**PROJECT SYNOPSIS**

**of**

**VMWare VSphere ESXi and Vcenter Administration**

*Submitted in the partial fulfilment of Bachelor of Technology in*

*Computer Science and Engineering*

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**Introduction**

What Is Virtualization?  
Virtualization is a technique of how to separate a service from the underlying physical delivery of that service. It is the process of creating a virtual version of something like computer hardware. It was initially developed during the mainframe era. It involves using specialized software to create a virtual or software-created version of a computing resource rather than the actual version of the same resource. With the help of Virtualization, multiple operating systems and applications can run on same machine and its same hardware at the same time, increasing the utilization and flexibility of hardware.

In other words, one of the main cost effective, hardware reducing, and energy saving techniques used by cloud providers is virtualization. Virtualization allows to share a single physical instance of a resource or an application among multiple customers and organizations at one time. Virtualization allows to share a single physical instance of a resource or an application among multiple customers and organizations at one time. It does this by assigning a logical name to a physical storage and providing a pointer to that physical resource on demand. The term virtualization is often synonymous with hardware virtualization, which plays a fundamental role in efficiently delivering Infrastructure-as-a-Service (IaaS) solutions for cloud computing.

Some Basic terms

1. Bare metal -**A bare metal server enables the user to rely on the entire hardware setup**.
2. Hypervisor -is software that creates and runs virtual machines (VMs). A hypervisor allows one host computer to support multiple guest VMs by virtually sharing its resources, such as memory and processing.
3. Virtual machine -A Virtual Machine (VM) is **a compute resource that uses software instead of a physical computer to run programs and deploy apps**.
4. Virtualization manager- A virtualization manager **provides a complete management solution for many different virtual machines simultaneously through a single application management console**.
5. Virtual desktop- Virtual desktops are preconfigured images of operating systems and applications in which the desktop environment is separated from the physical device used to access it. Users can access their virtual desktops remotely over a network
6. P2V- **In a P2V migration, the operating system running on a physical system is copied to a virtual machine.**
7. V2V-  In a V2V migration, an existing virtual machine running on one virtualization platform is copied to a virtual machine running on another virtualization platform
8. VM template - s **a perfect, model copy of a virtual machine (VM) from which an administrator can clone, convert or deploy more virtual machines**
9. Snapshot :
10. Clonning  A VMware clone has the same hardware, software, and other configurations as the original VM. Cloning is useful when deploying several virtual machines with the same resource allocation and configurations

Benefits of Virtualization

1. Cost- reduces per capital and operational costs
2. Real infrastructure- real infrastructure is not used as virtual VM’s do it all thus reducing cost
3. Electricity – whilst servers use a lot of electricity VM’s on the other hand doesn’t consume to much electricity which again circle backs to cost reduction
4. Management - With fewer servers, your IT teams will be able to spend less time maintaining the physical hardware and IT infrastructure. You’ll be able to install, update, and maintain the environment across all the VMs in the virtual environment on the server instead of going through the laborious and tedious process of applying the updates server-by-server.
5. Redundancy - This kind of redundancy works in two ways when applied to virtual machines:

* If one virtual system fails, another virtual system takes over.
* By running the redundant virtual machines on separate physical hardware, you can also provide better protection against physical hardware failure.

1. Faster deployment- Minimized or eliminated downtime.
2. Resource availability - Faster provisioning of applications and resources.
3. Testing and performance - allows **you to very quickly spin up a service/API** and conduct different tests such as: load tests, performance tests, functional tests. These types of tests can be done early in the development lifecycle, and not blocked by other functions.

Companies that host hypervisor

|  |  |  |
| --- | --- | --- |
| Company name | Hypervisor | Cloud Technologies |
| VMware   * Vmplayer | ESXi | Vcloud |
| Oracle   * oracle virtualbox | OVM or OLNM | OCI |
| Microsoft | Hyper-v | Azure |
| Citrix | Xenser | Citric cloud |
| Red hat | KVM | Red hat cloud suite |

Why to choose VMware?

**VMware has a better approach to cloud security than other virtualization and cloud vendors** with a new set of virtualization-aware security products that work with existing solutions to enable adaptive and cost-eective security and compliance within a single management framework.

* It occupies the highest market in virtual servers i.e. about 80%
* Its not only provides virtual servers but also a lot many type of services like vcenter, Vsphere.
* Cost efficient

Why do we need virtualization?

[Diagram

Description automatically generated](https://media.geeksforgeeks.org/wp-content/uploads/Untitled-drawing-16.png)

Many companies and organizations are willing to transfer there data to a hassle free data collection platform without investing more in infrastructure, thus virtualization not only is a cost efficient but it also enhances performance by providing the data under a centralized umbrella.

How does virtualization work?

Diagram

Description automatically generated

**Objective of Project**

* We are creating a datacenter using VM ware tools, to provide an IAAS server.
* Multiple VMs are clubbed so to increase the storage.
* We are basically setting up a datacenter where we are creating two ESXi VM’s and managing the equipment on it. Thus, the VM can access networking and storage capabilities.
* It is solely a IAAS server.
* This project allows us to simulate a virtual machine environment using a single system and creating multiple VMs.
* Simulation environment permits assessment of various kinds leasing of resources, situations with various loads along with pricing allocations in the side of the VM provider. It guides the providers for reducing the resource utilization pricing keeping in mind increasing the returns
* To understand different type of tools provided by VMWare software according to the needs of the project.
* With VMware server virtualization, a hypervisor is installed on a physical server to allow for multiple virtual machines to run on a same physical server, each VM can have its own Operating system, which means multiple OS can run on one physical server sharing resources which is provide by the ESXi physical Bare metal hypervisor tool.
* Whilst providing the flexibility and reliability of the project we learn about tools like vSphere The functionality of vSphere greatly helps existing data centers shift to cloud computing and offers a means of increasing hardware utilization from 5–15% to as much as 80% or higher without compromising on performance. One of the benefits of vSphere is its potential to reduce unplanned downtime and fully eliminate downtime required for storage and server maintenance.
* Providing centralized and extensible platform vCenter server performs a few tasks, including resource provisioning and allocation, performance monitoring, workflow automation and user privilege management. It enables a vSphere administrator to manage multiple ESXi and [ESXi](https://www.techtarget.com/searchvmware/definition/VMware-ESXi) servers and [virtual machines (VMs)](https://searchservervirtualization.techtarget.com/definition/virtual-machine) through a single console.
* Resource allocation takes a vital role in Virtual machines, if the resources ae improperly allocated then some machines may have high load and other have low load which may guide for extra utilization so resource allocations is must in VMs so resources allocations major issue as the VM can be scaled starting from only two VM’s to thousand no. of VM’s which is impossible to test thus the simulation occurs for testing the VM’s as per the requirement which can consume less time , cost and energy
* The resource arrangement comprises processing capability, quantity of RAM, existing bandwidth, resource usage with implementation period.

**SCOPE OF THE PROJECT**

* The scope of this project is to administer VMWare, vSphere ESXi and vCenter. Starting with the installation and configuration of VMWare and ESXi server. The further tasks include setting up virtual machines and their management, reviewing and modification of resources.
* ESXi hypervisor will allow us to create and manage multiple virtual machines using a single physical host. ESXi is installed directly on a physical machine, meaning that it is a bare-metal hypervisor.
* With the help of vSphere, the following functionality such as creating and managing multiple VMs with ease, performing live migration of the workloads and maintenance of datacenters without downtime etc. will be achieved.
* The next goal is to set-up vCenter. vCenter Server will allow for centralized management of the virtual infrastructure. The hosts and VMs can be controlled from a single console, which will enhance visibility and help with error prevention. vCenter Server will allow us to optimize routine operations and daily tasks, even if managing a large-scale infrastructure. With this functionality, one receives an in-depth insight into the configuration of the key components of the environment. Overall, several workloads can be run, thus reducing the effort required for managing physical environment of the same scale by more than two times.
* The next step would be creating cluster which is a group of hosts. The cluster will manage the resources of all hosts within it and enable the vSphere High Availability (HA) and vSphere Distributed Resource Scheduler (DRS) solutions.
* This will be followed by migrating VM with the help of vMotion which enables the live migration of running virtual machines from one physical server to another with zero downtime, continuous service availability, and complete transaction integrity.
* The project also aims on using features like cloning, templates, export, import and organizing VMs. A VM clone is a copy of a virtual machine. The existing virtual machine is known as the parent, while the new VM is called the clone. After the cloning operation, the clone VM runs as a separate virtual machine. A VM template is a master copy image of a virtual machine that includes VM disks, virtual devices, and settings. A VM template can be used many times over for the purposes of VM cloning. This is followed by fault tolerance that provides continuous availability for applications (with up to four virtual CPUs) by creating a live shadow instance of a virtual machine that mirrors the primary virtual machine.
* The aim is to even explore and work with other VMware products too such as vCenter converter that converts local and remote physical machines into virtual machines without any downtime, vRealize Operations, vRealize Automation, Horizon, Community and Resources etc.

**Tools and Techniques.**

## ESXi

Discover a robust, [bare-metal hypervisor](https://www.vmware.com/topics/glossary/content/bare-metal-hypervisor" \t "_blank) that installs directly onto your physical server. With direct access to and control of underlying resources. VMware ESXi effectively partitions hardware to consolidate applications and reduce costs. It is an industry leader for efficient architecture, setting the standard for reliability, performance, and support when deploying and serving virtual computers..

Notable features of VMware ESXi include:

**Small size**

At just 150 MB, Vmware touts ESXi as the world’s smallest hypervisor. A small footprint often means a reduced attack surface from outside threats, aside from easier maintainability. This also means that ESXi does not need frequent patching up.

**Convenient installation**

With its small size, faster installation is possible, allowing you to set up your infrastructure at the soonest time possible. You can even boot up ESXi from a USB flash drive.

**User-friendly administration tools**

ESXi offers a built-in, HTML5-compliant browser for administrative use. Organizations that require automated operations can also utilize the vSphere Command Line Interface for remote management and application programming interfaces (APIs) based on Representational state transfer (REST).

**Secure design**

The data that exists in your VMs are secure from prying eyes using built-in encryption. Add role-based access plus extensive logging and auditing capabilities and you get a secure virtual platform at the outset.

**Scalable reliability**

No matter your application requirements, a single ESXi hypervisor can be configured to run as many as 128 virtual CPUs and 120 devices on 6 TB of memory. ESXi also features a high-performance cluster file system dubbed the Virtual Machine File System (VMFS) that allows more storage resources to be distributed, even with limited physical storage. VMs can also use more than one CPU simultaneously.

**Extensive support and compatibility**

ESXi’s popularity as an enterprise platform means wide support from hardware vendors and application partners, as well as compatibility with a broad range of applications and guest operating systems.

**vSphere**

**vSphere** is a cloud computing virtualization platform delivered by VMware. VMware vSphere is not a particular software, but rather a software package that has several sub-components. vSphere encompasses several individual products and technologies to provide a [complete infrastructure for virtualization](https://www.wiley.com/en-bd/3A+VCAD+510-p-9781118919682/)

vSphere components are available as plugins that extend the functionality of the vSphere product.

* **[Virtualization Basics](https://docs.vmware.com/en/VMware-vSphere/7.0/com.vmware.vsphere.vcenterhost.doc/GUID-ED375B12-7D08-4B7E-81EE-DCE83E51B1AF.html)**  
  A virtual machine is a software computer that, like a physical computer, runs an operating system and applications. The hypervisor serves as a platform for running virtual machines and allows for the consolidation of computing resources. [[](https://docs.vmware.com/en/VMware-vSphere/7.0/com.vmware.vsphere.vcenterhost.doc/GUID-ED375B12-7D08-4B7E-81EE-DCE83E51B1AF.html)

* **[Physical Topology of vSphere Data Center](https://docs.vmware.com/en/VMware-vSphere/7.0/com.vmware.vsphere.vcenterhost.doc/GUID-8BE2902F-AF5D-4493-95E3-B93A8A862192.html)**  
  A typical VMware vSphere data center consists of physical building blocks such as x86 virtualization servers, storage networks and arrays, IP networks, a management server, and desktop clients.
* [**vSphere Software Components**](https://docs.vmware.com/en/VMware-vSphere/7.0/com.vmware.vsphere.vcenterhost.doc/GUID-B3A1A79B-EF9B-4C10-A053-D54D88254C52.html)  
  VMware vSphere is a suite of software components for virtualization. These include ESXi, vCenter Server, and other software components that fulfill several different functions in the vSphere environment.
* [**vSphere Cluster Services**](https://docs.vmware.com/en/VMware-vSphere/7.0/com.vmware.vsphere.vcenterhost.doc/GUID-96BD6016-4BE7-4B1C-8269-568D1555B08C.html)  
  vSphere Cluster Services (vCLS) is enabled by default and runs in all vSphere clusters. vCLS ensures that if vCenter Server becomes unavailable, cluster services remain available to maintain the resources and health of the workloads that run in the clusters. vCenter Server is still required to run DRS and HA.
* [**Client Interfaces for vSphere**](https://docs.vmware.com/en/VMware-vSphere/7.0/com.vmware.vsphere.vcenterhost.doc/GUID-6710A6C4-00AE-4930-BBD6-BDEF78029994.html)  
  You can access vSphere components through the vSphere Client, the VMware Host Client, and the vSphere Command-Line Interface.
* [**vSphere Managed Inventory Objects**](https://docs.vmware.com/en/VMware-vSphere/7.0/com.vmware.vsphere.vcenterhost.doc/GUID-4D4B3DF2-D033-4782-A030-3C3600DE5A7F.html)  
  In vSphere, the inventory is a collection of virtual and physical objects on which you can place permissions, monitor tasks and events, and set alarms. You can group most inventory objects by using folders to manage them more easily. [
* [**Optional vCenter Server Components**](https://docs.vmware.com/en/VMware-vSphere/7.0/com.vmware.vsphere.vcenterhost.doc/GUID-C0BA2388-85A4-4BDB-B09A-80DE69BE513F.html)  
  Optional vCenter Server components are packaged and installed with the base product, but might require a separate license.
* [**vCenter Server Plug-Ins**](https://docs.vmware.com/en/VMware-vSphere/7.0/com.vmware.vsphere.vcenterhost.doc/GUID-BCBA66C3-AECA-48A0-B139-3FC59EB42880.html)  
  vCenter Server plug-ins extend the capabilities of vCenter Server by providing additional features and functions.

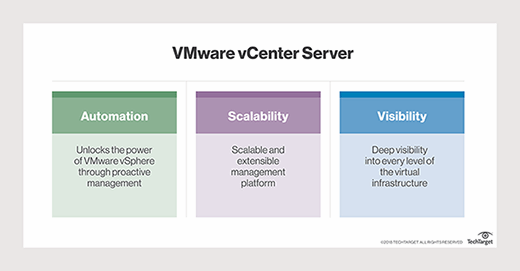
**vCenter Server**

vCenter severs advanced server management software provided by VMware. vCenter Server provides a centralized platform for controlling vSphere environments, providing visibility across hybrid clouds. It allows the automation and delivery of infrastructure. VMware vCenter Server is a centralized management application that allows managing virtual machines and ESXi hosts.

Important vCenter Server features include the following:

**Multi-hypervisor management:**

VMware vCenter Server offers integrated management for VMware and Microsoft Hyper-V hosts.

**VMware Host Profiles.** This tool automates ESX and ESXi host configuration. A vSphere administrator can use Host Profiles to create a standard configuration, which serves as a sort of blueprint for all other hosts, and automate compliance to this configuration across all hosts or clusters. 

**Automatic VM restart.**VMware vCenter Server uses vSphere HA to pool VMs and their hosts into a cluster. In the event of a server failure, vSphere HA will automatically restart these VMs on other hosts within the cluster.

**Patch management.**The [vSphere Update Manager (VUM)](https://www.techtarget.com/searchvmware/definition/VMware-Update-Manager) automatically scans and patches ESXi hosts and certain Microsoft and Linux VMs.

**vRealize Orchestrator (vRO).** This vCenter Server plug-in, which integrates with [vRealize Suite](https://searchservervirtualization.techtarget.com/definition/VMware-vRealize-Suite) and [vCloud Suite](https://www.techtarget.com/searchvmware/definition/VMware-vCloud-Suite), automates tasks using workflows.

**vRealize Log Insight for vCenter Server.**This log management software has customizable dashboards that enable an administrator to analyze system log data, identify and troubleshoot issues, and check for system compliance.

[**vCenter Server Linked Mode**](https://www.techtarget.com/searchvmware/definition/VMware-vCenter-Server-Linked-Mode)**.**This feature provides an administrator with a single view of their vSphere deployment. An administrator can also use Linked Mode to connect multiple vCenter Server systems and grant them permission to share information. Linked Mode automatically replicates all new resources created by the administrator, including roles, policies and permissions, across the linked vCenter Server systems.

**Application programming interfaces (**[**APIs**](https://www.techtarget.com/searchapparchitecture/definition/application-program-interface-API)**).**VMware vCenter Server uses APIs to communicate and integrate with third-party software.

TIME FRAME REQUIRED FOR THE VARIOUS STAGES OF PROJECT IMPLEMENTATION

|  |  |  |
| --- | --- | --- |
| Sr No. | Phase | Time Duration |
| 1. | Software Requirement Specification |  |
| 2.  3. | System Design  Coding and Implementation |  |
| 4. | Deployment and testing |  |