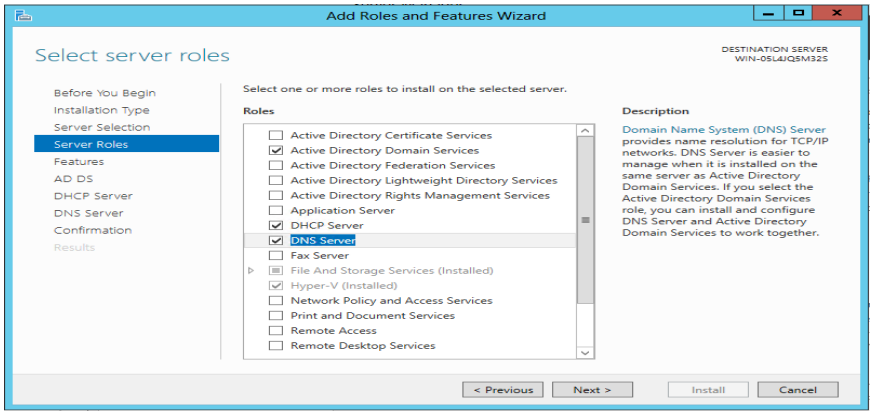
Screenshot: Installation type Window in Add Roles and Features Wizard

3. In the next tab, we can choose which server to install roles. For this situation, it will be local. So, keep the default option and click Next.



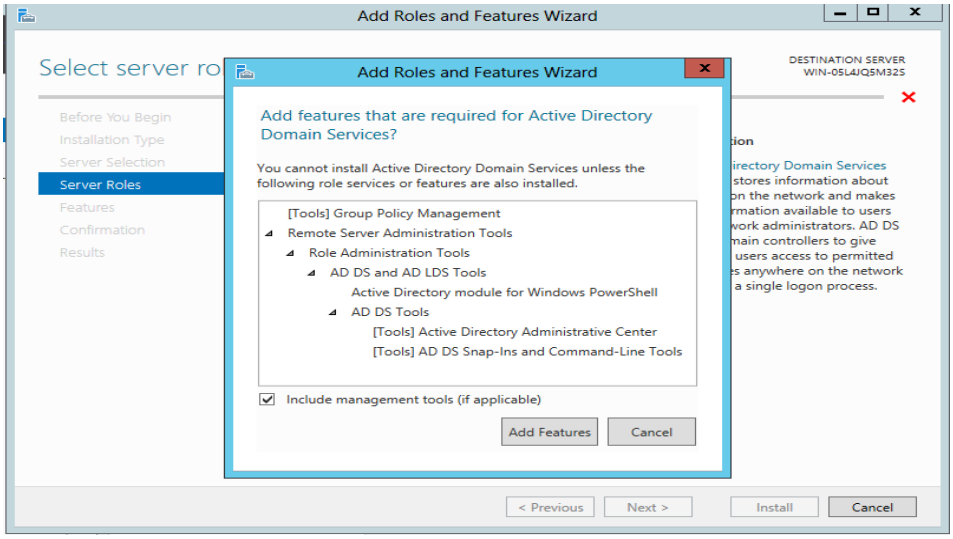
Screenshot: Server Selection tab in Add Roles and Features Wizard

4. In next tab, it tells us to choose the roles. Select and click on the box <Active Directory Domain Services>.



Screenshot: Server Roles tab in Add Roles and Features Wizard

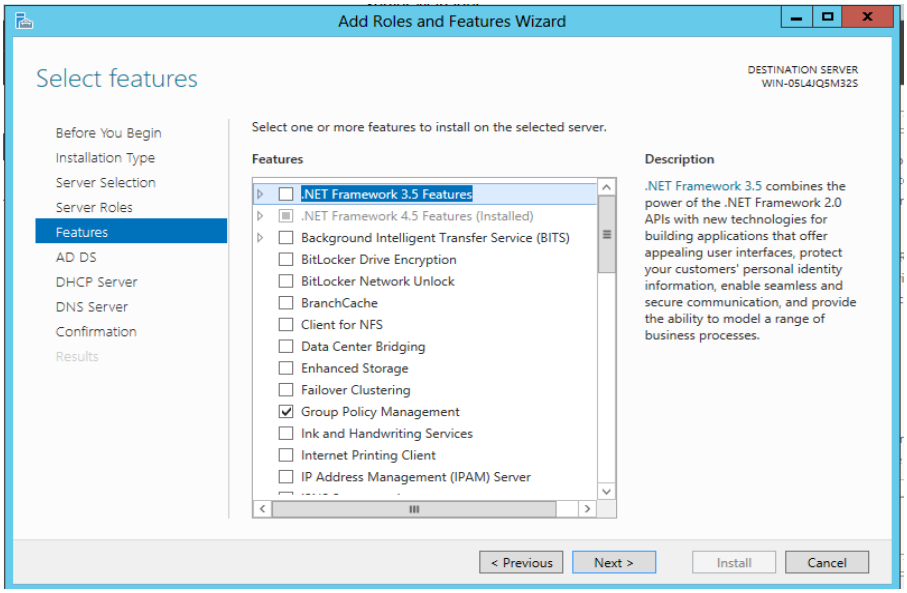
5. At this point it will pop up a window to show the additional feature installations related with the chosen role. Click on <Add Features> to proceed.



Screenshot: A Pop-up Window for Adding Features

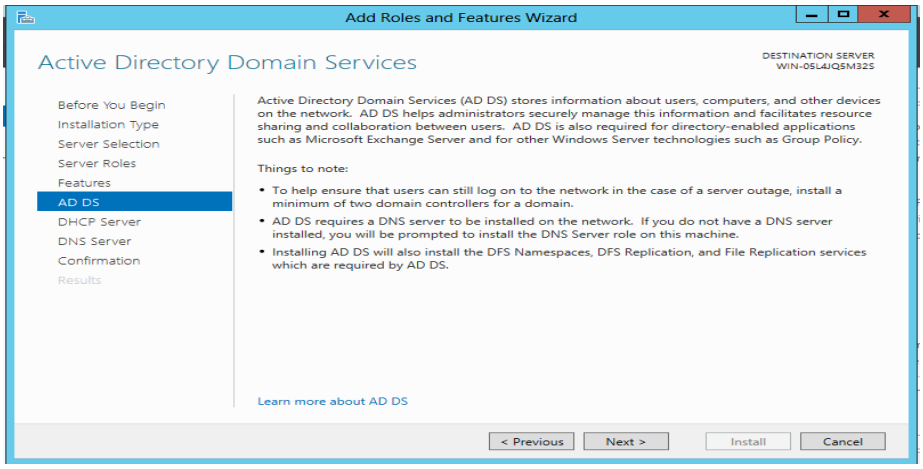
6. Click Next to proceed to the next tab.

7. In the next window, it will give an alternative to choose additional feature to install. In any case, we will keep the default selection. Click on Next to install.



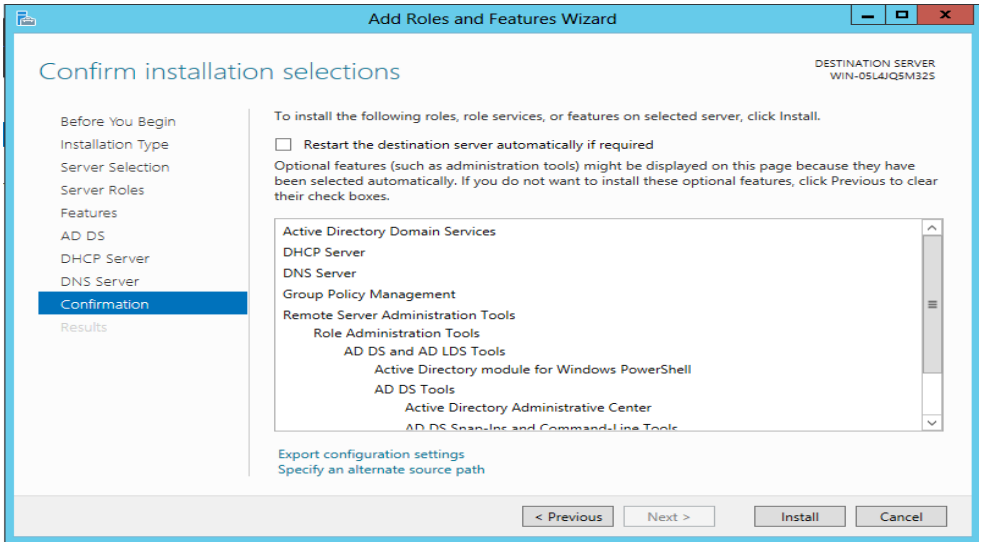
Screenshot: Features tab in Add Roles and Features Wizard

8. In this tab, it gives a brief description about the AD, DHCP and DNS service. Click Next to proceed.



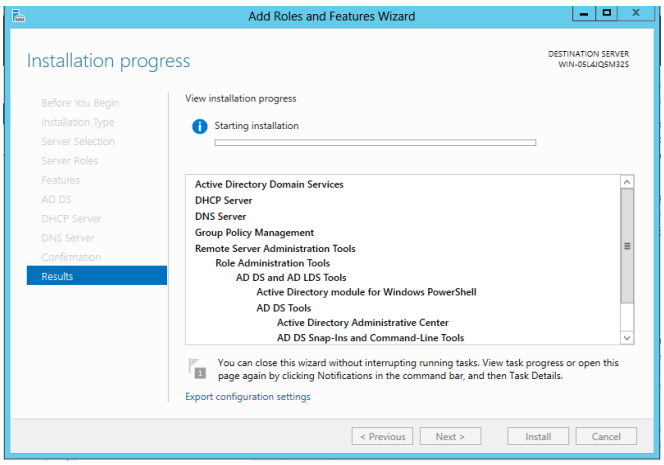
Screenshot: ADDS tab in Add Roles and Features Wizard

9. In next tab, it gives a brief about the installation. Click on <Install> to begin the installation process.



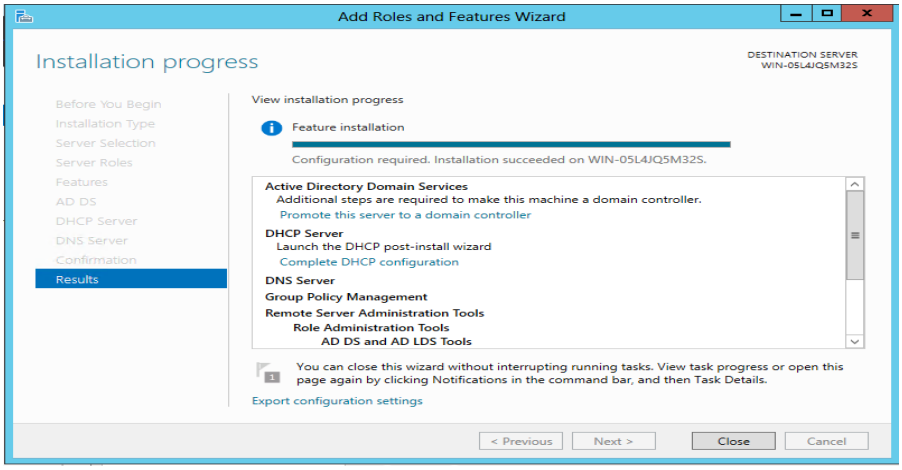
Screenshot: Confirmation tab in Add Roles and Features.

10. In the next tab, it will start the service installations and we need to hold up until it finishes.



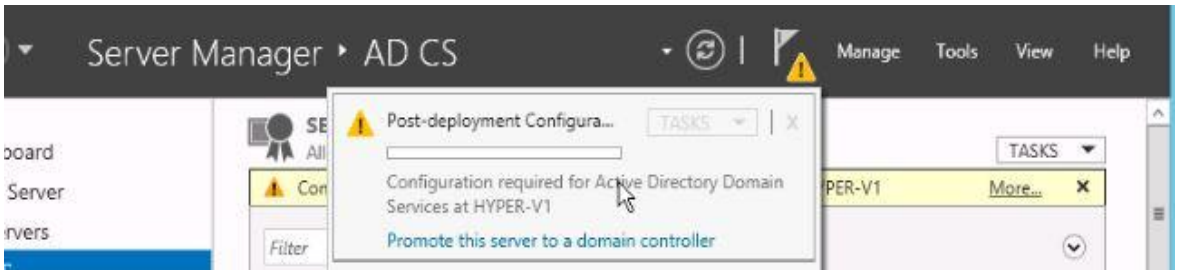
Screenshot: Results tab in Add Roles and Features

11. When it completes click the <Close> icon to exit from the wizard. At this point, it next asks us to reboot the server to finish the installation.



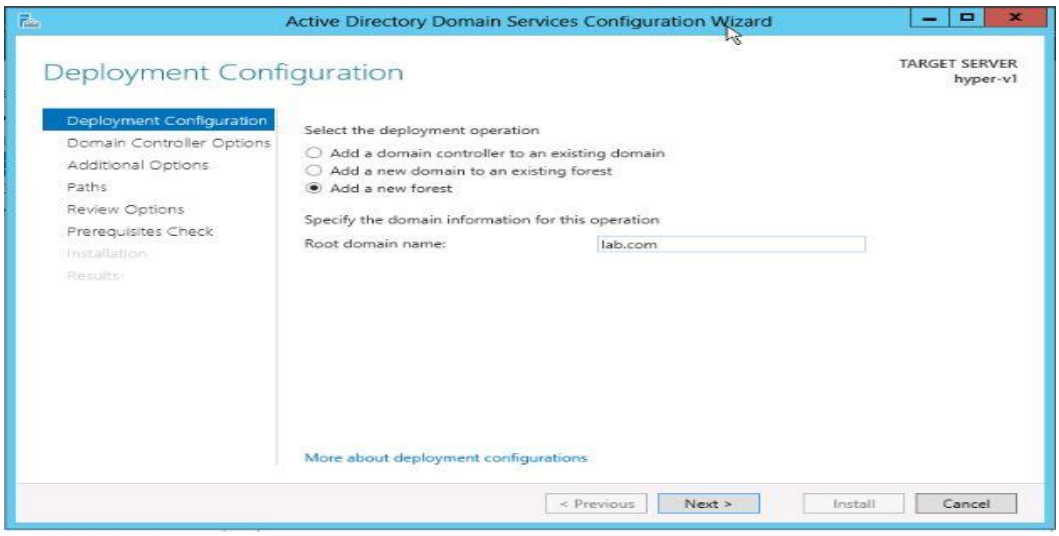
Screenshot: results tab in roles and features wizard

12. After the completion, we should begin on the DC setup. To begin that go to <Server Manager> and look for the Task flag on right hand corner. At this point it will be listed as shown. Go to <promote this server to a domain controller> option.



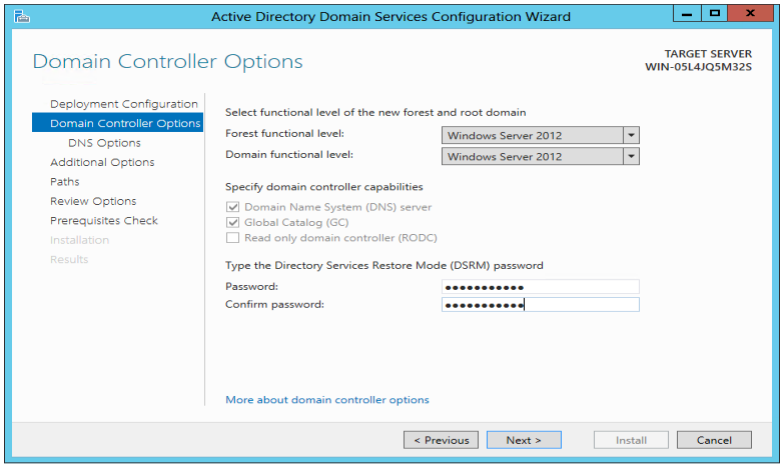
Screenshot: Post-Deployment Warning tab

13. Now it begins the DCPROMO wizard, on the primary window since it will be a new forest it is necessary to choose the option “Add a new forest” and I gave the area name <lab.com> which I will use on the forest. When the configuration is completed click on “Next” to proceed.



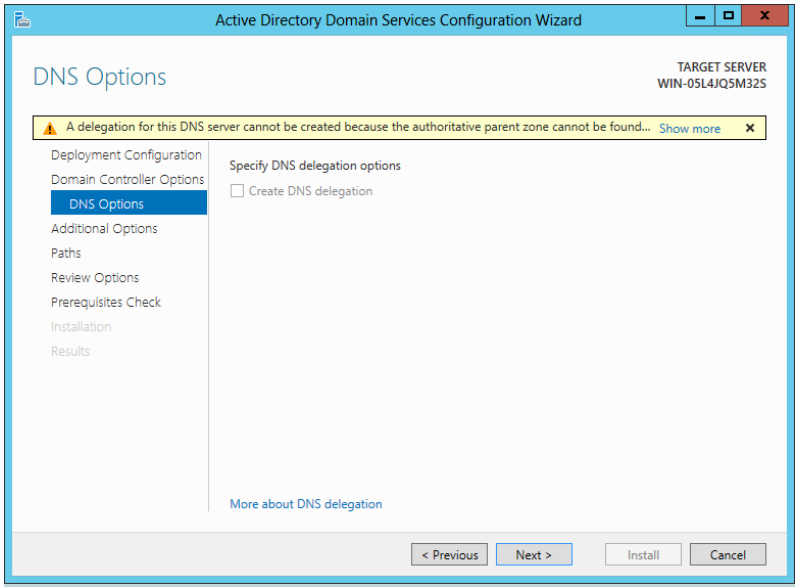
Screenshot: Deployment Configuration Window in ADDS Wizard

14. In the next tab, we can choose the forest and domain functional levels. I kept it as the default setting. Now in the domain controller capabilities by default it is chosen as the DNS server and Global Catalog as its first DC in the forest. At this point it is necessary to create a secret password to use in DC recovery. Click Next to proceed.



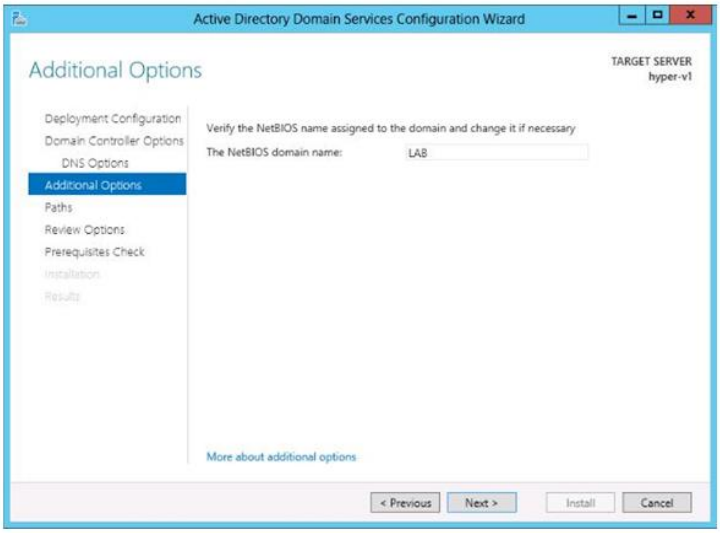
Screenshot: Domain Controller Options tab in ADDS Wizard

15. In the next window it will show the following error yet it can be discarded as the domain we created is in a new forest. Click Next to proceed.



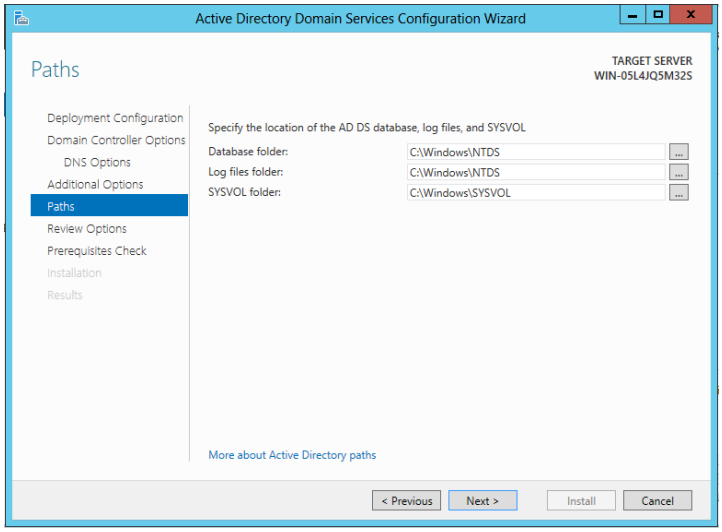
Screenshot: DNS Options Window in ADDS Wizard

16. In the next window, it requests for the netbios name. We can keep it by default and tap on Next to proceed.



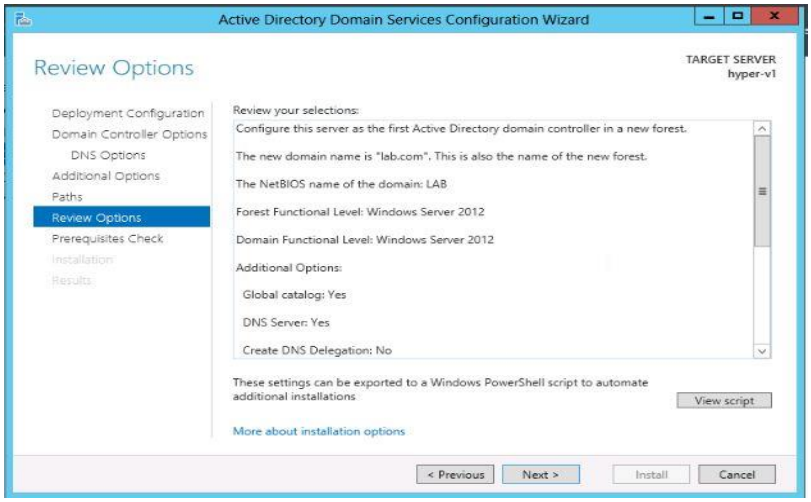
Screenshot: Additional Options tab in ADDS Wizard

17. In the next tab, we have a choice to change file paths for AD database, log files and SYSVOL files. We can change the path or keep them as the default, we have kept it as the default setting in this case. When changes are complete click on Next to proceed.



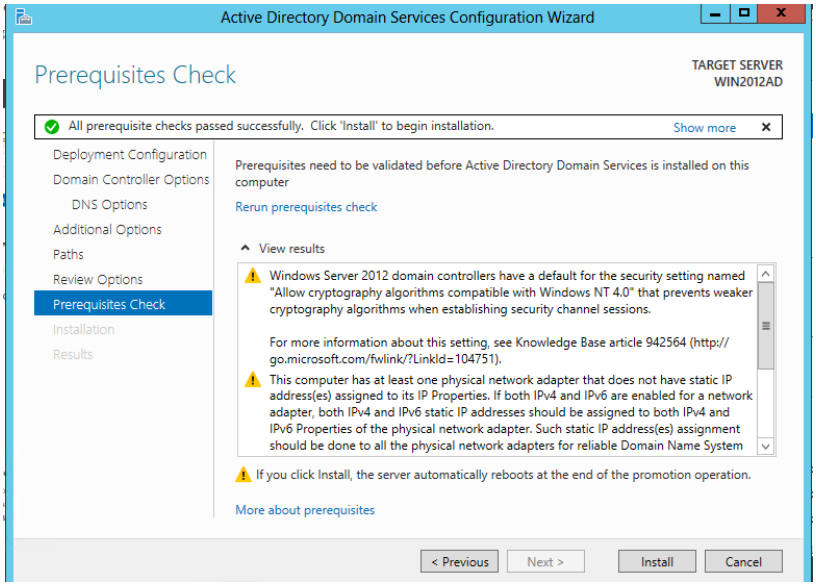
Screenshot: Paths tab in ADDS Wizard

18. In the next window, it gives the review of the installation. Click on Next to proceed.



Screenshot: Review Options tab in in ADDS Wizard

19. Next it will run a system check and confirm the system is compatible with the chosen configurations. When the test finishes successfully, click on Install to start the installation. By any chance that the system passes any critical errors those should be corrected before the installation starts. I did not receive any errors during this process.



Screenshot: Prerequisites Check in ADDS Wizard

20. Now it will begin the installation. After the completion of the installation, the server will be automatically rebooted. Once the server has rebooted, I logged into the server using domain admin credentials. I did not get a chance to take a screenshot for this as the system automatically rebooted once completed within no time.

    User: Administrator

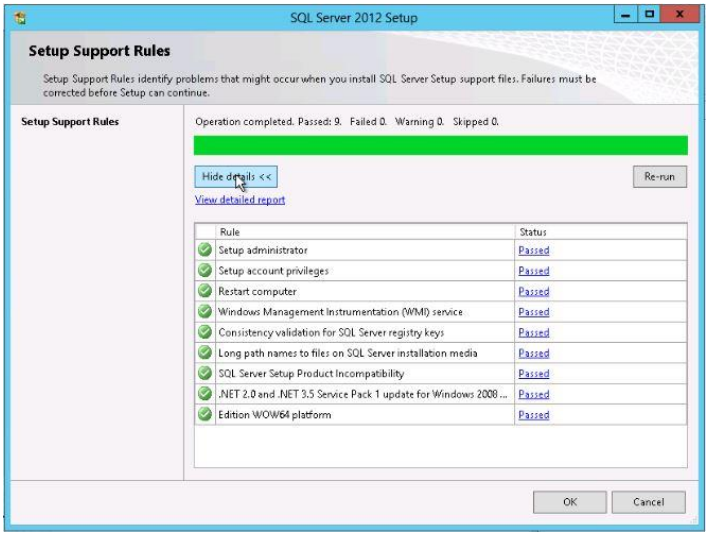
    Password: *****

Installing SQL

Proceeding to the installation of SQL Server 2012, we have to install .NET Framework 3.5 from Roles and Features in Server Manager. This is pre-installed on windows 2008 server

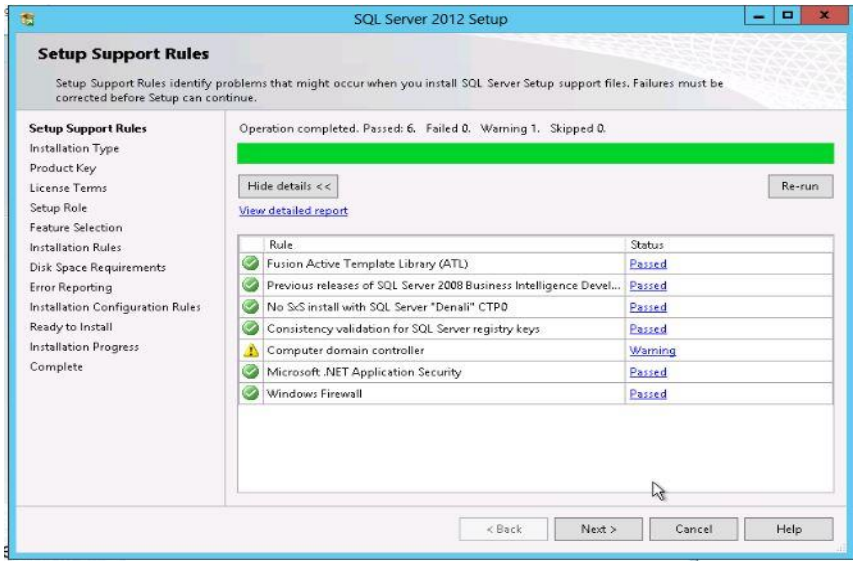
but for newer versions we have to install it before SCVMM installation. We can install .NET from the Server Manager > Add roles and features > Check mark on .Net Framework 3.5 and proceed for the installation.

1. You will then be prompted with SQL Server Installation Center. Click Installation from the left-hand side, and then select New SQL Server standalone installation from the right hand.
2. Now a new window with setup support roles tab will open. It will now check with the system, to see if it is compatible with the present version and identify problems that might occur when you install SQL setup support files. Features must be corrected before setup can continue.



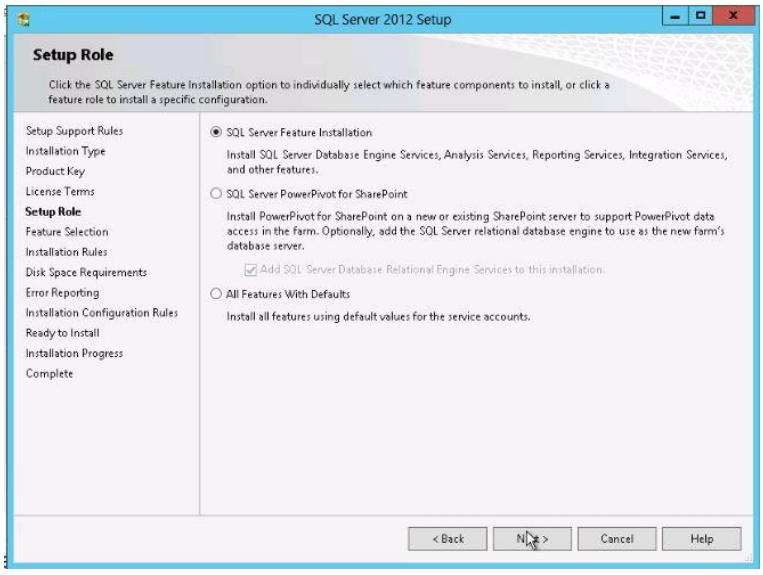
Screenshot: Checking Support Rules in SQL Server 2012 Setup

3. In Setup Support Rules, the install will run out a pre-check to confirm if the server can install SQL Server 2008–this should rectify any issues that may stop the installation process. In the illustrated window below, I'm overlooking the warning we receive that the Computer domain controller (this is because we cannot install all SCVMM and domain controller at once).



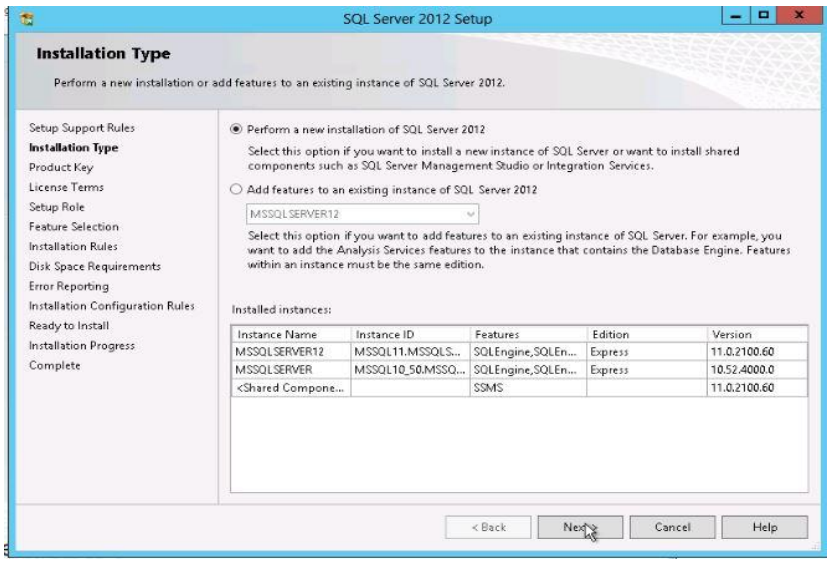
Screenshot: Passed Setup Rules in SQL Server 2012

4. In the Setup Role, we will select All Features with Defaults.



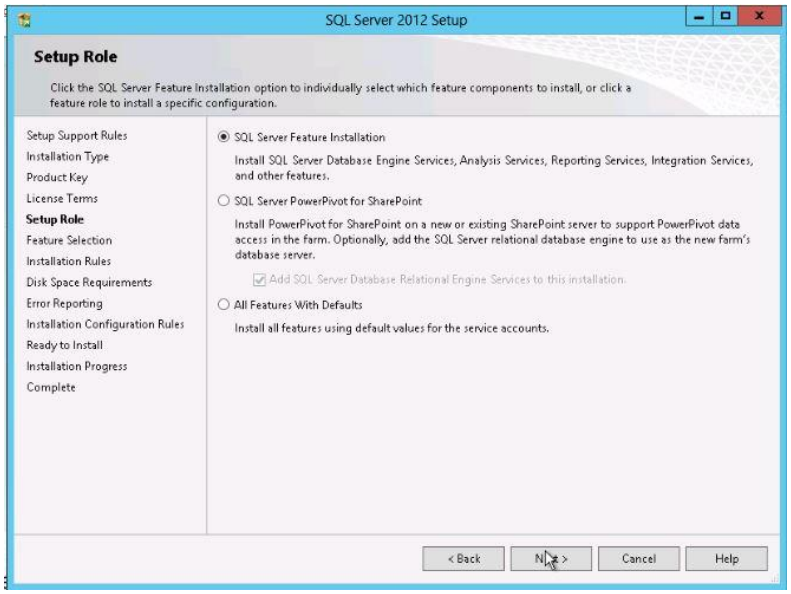
Screenshot: Setup Role tab in SQL Server Setup

5. In Installation Type, check perform a new installation of sql server 2012 and the other options kept as a default.



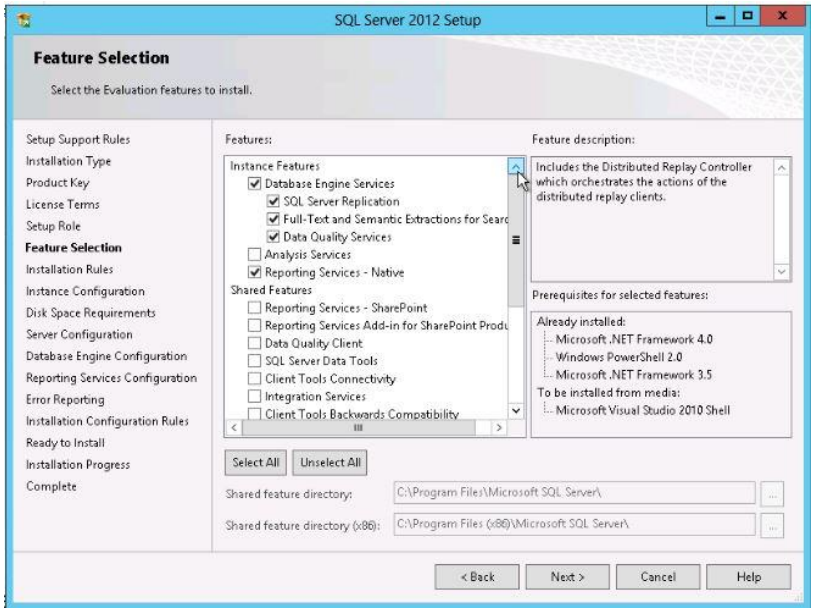
Screenshot: Installation Type tab in SQL Server Setup

6. In the Product Key tab, it asks for the product key. As we are not performing this install in an industrial application we will skip this step for now and then proceed.
7. Accept the License terms and it is then optional to send the feature usage data to Microsoft.
8. In Setup Role, allow the SQL Server installation be configured as the default setting.



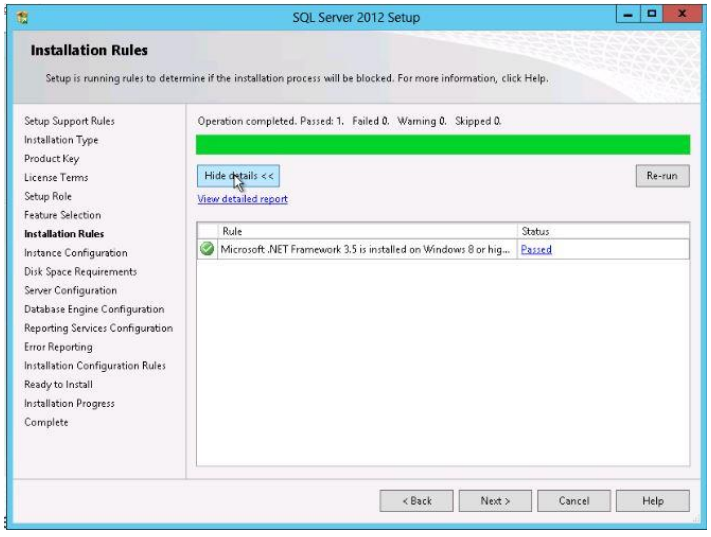
Screenshot: Setup Role tab in SQL Server Setup

9. In the Feature Selection, check the Database Engine Services, Reporting Services and Management Tools.



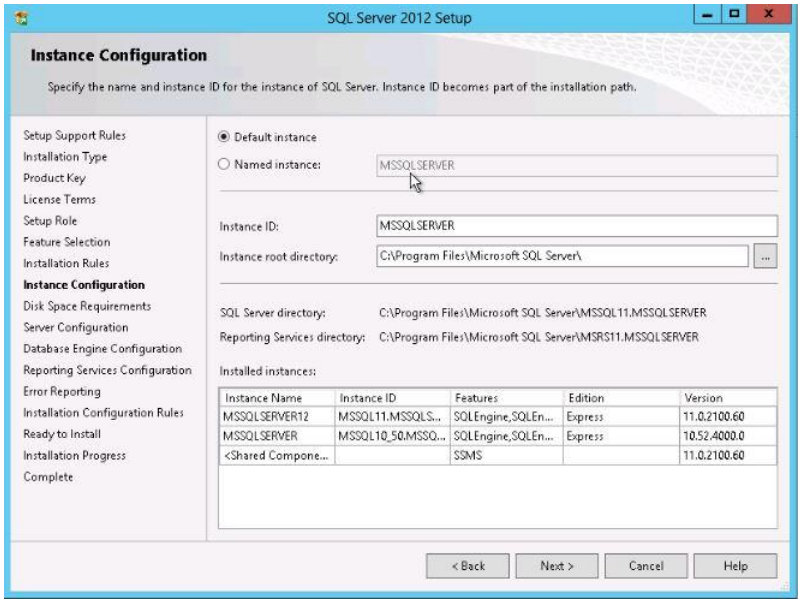
Screenshot: Feature Selection tab in SQL Server Setup

10. Installed Rules will then be approved and enable us to proceed to the next steps. We must rectify any issues if there are any prior to continuing:



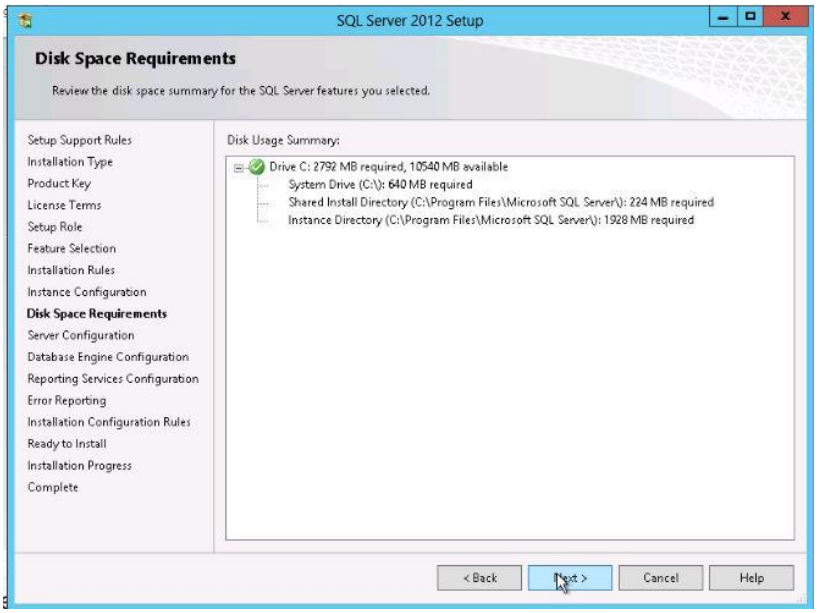
Screenshot: Installation Rules tab in SQL Server Setup

11. In Instance Configuration, leave the instance name and root index as default.



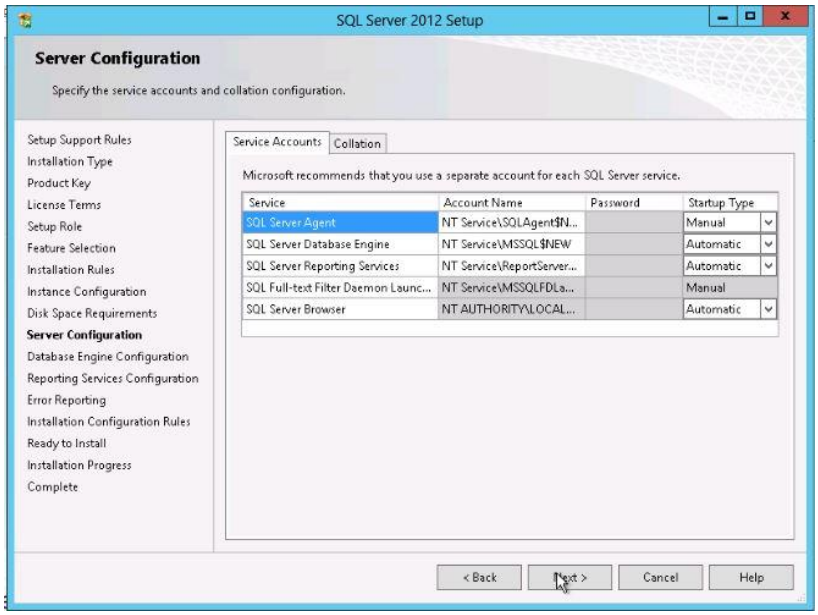
Screenshot: Instance Configuration tab in SQL Server Setup

12. In Disk Space Requirements, the system will approve that there is adequate disk space to proceed with the installation.



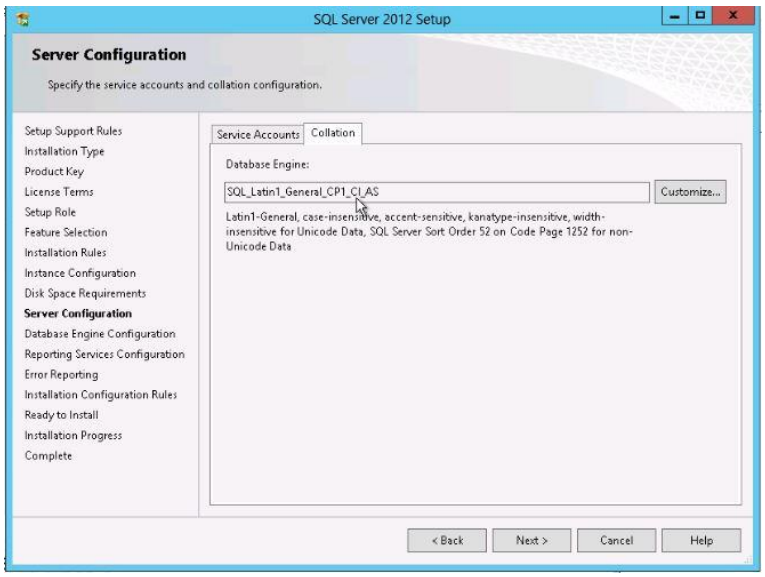
Screenshot: Disk Space Requirements in SQL Server Setup

13. In Server Configuration, choose after the startup types for the Services below



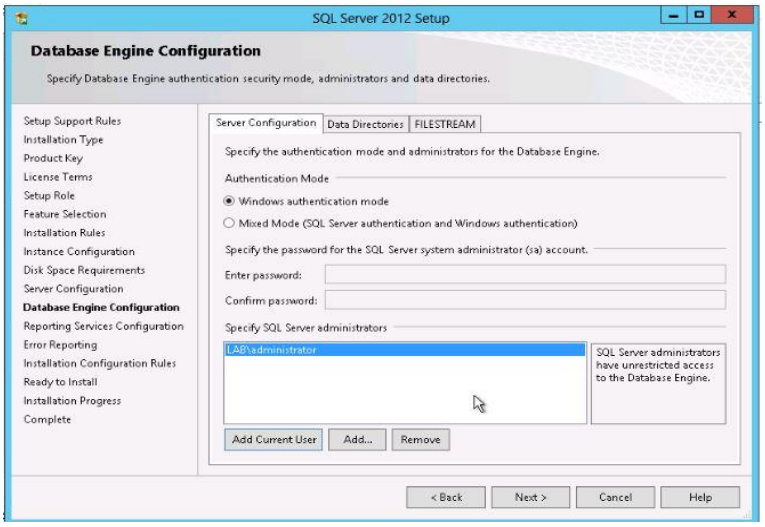
Screenshot: server configuration in SQL setup

In the collation tab, as I will set this SQL server up to use a Configuration Manager 2008 Database, it must be indicated the Collation required (Click Customize and pick SQL_Latin1_General_CP1_CI_AS):



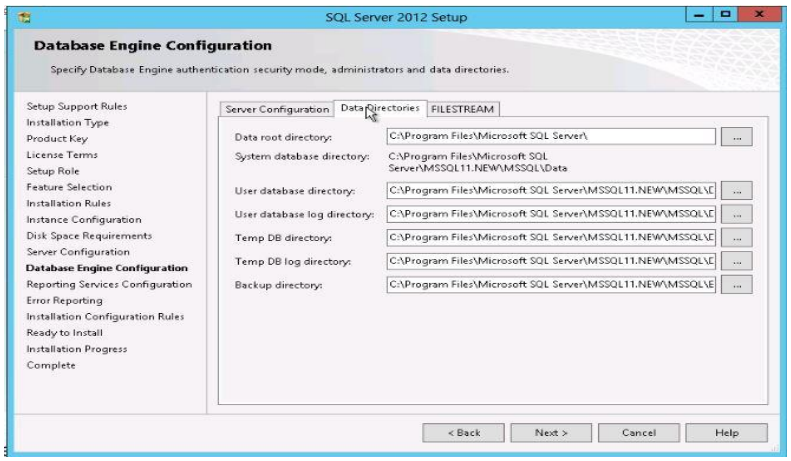
Screenshot: Server Configuration in SQL Server Setup

14. In Database Engine Configuration—set authentication to Windows, include the credentials used to sign into the Administrator account, include the Domain Admins group.



Screenshot: Database Engine Configuration in SQL Server Setup

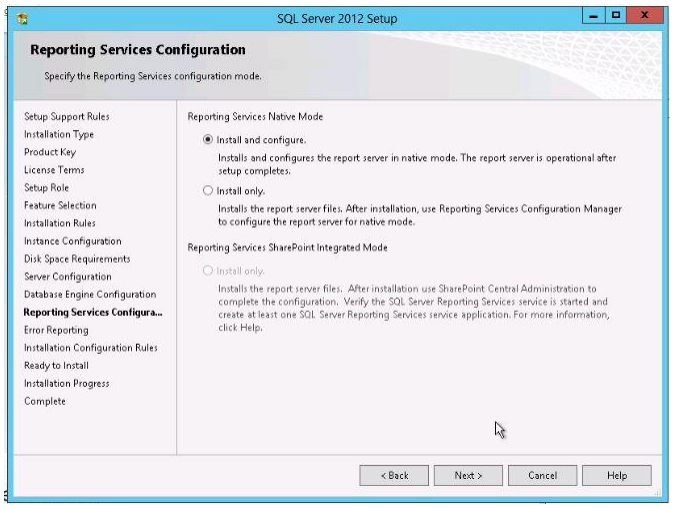
a) Data Directories are as per shown in the following. Set the path where the directories are installed. (we'll have to make these catalogs before indicating the installation locations to them):



Screenshot: Database Engine Configuration in SQL Server Setup

b) Leave Filestream as default.

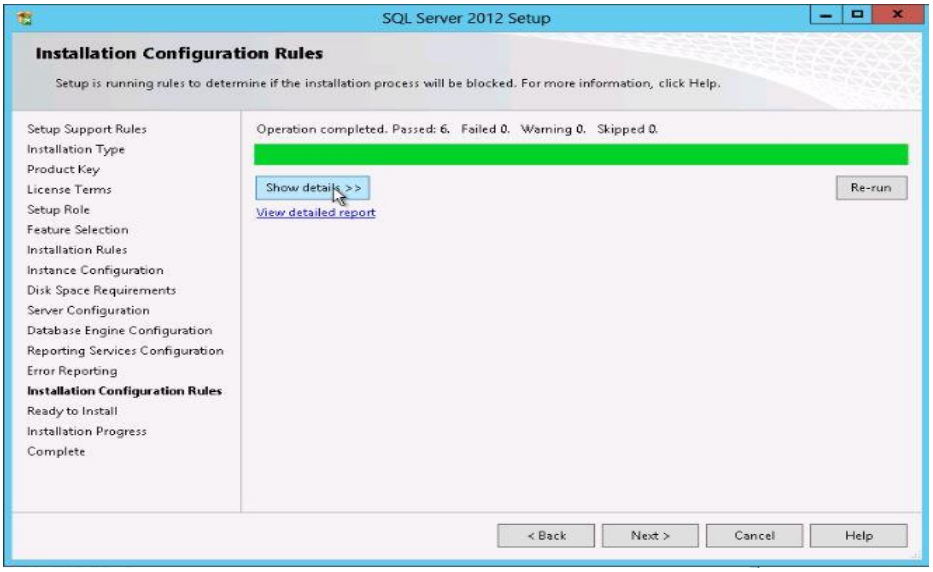
15. In this Reporting Services Configuration, set to Install and configure.



Screenshot: Reporting Service Configuration in SQL Server Setup

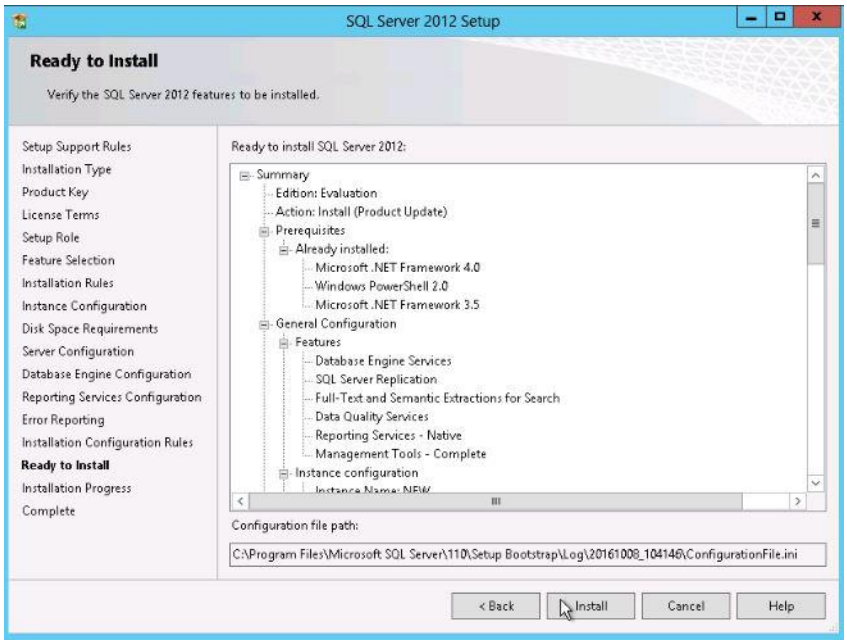
16. In Error Reporting, we select default and click on Next.

17. In Installation Configuration Rules, we should check that our setup has passed the rules displayed.



Screenshot: installation Configuration Rules in SQL Server Setup

18. In Ready to Install, ensure the installation synopsis to run the installation process.



Screenshot: Installations tab

19. The installer will then at last install SQL according to the prerequisites, and will then present a completed screen.

    To ensure the installation, click Start, SQL Server Management Studio. Make sure that the server type is Database Engine and that the server name corresponds to the hostname we have installed SQL Server 2012 to; then click Connect.

Screenshot: SQL credentials window

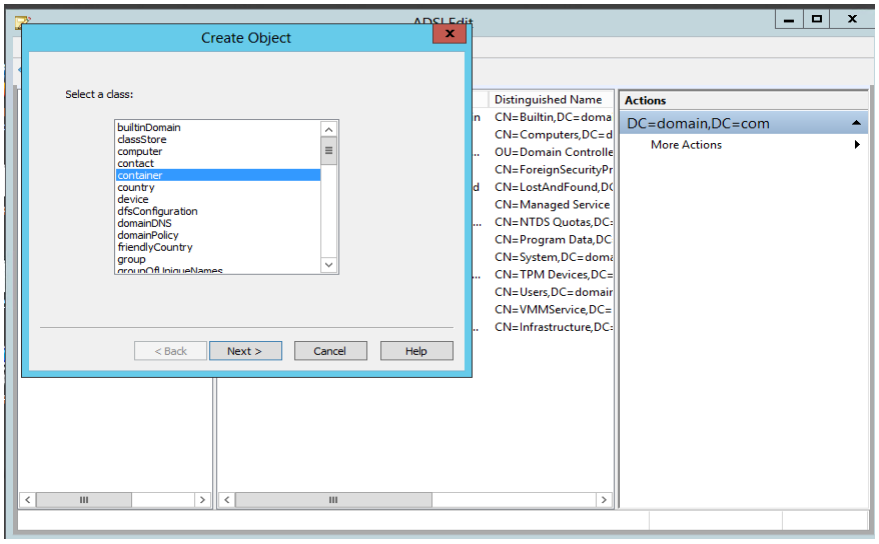
In Object Explorer, right-click the top box <Admin> (SQL Server), click Properties and confirm your SQL Server 2012 establishment.

1. It must be configured for the Firewall to acknowledge incoming connections with the SQL Server.
2. Go to Start > Administrative Tools > Windows Firewall with Advanced Security, click Inbound Rules and click New Rule from the Action tab.
3. Give the Rule Type as Port
4. Protocol and Ports as TCP; Specific Local Ports: 1433
5. Activity, mark on Allow the connection (first option)
6. Profile, mark on Domain, Private, Public
7. Name given as SQL TCP 1433. (This is an open port to every single server in the lab)
8. This finishes introducing SQL Server 2012.

Prerequisites for SCVMM

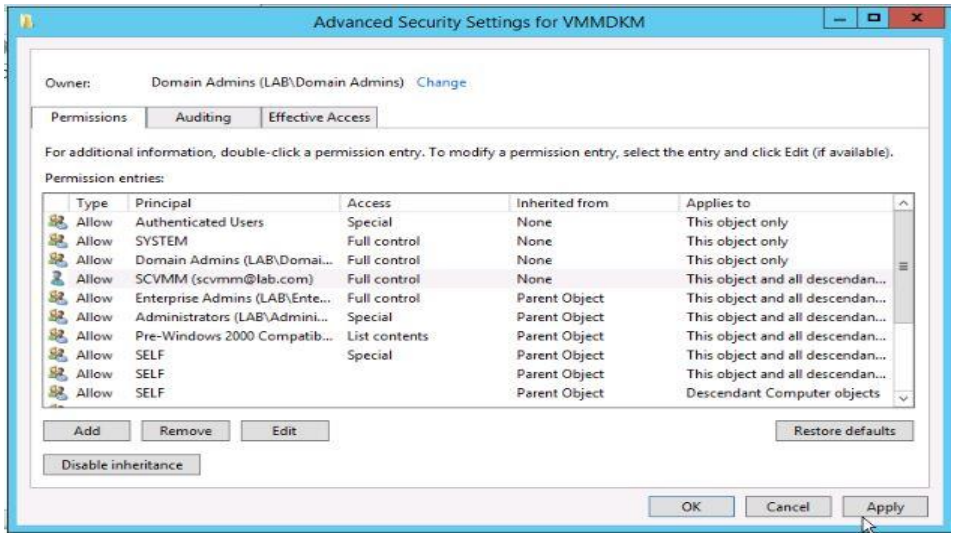
Below are the steps mentioned to follow to obtain the Pre-requisites of SCVMM:

1. As a Domain Administrator, open ADSI Edit from Administrative Tools, right-click on ADSI Edit and click Connect.
2. It will then provide the default settings, click on OK
3. Extend the tree to the root of the domain as shown in the below screenshots, right-click it and select > New > Object > Container.



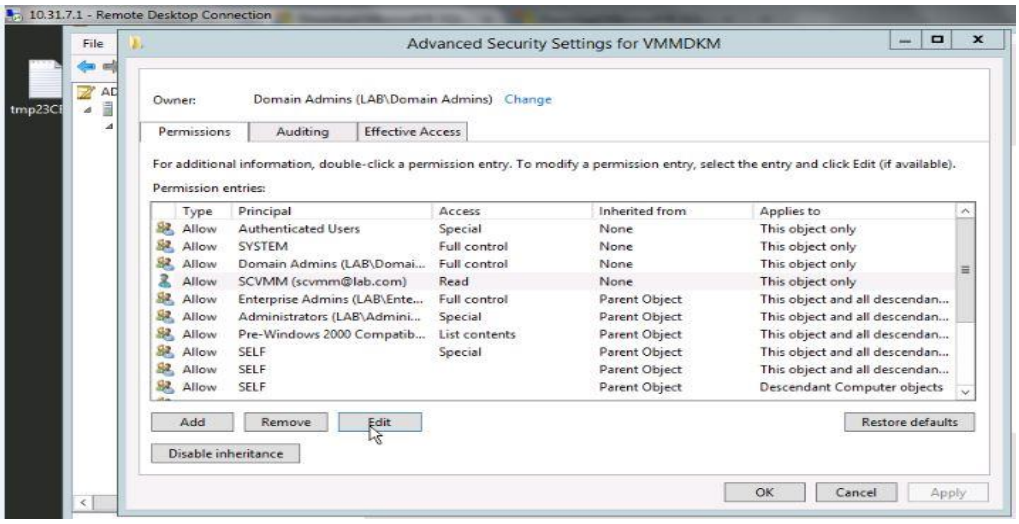
Screenshot: Popup Window of Create Object

4. Enter SCVMM as the name of the container. We can see the container SCVMM added to the default naming context as shown.
5. Click on Finish.
6. Right-click on the recently created container, select > properties> security, include the SCVMM Admin account > OK, from the Permissions list mark on Full Control.



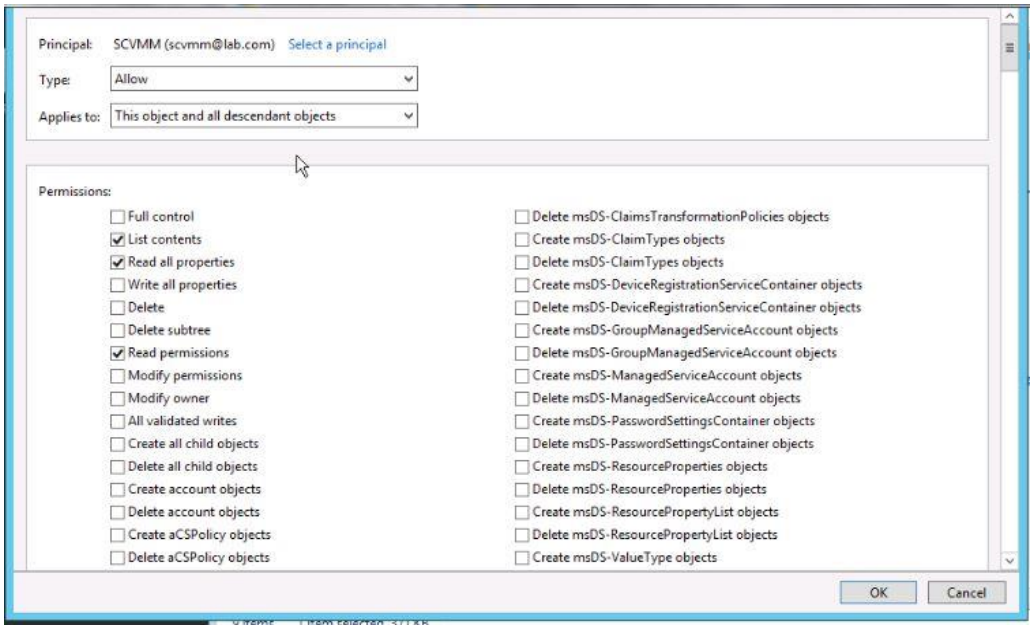
Screenshot: Advanced Security Settings tab for VMMDKM

7. Go to Advanced, select SCVMM Service account from the permission options > Edit, in the Permission Entry for SCVMM.



Screenshot: Editing Advanced Security Settings for VMMDKM

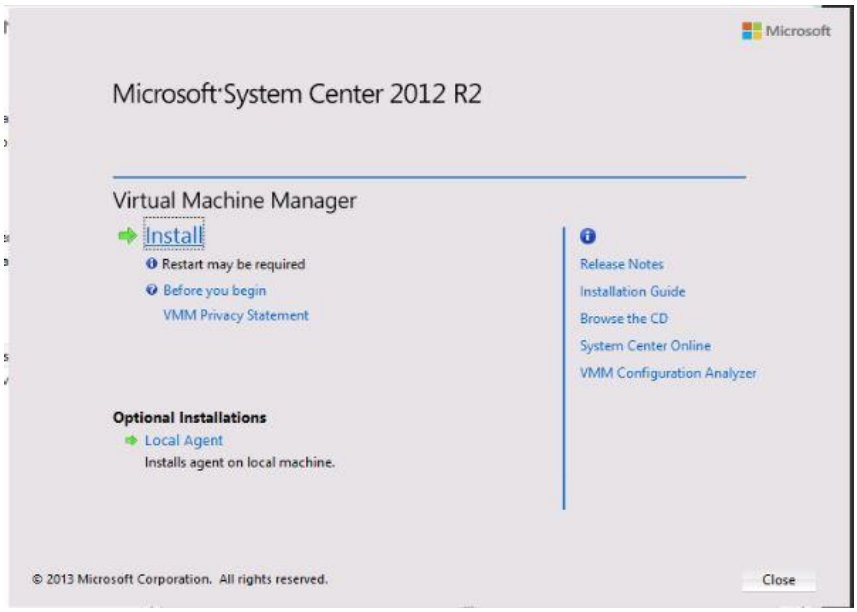
8. Now scroll down to the Applies to and click on <This object and all descendant objects> click OK and proceed to finish completing the ongoing task.



Screenshot: Permissions to set Principles for SCVMM tab

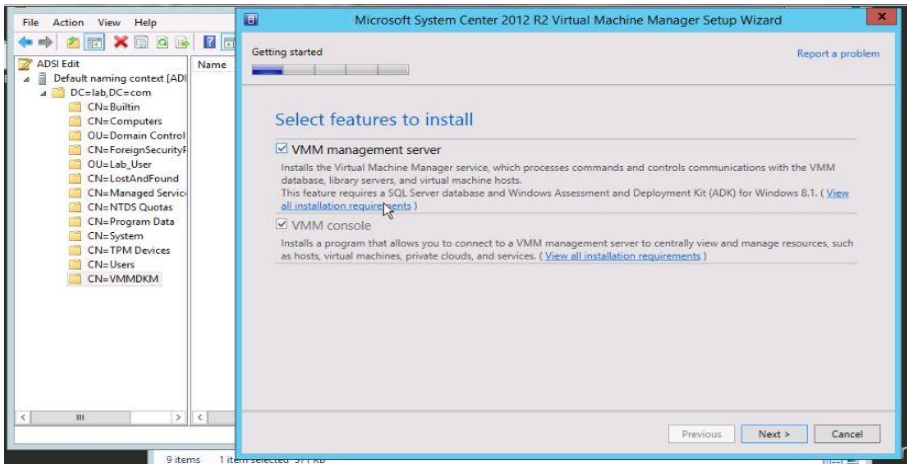
Installing System Center Virtual Machine Manager R2

1. Run and extract the installer for SCVMM2012R2. In the extricated directory, click Setup.exe and then click Install.



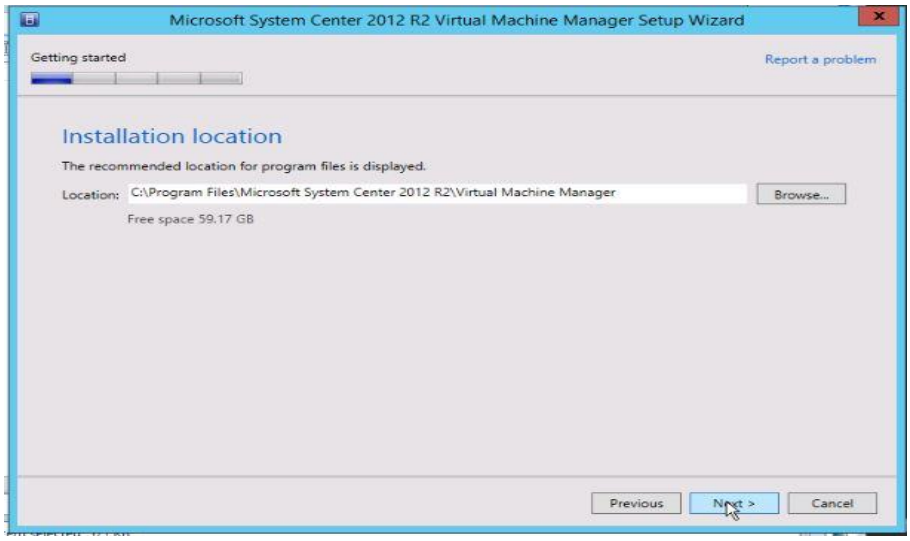
Screenshot: SCVMM installation Startup Tab

2. Select VMM management server (which will consequently install the VMM console). Click on Next.



Screenshot: Features Selection Tab

3. Our illustration is utilizing an assessment, so we are not entering a product key, but rather we can give a key later.
4. Acknowledge the license agreement.
5. It is optional to take a part in the Customer Experience Improvement Program and also optional for the Microsoft Updates, in my lab case, we have chosen to disable this.
6. Now we are accepting the default path to introduce SCVMM2012R2

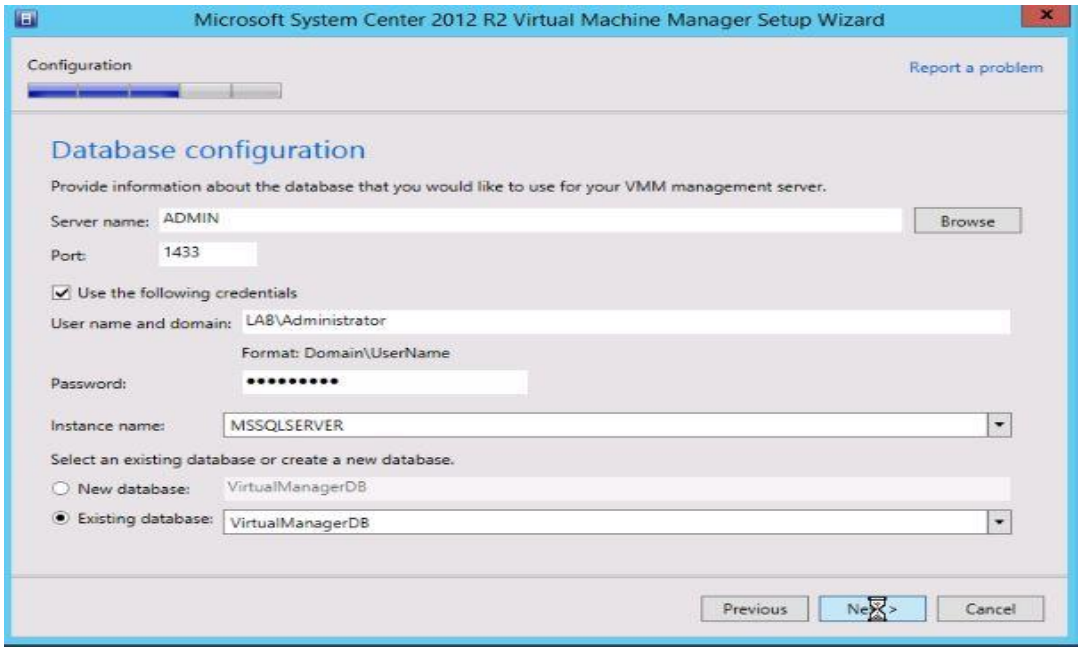


Screenshot: Installation Location tab

7. For the Database Configuration, enter the SQL Server name ADMIN. We have designed our Database event to listen on a port 1433, and then we do not have to enter a port number. If we are installing VMM in an account in which it does not have SQL permissions for VMM database configuration, we should give an account that has correct permissions to do so. Here we have designed the installer account (for our situation: admin) to have the right authorizations on the SQL server, leave this blank.

Note: Our "SQL" server has a default case of MSSQLSERVER, so by default this occurrence name will be used to create a new database. I have left mine blank realizing that

MSSQLSERVER will be utilized. Also, I have changed the default option to create a new database with the name: VirtualManagerDB.



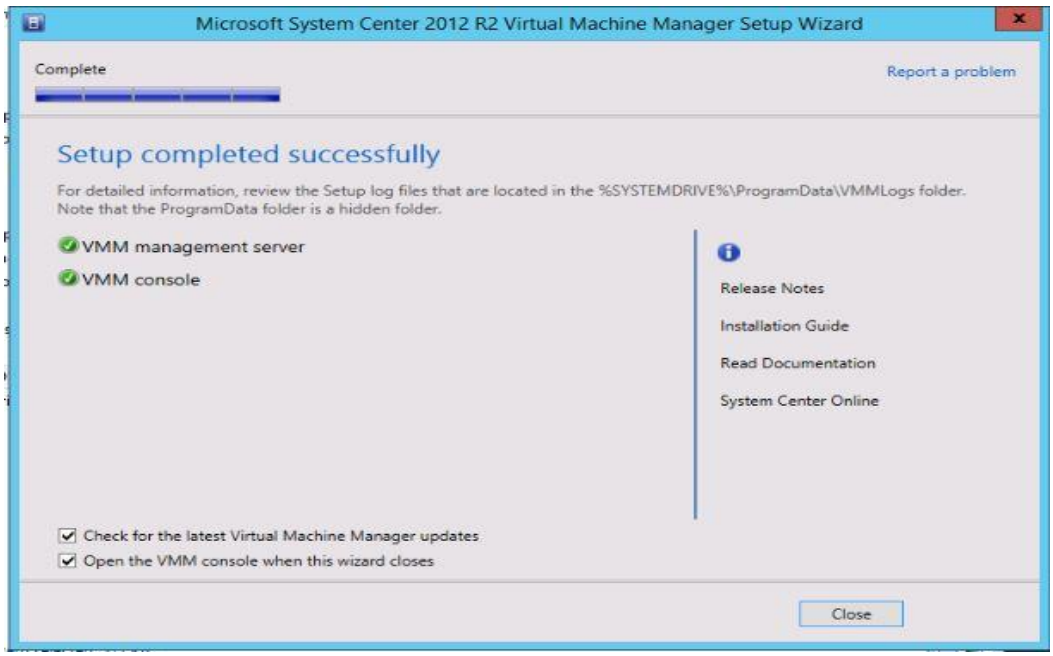
Screenshot: Database Configuration Window

8. Now enter the domain service account details in the Configure Service Account and Distributed Key Management screen. Here we have opted to store the keys in Active Directory, so then we need to give the Distinguished Name of the path in AD we've already set up for VMM distributed key management.

   NOTE: To get the Distinguished Name (DN) for the VMM Container, in ADSI Edit, click into the properties and then Attribute Editor of the VMM Container and copy the value in 'distinguishedname'.

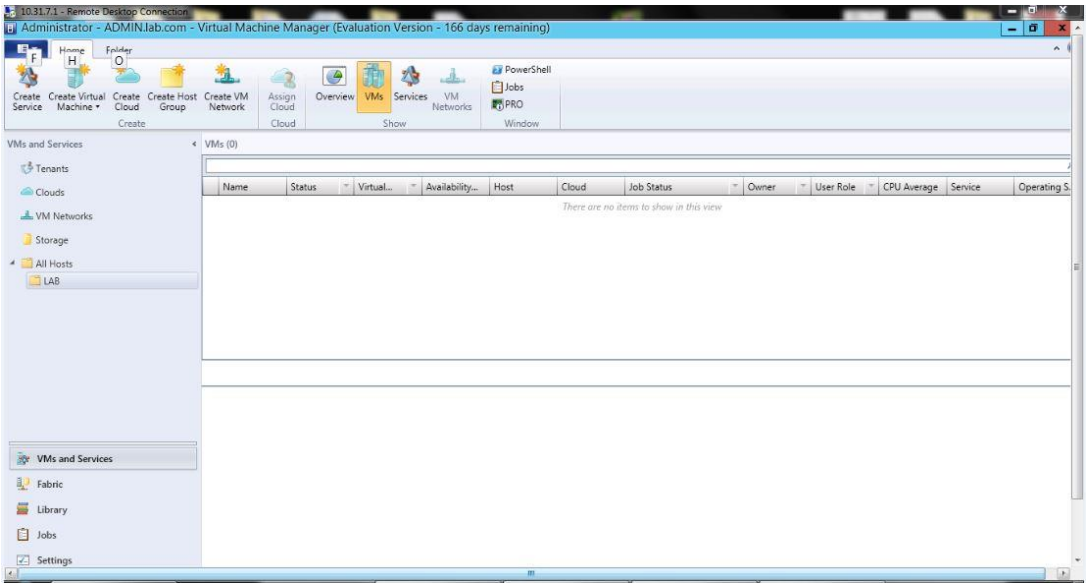
9. Now we will Accept the default Port Configurations options, default library share option and review the installation outline and click Install.

   Now we can see SCVMM setup instalaltion was successfully completed.



Screenshot: Completed VMM Setup Window

After the installation completed, now SCVMM is ready to add the hosts.



Screenshot: SCVMM View

Adding Hosts to VMM

We can utilize the following technique to add a trusted Windows Server–based computer or Windows Server–based failover cluster as one or more managed Hyper-V hosts in Virtual Machine Manager (VMM).

Before we start the procedure, we should consider the prerequisites mentioned below:

1. We should make sure that the stand-alone server or the failover cluster is a member from an Active Directory domain that has a two-path trust with the domain of the VMM management server. The computers that we need to include must support Hyper-V.
2. If we need to include the VMM server as a managed Hyper-V host, ensure that we enable the Hyper-V role on the VMM management server before we include the computer.
3. We cannot include a highly available VMM management server as a managed Hyper-V host cluster.
4. If we are including a Hyper-V cluster, this strategy assumes that we have an existing failover cluster that we made by utilizing the Failover Cluster Management add-in.
5. If we utilize group Policy to give Windows Remote Management (WinRM) settings, assure the following before adding a Hyper-V host to VMM management.
6. VMM can only support the setup of WinRM Service settings through group Policy, and just on hosts, which are in a trusted Active Directory domain. In particular, VMM supports the setup of the Allow automatic configuration of listener, and Turn on Compatibility HTTP Listener, and Compatibility HTTPS Listener Group Policy

settings. VMM will not support configuration of the other WinRM Service policy settings.

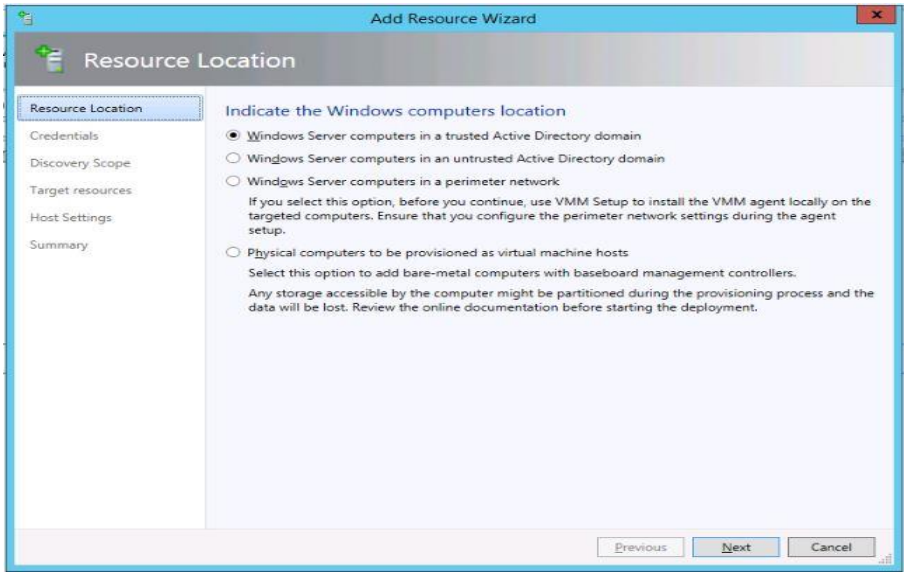
7. If we enable it to allow automatic configuration of listener's policy settings, we should design it to permit messages from any IP address. To confirm this setup, see the policy setting and ensure that the IPv4 filter and IPv6 filter are set to *.
8. VMM does not support the setup of WinRM Client settings through group Policy. In the event that we setup WinRM Client Group Policy settings, these strategy settings may abrogate client properties that VMM requires for the VMM operator to work accurately.
9. In the case if we enable any unsupported WinRM group Policy settings, installation of the VMM agent may come up short.
10. The WinRM strategy settings are situated in the Computer Configuration > Administrative Templates > Windows Components > Windows Remote Management (WinRM) hub of the Local Group Policy Editor or the Group Policy Management Console (GPMC).
11. When we include a trusted host, we should determine account credentials for an account that has authentication rights on the computers that we need to include. We can enter a user name and password or indicate to Run As account. On the off chance that we need to utilize a Run As account, we can make the Run As account before we start this method, or we can make it amid the procedure.

NOTE: If we configured the VMM management to utilize a domain account when we installed the VMM management server, we should not utilize the same domain account to include or expel Hyper-V hosts from VMM. To add a trusted Hyper-V host or host cluster:

1. Start the Fabric workspace.
2. In the Fabric tab, click Servers.
3. In the Home window, in the Add group, click on Add Resources, and afterward click Hyper-V Hosts and Clusters.

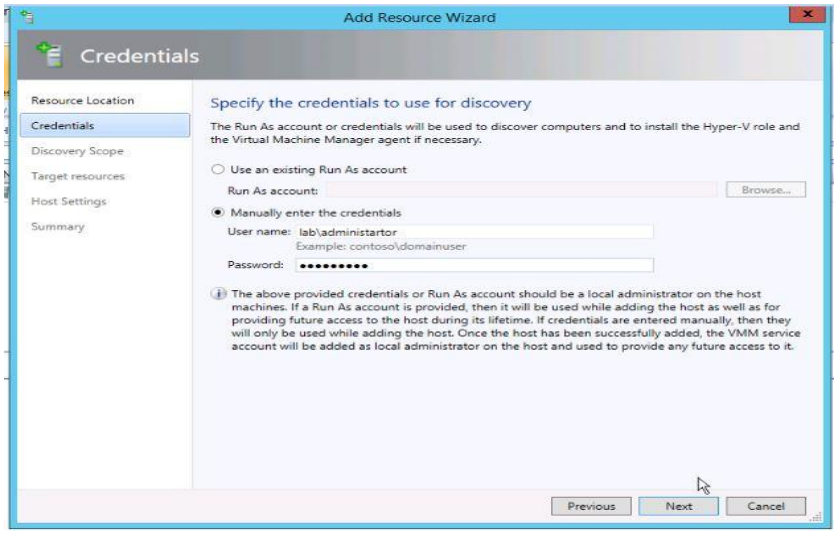
Now the Add Resource Wizard begins.

4. On the Resource location page, click Windows Server computers in a trusted Active Directory domain, and after that click Next.



Screenshot: Resource Location tab to Add Hosts

5. On the Credentials page, enter the username and password for a domain account that has administrative consents on all hosts that we need to include, and after that click Next.



Screenshot: Credentials Window to Add Hosts

NOTE: If we configure the VMM service to utilize a domain account when we install the VMM management server, do not utilize the same domain account to include the hosts. We can determine a current Run As account or physically enter client credentials in the format domain_name\user_name.

a) On the off chance that we do not have Run As account, click Browse, and after in the Select a Run as Account tab, click Create Run as Account.

b) For instance, if we made the case Run As account that is mentioned in the "Requirements" segment in this topic, click Browse, and after tap the Trusted Hyper-V Hosts Run As account.

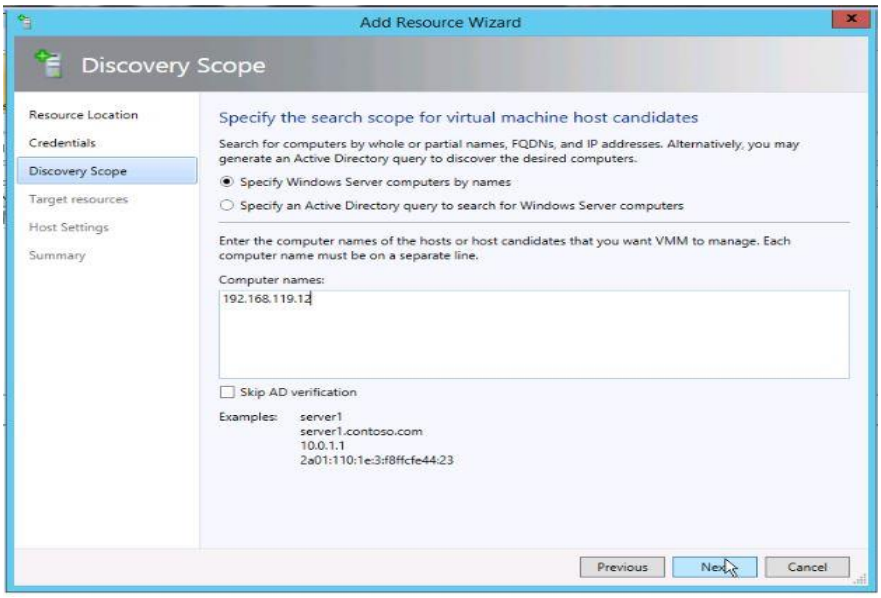
6. On the Discovery scope page, do any of the following, and snap next:

a) Click "Specify Windows Server computers by names". In the "Computer names" tab, enter the computers that we need to include, with every computer name or IP address on another line. In the event that we are including a Hyper-V cluster, we can either

determine the cluster name or IP address, or indicate the name or IP address of any cluster node.

b) For our case, click "Specify Windows Server computer by names", enter "Hyperv.lab.com" as the COMPUTER name, and click Next.

c) If we go to "Specify an Active Directory question to search for Windows Server computers". At that point, enter an Active Directory Domain Services (AD DS) inquiry in the "Type your AD query" box, or click "Generate an AD query" to make a query.

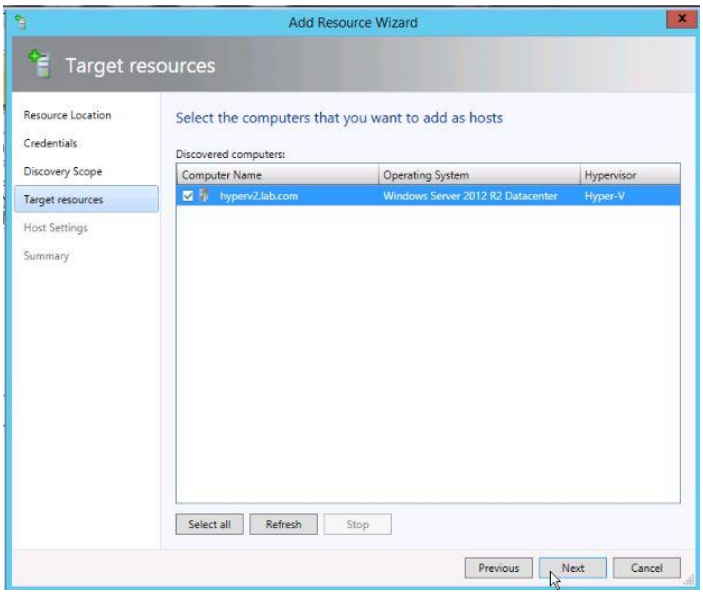


Screenshot: Discovery scope tab in Add resource wizard

7. On the "Target resources" page, we should mark the check box on every computer that needs to be included, and click Next. If we entered a cluster name or cluster node in step 6 above, mark the cluster name. Here the cluster name is recorded together with the related cluster hubs.

   For our case, mark the check box Hyperv1.lab.com, and click Next.

In the event that the Hyper-V part is disabled on a chosen server, we get a message that VMM will install the Hyper-V and restart the server. Click OK to proceed.



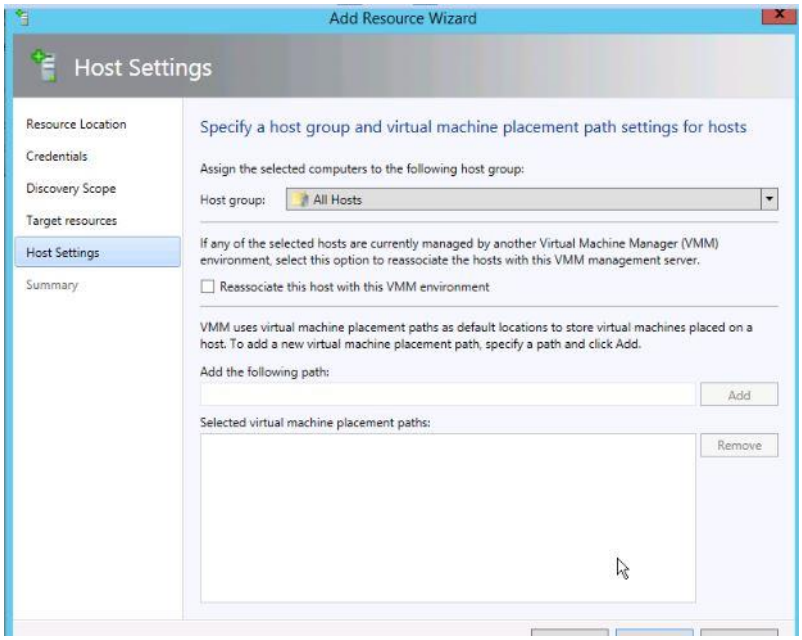
Screenshot: Target Resources tab to Add Hosts

8. On the Host settings page, do the following:
   a. In the "Host group" list, select the host group to which we need to give the host or host cluster.

   For our instance, select the host group ALL HOSTS.

   b. If the host is now connected with an alternate VMM management server, select "Re-associate this host with this VMM environment".
   c. If we are including a stand-alone host, in the "Add the following path", give the path on the host where we need to store the documents for virtual machines that are deployed on the host, and after this click Add. Repeat this process if we need to include more than one path. Take note of the following:

1. If we left the box empty, the default path is utilized. We should know that it is a best practice not to include the default path, which are on the same drive as the operating system files.
2. If we determine a path that does not exist, the path is automated.

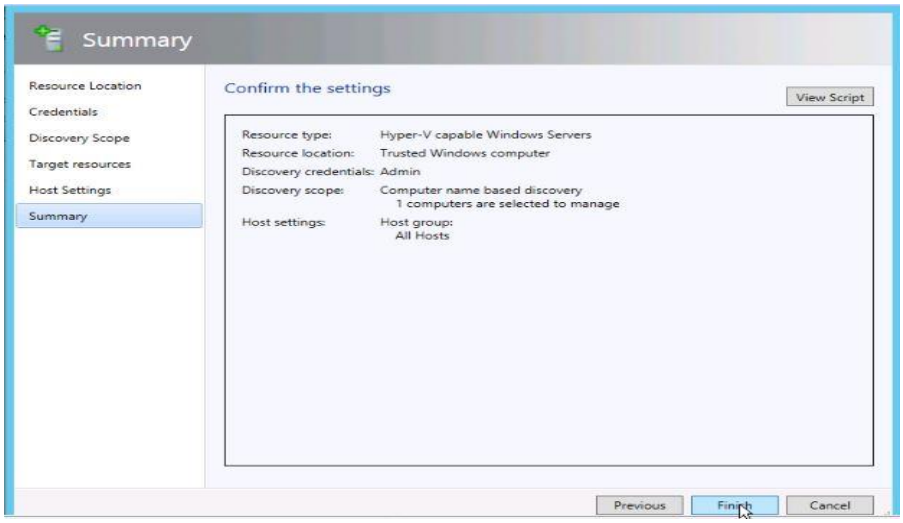


Screenshot: Host Settings tab in Add Resource Wizard

d. When the process is completed, click Next.

Note: When we include a host cluster, we do not indicate default virtual machine paths, as we would for a remaining solitary host. For a host cluster, VMM naturally deals with the paths that are accessible for virtual machines considering the common storage that is accessible to the host cluster.

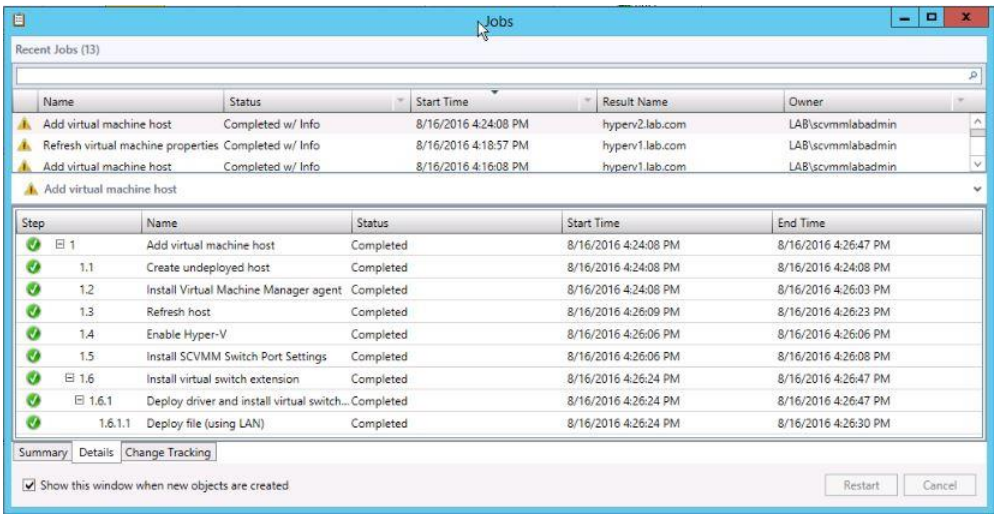
9. On the Summary page, ensure with the settings, and click Finish.



Screenshot: Summary Tab to Add Hosts

10. To check that the host or host cluster was effectively included in the Fabric tab, extend the host group where we included the host or host cluster, tap the host or host cluster. At that point, in the Hosts tab, confirm that the host status is OK.

    Note: The Jobs tab box seems to demonstrate its status. Ensure that the job has a status of Completed before we close the tab.



Screenshot: Display of Jobs Completed

To Configure a Logical Network in SCVMM

1. Open the Fabric tab > Home > Show Group > Fabric Resources.
2. In this tab, pull down Networking, and click Logical Networks.
3. On the Home tab, on the Create group, click Create Logical Network. Now the Create Logical Network Wizard opens.

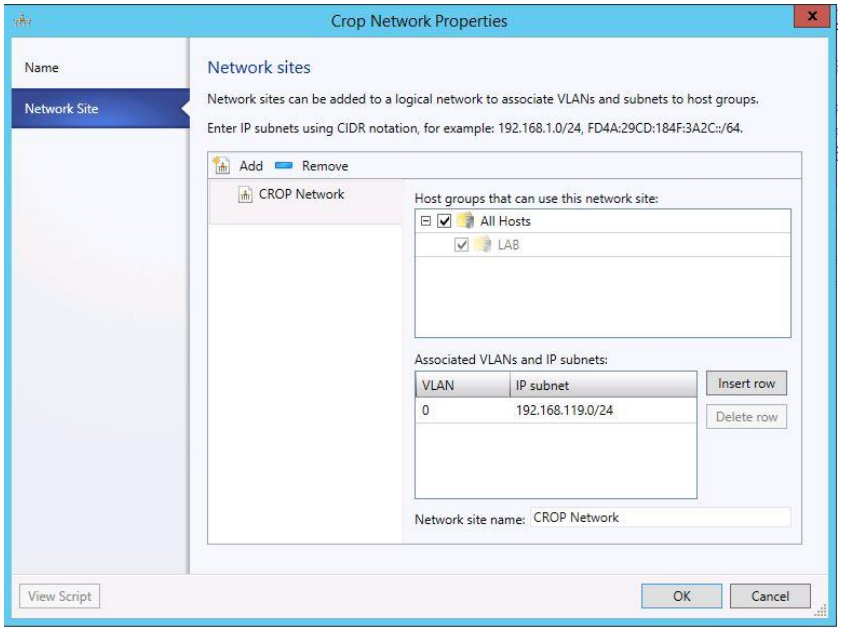
4. On the Name page, as ours is System Center 2012 R2, mark check boxes as suitable.

5. On the Network Site page, make the following configurations.

   a. To make a system site, click Add. VMM consequently gives a site name that comprises of the logical network name, trailed by an underscore and a number.
   b. Review the network site name and guarantee that it is no more than 64 characters. To change the default name, in the Network site name, enter another name for the network site.
   c. Under "Host groups that can utilize this network site" marks every host group to which we need to make the logical network accessible. For instance, to make the LAB logical network accessible to the VLAN host group and all its host groups, mark the box beside VLAN.
   d. Under "Associated VLANs and IP subnets", enter the VLANs and IP subnets that we need to assign to the network site. To enter VLAN and IP subnet info, click Insert row, tap the field under VLAN or IP subnet, contingent upon what we need to setup, and enter a VLAN, an IP subnet, or a subnet/VLAN set. We can give multiple columns.

In the event that we have System Center 2012 SP1 or System Center 2012 R2 and already have chosen the alternatives for private VLANs, likewise enter the secondary VLAN for each VLAN that we enter.

In case we leave the VLAN field empty, VMM allocates a VLAN of 0. This demonstrates to VMM not to utilize VLANs. In trunk mode VLAN 0 denotes native VLAN.



Screenshot: Network Site tab in Crop Network Properties

Configuring the IP Address Pools for the Logical Networks Created Already

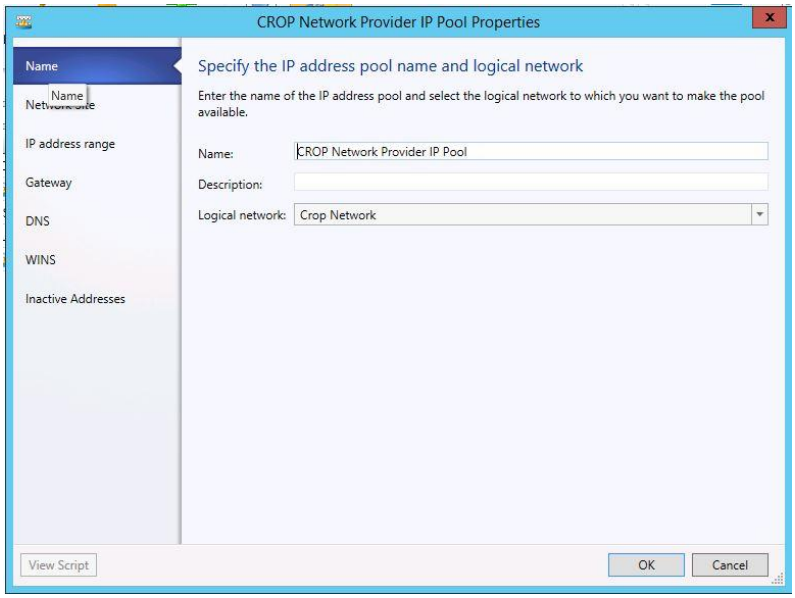
Before we start this technique, ensure that a logical network exists, in a perfect instance with one or more related network sites (which are components of the logical network). The network sites must have no less than one IP subnet or VLAN pair given. If we do not have network destinations characterized, we can make a network site when you make the static IP address pool.

To make static IP address pools for logical networks:

1. Open the Fabric workspace tab from VMM management.
2. In the Fabric tab, pull down the Networking, and select Logical Networks.
3. On the Home tab, in the Show group, select Fabric Resources tab.
4. In the Logical Networks and IP Pools tab, tap the logical network where you need to make the IP pool.

For instance, click CROP.

5. On the Home tab, from Create group, click Create IP Pool. This will open Create Static IP Address Pool Wizard.
6. On the Name page, do the accompanying, and after click Next.



Screenshot: Name tab in CROP Network Properties

a. Enter a name and description (optional) for the IP address pool.

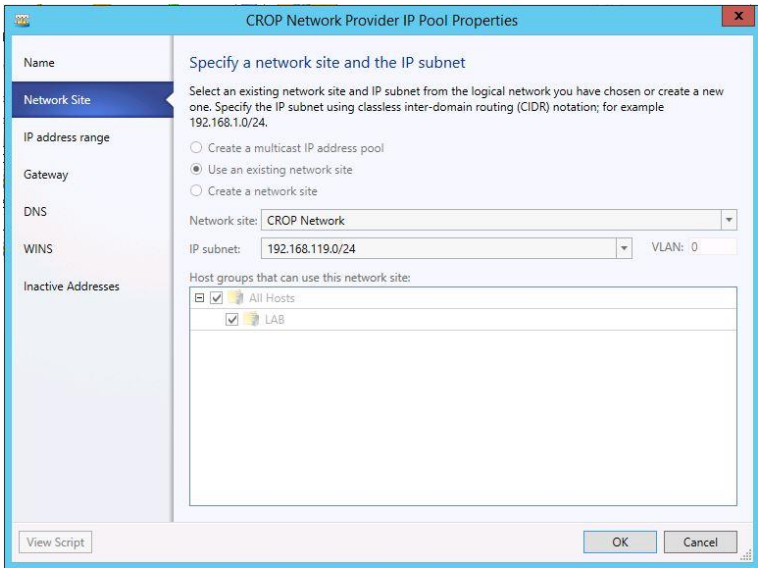
b. In the Logical network list, ensure that the right logical network is chosen.

For our instance, we will enter the name and description for the CROP logical network, and afterward click Next.

7. On the Network Site page, select a current network site or create another one. Then again, beginning with VMM in System Center 2012 SP1, if we need to utilize multicasting or broadcasting, skip to the following step.

If you select <Use an existing network site>, select the network site and the IP subnet that you need to make the IP address pool from, and after click Next.

We cannot change the virtual local area network or the given host groups for an already existing network site from this page. If you attempt to change the host groups that can utilize the network site from this page, the state will return to the original value when you proceed to the following page of the wizard. To adjust these qualities, you should change the properties of the logical network.



Screenshot: Network Site tab in IP Pool Properties.

In the event that you select Create a network site, follow the given steps, and after that click Next:

a. In the Network site name tab, enter a name for the network site.

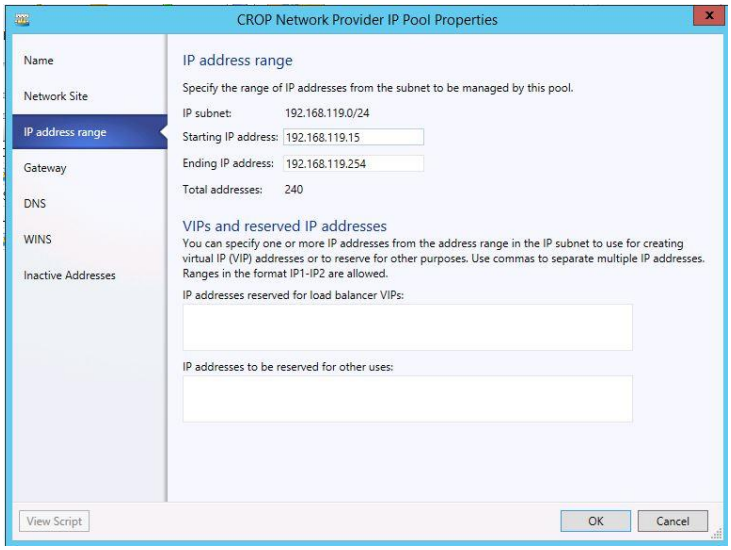
b. In the IP subnet box, enter the IP subnet that you need to allot to the network site. Later in this technique you can give a range of IP locations from the subnet to the pool. You should determine the IP subnet by utilizing Classless Inter-Domain Router (CIDR)

c. If you are utilizing VLANs, in the VLAN box, enter the VLAN ID. A VLAN of 0 demonstrates to VMM not to utilize VLANs. In trunk mode, VLAN 0 shows native VLAN.

d. Under Host groups that can use this system site, mark the check box by every host group to which you need to make the network site and the related logical network accessible.

8. Starting with VMM in System Center 2012 SP1, if we need to utilize multicasting or broadcasting, we follow this or we skip to the following numbered step. Beginning with System Center 2012 SP1, if the logical network on which we are creating the IP address pool is designed to utilize network virtualization, we can utilize this pool to support broadcasting or multicasting. To do this, on the Network Site page, click create a multicast IP address pool, select the IP subnet that we need to use for multicasting or broadcasting, and after that click Next. On the IP address range page, follow the below steps, and after that click Next:

   a. Under IP address range, enter the starting and ending IP addresses from the subnet that will make up the managed IP address pool. The starting and consummation IP address must be contained within its subnet.



Screenshot: IP Address Range in IP Pool Properties

b. For our illustration, include the mentioned information for the CROP VLAN network site, and after that click Next.

c. Under VIPs and reserved IP addresses, determine IP address ranges that we need to hold, for example, a range for load balancer virtual IP addresses (VIPs). The IP addresses that we need to hold must fall inside the IP address range that we indicated in Step 8a.

During deployment of an administration with a load-balanced service tier, VMM allocates a virtual IP to deliver to the load balancer from the reserved range of VIP addresses automatically. After the DNS administrator registers the assigned VIP address in DNS, customers can get to the administrative functions by interfacing through its enrolled name in DNS.

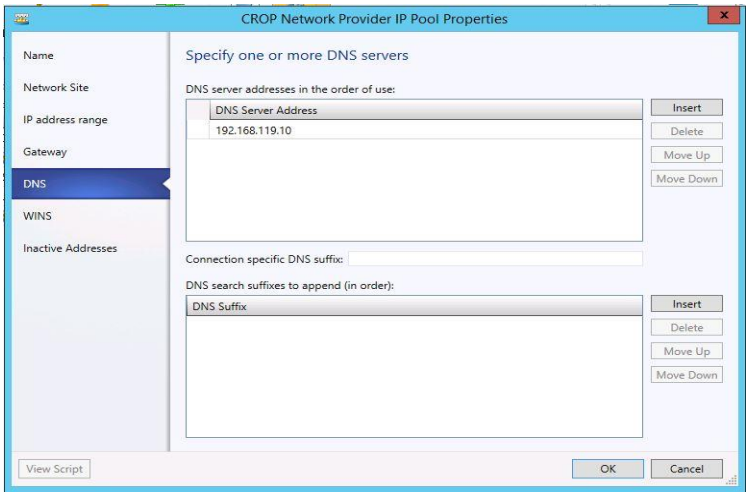
9. On the Gateway page, go to Insert, and after that indicate one or more default gateway addresses and the metric. The default gateway address must fall inside the same subnet range as the IP address pool. It does not need to be a component of the IP address pool.

For our instance, enter the default portal address; acknowledge the default of Automatic as the metric, and after that click Next.

The metric is given out to an IP course for a specific network interface that distinguishes the cost that relates to utilizing that route. If we utilize the automatic metric, the metric is consequently given for local routes taking into account the link speed.

10. Optionally, on the DNS page, indicate Domain Name System (DNS) - related data, for example, the DNS servers list and their request, the default DNS addition for the association, and the DNS inquiry list suffixes.

    For virtual machines that will join an Active Directory, Microsoft recommends that we utilize Group Policy to set the essential DNS suffix. This will guarantee that when a Windows-based virtual machine is set to enroll its IP addresses with the essential DNS suffix, dynamically Windows-based DNS server will enlist the IP address. Further, the usage of Group Policy enables to have an IP address pool that traverses various domains. For our situation, we would not have any desire to indicate a primary DNS suffix.



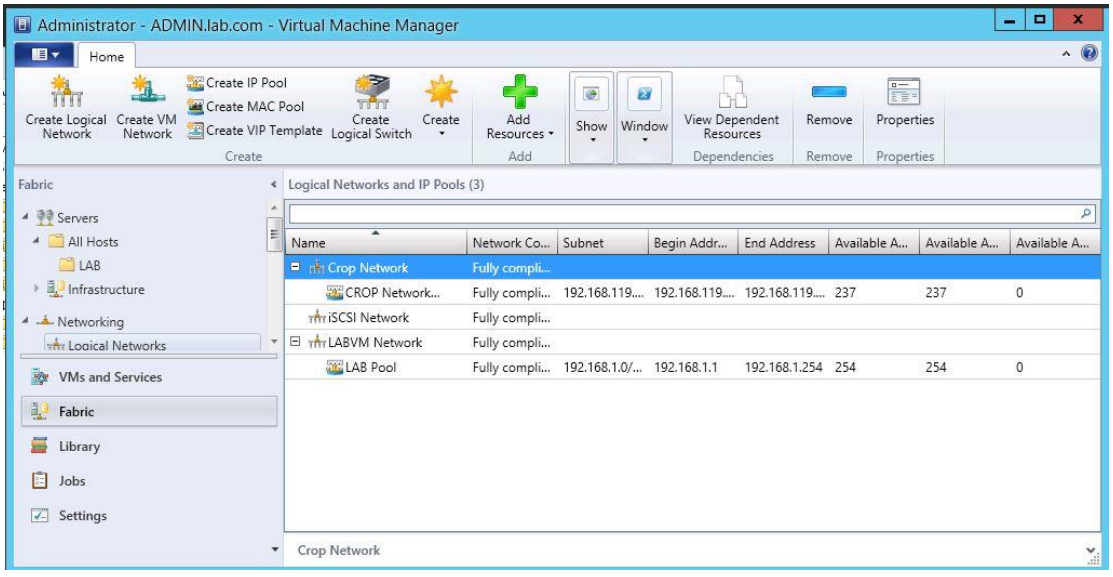
Screenshot: DNS Tab in IP Pool Properties

Note: For our case, enter the DNS server address 192.168.119.10, the connection-specific DNS suffix as default, and after that click Next.

12. Optionally, on the WINS page, select Insert, and enter the IP address of a Windows Internet Name Service (WINS) server. We can choose the check box that demonstrates whether to enable NetBIOS over TCP/IP. Know that enabling NetBIOS over TCP/IP is not recommended if the address is comprised of open IP addresses.

    For instance, the WINS server address is left as the default, and after that click Next.

13. On the Summary page, ensure the settings, and after that select Finish. The Jobs tab shows up. Ensure that the job has a status of Completed.
14. To check that the IP address pool was made, in the Logical Networks and IP Pools tab, pull down the logical network where you made the pool. The IP address pool shows up under the logical network.



Screenshot: View of IP Address Pool in Logical Networks

15. Repeating this same procedure to include IP address pools for other logical systems i.e., LAB.

Here we created CORP network for hosts and LAB network for virtual machines. As of System Center 2012 R2, after a virtual machine has been deployed in VMM, we can see the IP address given to that virtual machine. To do this, right-click the listing for the virtual machine, click Properties, tap the Hardware Configuration tab, tap the network adapter, and in the results tab, tap the Connection details.

Virtual Networks in SCVMM

VM systems make utilization of network virtualization or alternate network configuration. Network virtualization broadens the idea of server virtualization to permit you to send many virtual systems (VM systems) on the same physical system. VM systems can be arranged also in different ways.

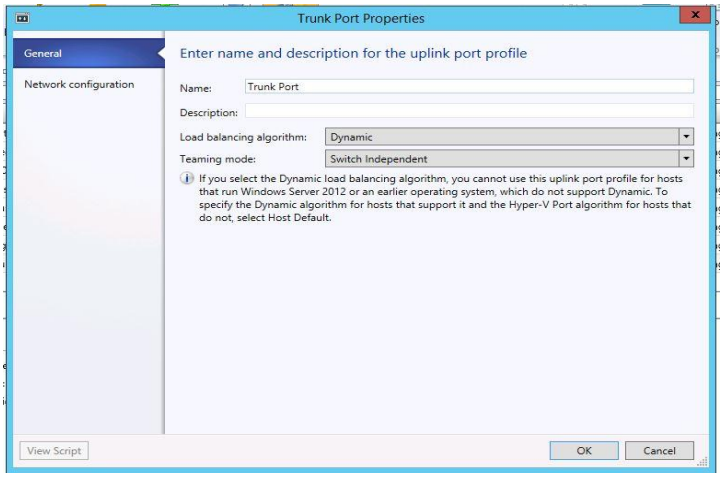
If we need to make a VM organize and design it with a gateway in the meantime, you should first add the gateway to our VMM design. We can also include a gateway later, then open the property tab of a current VM network and design the VM system to utilize the gateway.

Port profiles. A port profile for uplinks (called an uplink port profile) gives which logical network can interface through a specific physical network adaptor.

After we make an uplink port profile, and add it to a logical switch, which places it in profiles that are accessible through that logical switch. When we apply a network adaptor with a logical switch in a host, the uplink port profile is accessible in the profiles, yet it is not connected to that network adaptor until you select it from the available list. This helps to make consistency

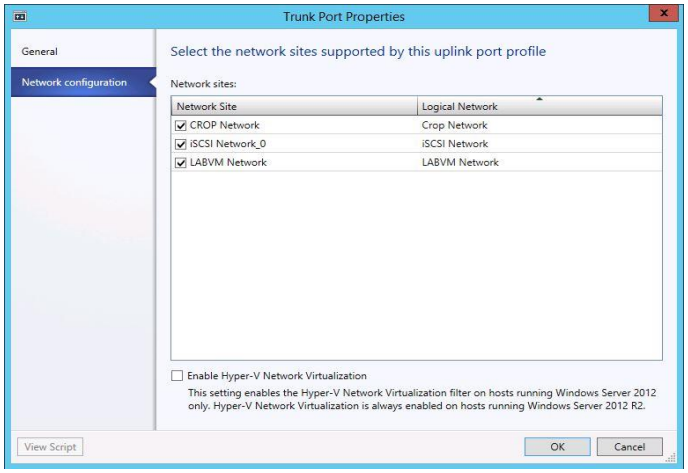
in the designs of network adaptors over different hosts, yet it additionally enables to arrange every network adaptor as per our requirements.

When we create a Trunk, port configure it with Dynamic load balancing algorithm and switch independent teaming mode.



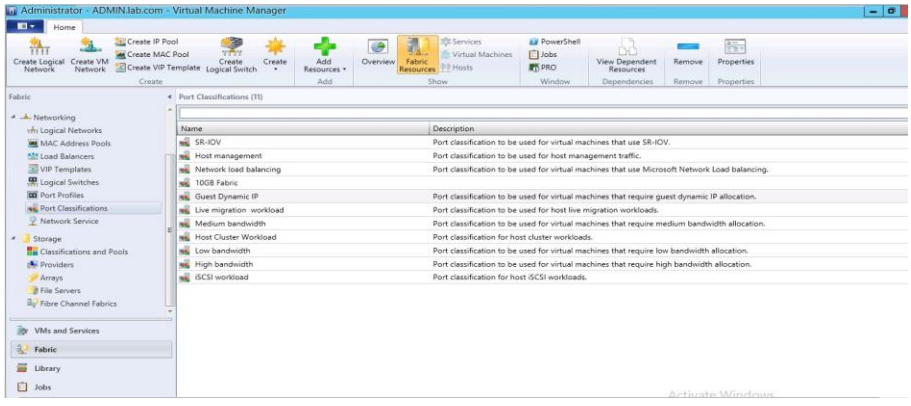
Screenshot: General Settings tab in Trunk Port

If we apply the same logical switch and uplink port profile to those network adaptors and give suitable settings in the consistent logical and uplink port profile, then it enables the joining of numerous network adaptors. In the logical switch, for the Uplink mode, select Team for joining. In the uplink port profile, select the proper Load-adjusting algorithm and Teaming mode settings (or the default settings).



Screenshot: Network Configuration tab in Trunk Port

Port classifications. A port classification gives a global name to distinguish types of virtual network adapter port profiles. Therefore, an arrangement can be made over different logical switches while the configurations for the arrangement will be particular to each logical switch. For instance, we may make one port arrangement that is named MORE to distinguish ports that are designed to have more transmission capacity, and one port characterization that is named LESS to recognize ports that are designed to have less data transmission. We can utilize the port classifications that are given in VMM, or we can make our own particular port classifications.



Screenshot: View of Port Classifications under Fabric

Logical switch. A logical switch gets the port profiles, port characterizations, and switch extensions together with the goal that they can be applied reliably to network connectors on numerous host frameworks.

NOTE: when we add an uplink port profile to a logical switch, this will place the uplink port profile in a rundown of profiles that are accessible through that switch. When we apply it to a network adaptor in a host, the uplink port profile is accessible in the rundown of profiles, yet it is not connected to that network adaptor until you select it from the rundown. This helps you to make consistency in the designs of network adaptors over different hosts, yet it makes it workable to change settings for every network adaptor as per our requirements.

To join different network adaptors, the same logical switch and uplink port profile can be applied to those network adaptors and design proper settings in the logical switch and uplink port profile. For the Uplink mode, select Team to joining. In the uplink port profile, select proper Load-balancing algorithm and Teaming mode settings (or the default settings) in the logical switch.

Switch extensions (which can be introduced on the VMM administration server and after incorporate into a logical switch) permit us to see network traffic, utilize Quality of Service (QoS) to control how data bandwidth is utilized, upgrade the level of security, or generally expand the abilities of a switch. In VMM, four sorts of switch extensions are supported:

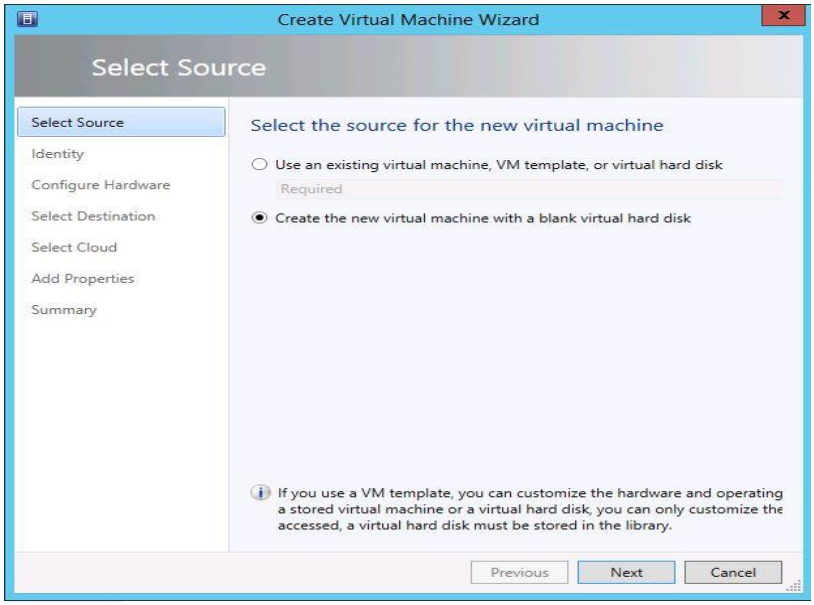
1. Monitoring extensions are for monitoring and reporting but not for modifications of packets.
2. Capturing extensions is to investigate and test the migration, but cannot modify them. Filtering extensions are to block, adjust, or defragment. Also, it can block ports.

3. Forwarding extensions is to direct activity by giving destinations, and they can capture and filter traffic. Only one forwarding extension can be active on a logical switch to avoid traffic.

Storage Migration

Follow the below mentioned method to run storage migration in Virtual Machine Manager (VMM).

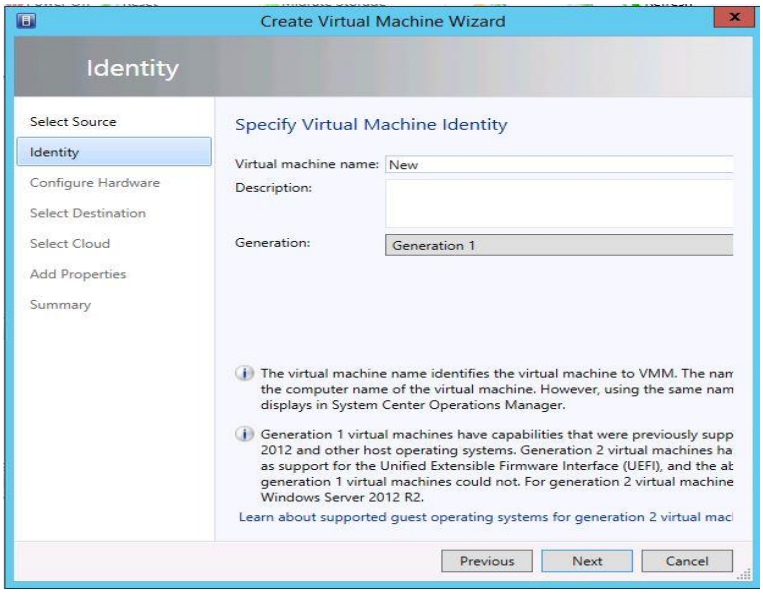
1. In the VMM manager, open the VM's and Services tab. In the VM's and Services window, pull down All Hosts, and after that select the host on which the virtual machine for the deployment.
2. Right-click on the host we selected and select create virtual machine. Now create virtual machine wizard will open.
3. Select create the new virtual machine with a blank virtual hard disk as we are not migrating a virtual machine which already exists.



Screenshot: Select Source Tab in Create VM Wizard

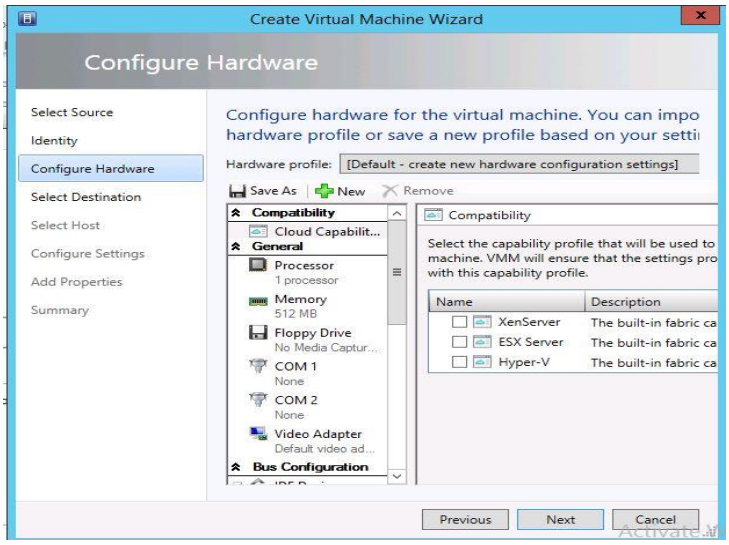
4. In this step, give the Virtual machine a name, it identifies the virtual machine to VMM.

   Select the Generation which is supported to the operating systems we have.



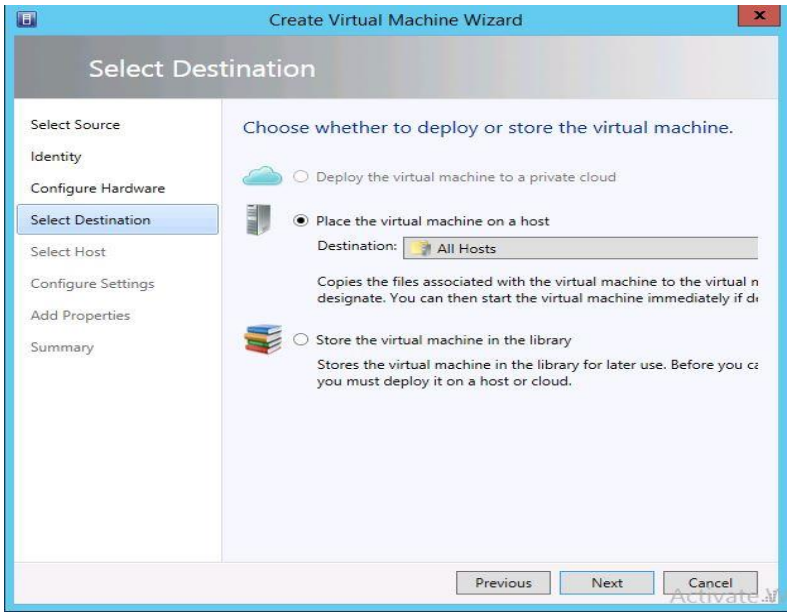
Screenshot: Identity Tab in Create VM Wizard

5. In Configure Hardware, leave it as default.



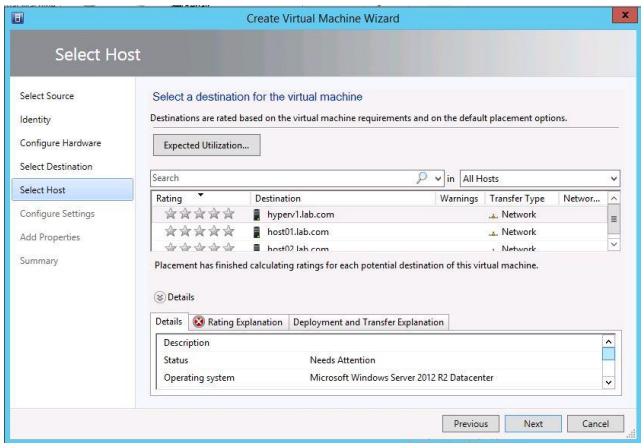
Screenshot: Configuration Hardware in Create VM Wizard

6. In Select Destination, Check the place the virtual machine on a host and select the destination (ALL HOSTS) where we want to install the VM to migrate. Click Next.



Screenshot: Select Destination Tab in Create VM Wizard

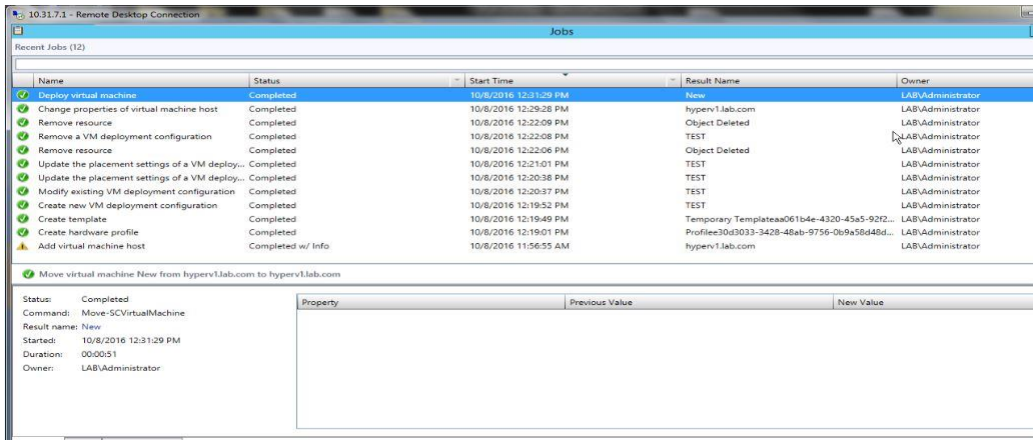
7. In Select host, select the host hyperv1.lab.com in which we want to deploy the VM. Here the system will recommend selecting the highest rating host (depends on the memory usage).



Screenshot: Host Selection Tab in Create VM Wizard

8. Leave the Configure setting and add properties to default options and click Next.

9. On the Summary page, click Next to start moving the files of the virtual machine. To summarize the progress and consequences of the operation, see the Jobs tab which will open by default. To view this tab at any time, click Jobs on the VMM toolbar.



Screenshot: View of Jobs Completed

We can see the files loading to the folder in the SAN drive which we created before and gave the file path while we are configuring the settings.

Fast storage migration allows us to move the storage of a virtual machine starting with one storage area onto the next on the same virtual machine host. In the event that if the virtual machine is running, it performs a fast storage migration, which brings about few or no service outages for clients of the virtual machine. If more than one virtual hard disk is present in a virtual machine, we can give a different file storage location for each virtual hard disk (.vhd or .vhdx).

To run a fast storage migration:

1. In the VMM manager, open the VM's and Services tab. In the VM's and Services window, pull down All Hosts, and afterwards select the host on which the virtual machine for the deployment.

2. In the VM's tab, right-click the virtual machine, and click Migrate Storage. The Migrate Storage tab opens at the Select Path page. It shows the present locations of the virtual machines. The present path of the configuration files location is shown in the Storage area for VM setup box, and the present path to the location of each virtual hard disk (.vhd) is shown in the Disks record.
3. On the Select Path page, configure a storage location for the virtual machine arrangement, by doing one of the following:
    - Select the Browse by next to Storage location for VM settings, and click a current default virtual machine path in the shown list.
    - Select the Browse by Storage location for VM settings and look for a location on the host. VMM automatically changes the paths for every single virtual disk to the same way that was indicated for the previous settings.
4. Give a path. When another path is given for the setup files of the virtual machine, VMM does not change the ways for the virtual plates until we click outside of the Storage path for VM arrangement box.
5. Select add this path to the listed default storage locations on the host, if a current virtual machine path is chosen, and you need to add the path to the default ways on the host. Indicate the settings file replacement choices, as mentioned below:
    a) Select automatically place all VHDs with the settings to migrate the virtual machine documents to the same locations.
    b) Select Allow VHDs to be set exclusively to move one or many of the virtual machine documents to an alternate path than the path of the settings file. In the

event this setting is selected, in the Disks territory, give the new path in the Location box given for each virtual hard disk, or click Browse to look to the path where to store the file. Take note if the virtual machine is running and we change the path for any of the virtual hard drives, additionally another path is given for the setup files of the virtual machine, or the migration operation will not succeed. We should give the new path regardless of the possibility that we need to leave the setup files in their present path. We can make another subfolder inside the present path of the setup files, and select that new path in the Storage location for VM setup box.

6. On the Summary page, click Move to start moving the files of the virtual machine. To summarize the progress and consequences of the operation, see the Jobs tab which will open by default. To view this tab at any time, click Jobs on the VMM toolbar.

Summary

In this section, it introduced the Hyper-V installations and its role in server manager and with the operating systems. This section has every detailed step how to implement Hyper-V on SCVMM. It also discussed the requirements and its configurations.

Chapter VI: Summary

Hyper-V is mainly useful for an administrator or someone who is planning to design a virtual infrastructure. We can use Hyper-V for computer management and security throughout the organization. It reduces the operation and maintenance costs of the physical servers by utilizing less hardware. Development and test efficiency will be increased by minimizing the time taking to setup hardware and software for test environments. With the use of Hyper-V, server availability was improved without any help of physical computers which are needed in a configuration failover.

From the study the main applications of Hyper-V are as follows:

1. In expanding or establishing virtual desktop infrastructure. VDI can help in increasing data security, business agility as well as in desktop operating system management and its applications with a centralized desktop method.
2. In development making and in more efficient testing.
3. In establishing or extending a private cloud environment. Hyper-V can help to move or extend the utilization of shared resources and conform usage as requests change, to give more adaptable, and on-request IT administration.
4. Effective usage of hardware. By getting servers together and with less workload, more effective physical server utilization of resources are reduced, for example physical space and power consumption.
5. To improve business progression. Hyper-V can help in reducing the effect of both scheduled and unscheduled downtime of the workloads.

6. For disaster recovery and backup capabilities. Hyper-V creates replications of virtual machines which are stored in different server locations so the restoration of a VM will be done from the replica. For back-up Hyper-V offers saved states and volume shadow copy service (VSS) so the consistent backup of the applications that support VSS are done.

Future Work

Linux secure boot. Things being what they are while Microsoft heard a considerable measure of feedback in the beginning of Windows 8 for attempting to bolt Linux out from being introduced on new PCs, it was simply biding its time before spreading the security. Generation 2 Virtual Machines have virtual UEFI firmware rather than a legacy BIOS; in Windows server vNext version this can be utilized to extend out Secure Boot to Linux, relieving the security risks of root kits and low-level malware. Today, this works for version 14.4 of Ubuntu and SUSE Linux Enterprise Server 12. We need to manually enable it before we begin the VM the first run through utilizing Windows PowerShell.

Set-VMFirmware vmname - SecureBootTemplate MicrosoftUEFICertificateAuthority.

Other configuration files and version upgrades. Things being turned out for Hyper-V that has an edition for virtual machine configurations, with the first version in Windows Server 2008 till Windows Server 2012 R2 (5.0). This was taken care of by Hyper-V under the saved configuration files for VMs which were automatically updated when the VM moved to another host, with no administrator user input. The following version of Hyper-V which is called vNext will get 6th edition which is also compatible with earlier editions (i.e., Windows server 2008 to

windows server 2012 R2). This implies we can cross-form the live migration process in a VM from a 2012 cluster group to a vNext group like how we did for 2012 to 2012 R2.

More improvements. Generation 2 VMs were presented in 2012 R2, getting rid of all legacy-copied equipment; however, they were progressively a pointer to the future, as they weren't upheld in System Center Virtual Machine Manager 2012 R2 service templates. In vNext, we can include or exclude NICs in a Windows/Linux Generation 2 VM while it's power is still on. Also, we can change the memory configurations given to a VM while it is running.

Limitations

Integration Services update which are running in VM's: There is a procedure followed by organizations to separate administrative heads and application/VM managers. With this technique, the previous has no rights to the VMs running on top of their hosts, while the application administrators do not know the detailed elements of the basic configuration. This creates an issue, as every arrival of Hyper-V commands, an update is mandatory to the integrated services, which are already running inside each VM.

This issue has been dealt with by a change to updating integration services through Windows Update. So, whether we are utilizing Configuration Manager, Windows Server Update Services (WSUS), or Windows Update, we will get any required upgrades a similar way of whatever other patches have come to our VMs. Having the integration services variant coordinating the host Hyper-V upgrade is additionally no more extended a prerequisite for Microsoft compatibility. It simply requires the most recent version for our VM OS.

References

Application virtualization. (n.d.). *In Wikipedia*. Retrieved from http://en.wikipedia.org/wiki/Application_virtualization

Cisco. (n.d.). *Blade servers*. Retrieved from http://www.cisco.com/c/en/us/products/servers-unified-computing/ucs-b-series-blade-servers/index.html

Cloud computing. (n.d.) *In Wikipedi*a. Retrieved from http://en.wikipedia.org/wiki/Cloud_computing

Database. (n.d.). *In Wikipedia*. Retrieved from https://en.wikipedia.org/wiki/Database

IEEE Xplore. (n.d.-a). *A component-based performance comparison of four hypervisors.* Retrieved from ieeexplore.ieee.org/document/6572995/

IEEE Xplore. (n.d.-b). *An implementation of private cloud's service model (IaaS) using lightweight virtualization*. Retrieved from http://ieeexplore.ieee.org/document/7754826/

IEEE Xplore. (2016a). *Determining best practices for windows server deployment in the cloud*. Retrieved from http://ieeexplore.ieee.org/document/7578852/

IEEE Xplore. (2016b). *Network virtualization by using software-defined networking controller based docker*. Retrieved from http://ieeexplore.ieee.org/document/7560537/

IEEE Xplore. (2016c). *Performance considerations of network functions virtualization using containers*. Retrieved from http://ieeexplore.ieee.org/document/7440668/

Microsoft TechNet. (2010a). *Hyper-V architecture and feature overview*. Retrieved from https://msdn.microsoft.com/en-us/library/dd722833 (BTS.10).aspx

Microsoft TechNet. (2010b). *Understanding requirements for failover cluster*s. Retrieved from https://technet.microsoft.com/en-us/library/cc771404.aspx

Microsoft TechNet. (2013). *Fabric, cloud computing abstraction integrated in VMM*. Retrieved from http://blogs.technet.com/b/yungchou/archive/2013/04/08/understanding-private-cloud-with-system-center-2012-sp1-virtual-machine-manager-vmm-2012-sp1.aspx

Microsoft TechNet. (2014). *Hyper V: Migration options*. Retrieved from https://technet.microsoft.com/en-in/library/dn486792.aspx

Microsoft TechNet. (2016a). *How to create a port profile for uplinks in VMM*. Retrieved from https://technet.microsoft.com/en-us/library/jj628166 (v=sc.12).aspx

Microsoft TechNet. (2016b). *Hyper V*. Retrieved from https://technet.microsoft.com/en-in/windowsserver/dd448604.aspx

Microsoft. (2017a). *Hyper-V technology overview*. Retrieved from https://technet.microsoft.com/en-us/windows-server-docs/compute/hyper-v/hyper-v-technology-overview

Microsoft. (2017b, January 23). *System center: Virtual machine manager engineering blog*. Retrieved from http://blogs.technet.com/b/scvmm/

Red Hat Enterprise Linux. (n.d.). *Virtual machine management architecture*. Retrieved from https://www.centos.org/docs/5/html/5.2/Virtualization/sect-Virtualization-Managing_guests_with_Virtual_Machine_Managervirt_manager-Virtual_Machine_Manager_Architecture.html

Secure Link. (n.d.). *Radio becomes the SecureLInk secure workspace department. Virtualization enables cyber security*. Retrieved from http://www.raido.be/solutions/server-virtualization/

Tech Genix. (2014). *System center virtual machine manager for beginners: Part 1*. Retrieved from http://www.virtualizationadmin.com/articles-tutorials/microsoft-hyper-v-articles/management/system-center-virtual-machine-manager-beginners-part1.html

Tech Target. (n.d.-a). *Desktop virtualization*. Retrieved from http://searchvirtualdesktop.techtarget.com/definition/desktop-virtualization

Tech Target. (n.d.-b). *Rack server*. Retrieved from http://whatis.techtarget.com/definition/rack-server-rack-mounted-server

Tech Target. (n.d.-c). *Tower server*. Retrieved from http://whatis.techtarget.com/definition/tower-server

Tech Target. (2006). *Live migration*. Retrieved from http://searchservervirtualization.techtarget.com/definition/live-migration

Techopedia. (n.d.). *Virtualization.* Retrieved from http://www.techopedia.com/definition/719/virtualization