# Standard Operating Procedure (SOP) for Building a VMware Cluster with Three ESXi Servers and a vCenter Server for Testing

1. Overview and Goals  
  
The entire process of configuring a virtualised VMware cluster made up of three ESXi host servers and a vCenter Server Appliance (VCSA) is covered in this SOP. For educational purposes, internal testing, proof-of-concept assessments, and lab-based vSphere technology exploration, the cluster seeks to replicate a production-like environment. This configuration is appropriate for investigating virtualisation features like backup integration, centralised management, Distributed Resource Scheduler (DRS), and High Availability (HA). Using nested virtualisation on a single physical host system, the setup offers a repeatable, isolated, and economical environment.

2. Conditions  
Hardware specifications  
  
A desktop or server computer that can manage several virtual machines (VMs) is called a host system. The following are suggested specifications:  
  
CPU: multi-core processor with AMD-V/RVI or Intel VT-x/EPT enabled  
  
Memory: For seamless operation, at least 64 GB of RAM  
  
Storage: at least 1 TB, ideally SSD-based for better input/output efficiency  
  
Network: Bridged and host-only networking are supported by this gigabit Ethernet adapter.  
  
Software prerequisites  
  
VMware Workstation Pro: at least version 16.x  
  
Version 7.0.3 of VMware ESXi ISO is required for every host.  
  
Version 7.0.3 of the vCenter Server Appliance (VCSA) ISO  
  
ISOs for guest operating systems: Windows Server 2019 or later, Ubuntu 20.04 LTS  
  
To access management interfaces, use a browser like Chrome or Firefox.  
  
Design of Networks  
  
Make use of a specific subnet, like 192.168.146.0/24.  
  
IP address of the gateway: 192.168.146.1  
  
DNS servers: internal Active Directory-integrated DNS or 8.8.8.8  
  
To separate the test environment from production traffic, use a host-only network (VMnet2).  
  
Roles of Personnel  
  
IT Administrator: Charged with overseeing host systems, putting SOP into practice, and keeping an eye on cluster health  
  
Network Administrator: Manages DNS settings, firewall rules, and IP configuration.  
  
System Owner: Verifies test results and authorises configuration  
  
3. Setting Up the Host Environment 3.1 Installing VMware Workstation  
  
VMware Workstation Pro can be downloaded and installed from the official VMware website.  
  
For testing, use a legitimate license key or start a 30-day trial.  
  
3.2 Turn on virtualisation  
  
During system boot, access the BIOS or UEFI.  
  
Turn on AMD-V/RVI or Intel VT-x/EPT.  
  
Save the modifications, then restart the computer.  
  
3.3 Setting Up the Network  
  
Launch VMware Workstation's Virtual Network Editor.  
  
Establish a network that is host-only (VMnet2).  
  
Give the subnet the address 192.168.146.0/24.  
  
Turn off DHCP or configure a limited IP range (.100–.110, for example).  
  
3.4 Get ISO Files  
  
Download from VMware Customer Connect:  
  
ESXi ISO  
  
ISO VCSA  
  
When creating a virtual machine, keep files in a specific shared folder for convenient access.  
  
4. Construct virtual machines for ESXi  
4.1 Create Three ESXi Virtual Machines  
  
Start up VMware Workstation.  
  
Build three distinct virtual machines with the specifications listed below:  
  
ESXi-Host1, ESXi-Host2, and ESXi-Host3 are the names.  
  
CPU: 8 virtual CPUs (2 sockets, 4 cores each)  
  
RAM: 8 GB at minimum (10 GB preferred)  
  
100 GB thin-provisioned disc for storage  
  
Network: VMnet2 (host-only)  
  
Mount the ESXi ISO file on the CD/DVD drive.  
  
4.2 Turn on Nested Virtualisation  
  
When creating a virtual machine, select "Virtualise Intel VT-x/EPT or AMD-V/RVI" under CPU settings.  
  
As an alternative, modify the.vmx file to add: vhv.enable = "TRUE"  
  
4.3 Set up ESXi  
  
Turn on the virtual machine and adhere to the installation instructions.  
  
Install on the supplied disc after accepting licence agreements.  
  
Make use of the US keyboard layout by default.  
  
Enter P@ssw0rd123 as the root password!  
  
Install each of the three ESXi virtual machines again.  
  
4.4 Set Up IP Addresses Static  
  
192.168.146.101 is ESXi-Host1.  
  
192.168.146.102 is the ESXi-Host2 address.  
  
192.168.146.103 is the ESXi-Host3 address.  
  
Use 255.255.255.0 as the subnet mask and 192.168.146.1 as the gateway.  
  
8.8.8.8 is the DNS server.  
  
4.5 Turn on and off services  
  
During setup, enable SSH for troubleshooting.  
  
For security compliance, disable SSH after configuration.  
  
Use https://IP to confirm access to ESXi web clients.  
  
4.6 Synchronisation of Time  
  
Configure an internal time server (such as 192.168.146.10) or pool.ntp.org as the NTP server.  
  
Set up time synchronisation to begin when the host boots up.  
  
5. Install the vCenter Server Appliance (VCSA).  
5.1 Establish a vCenter virtual machine  
  
Make a new virtual machine in ESXi-Host1 or VMware Workstation:  
  
vCenter-Server is its name.  
  
CPU: four virtual CPUs  
  
12 GB of RAM (or 16 GB for more fluid performance)  
  
150 GB of disc space  
  
Network: VMnet2 (host-only)  
  
Mount: Virtual CD in VCSA ISO format  
  
5.2 Launch the installer for VCSA  
  
Open the UI installer after navigating to the mounted ISO.  
  
Deploy the appliance in Stage 1 and configure it in Stage 2.  
  
Static IP input: 192.168.146.100  
  
Configure vsphere.local as the SSO domain.  
  
Admin@123 or administrator@vsphere.local are the login credentials!  
  
5.3 Verify Deployment  
  
Use this link to access the vSphere Web Client: https://192.168.146.100:9443  
  
Use the Administration > Licensing panel to apply for evaluation licenses.  
  
6. Create and Set Up the Cluster 6.1 Include ESXi Hosts in vCenter  
  
Go to "Hosts and Clusters."  
  
Make Test-Datacenter a new datacenter object.  
  
For every ESXi server, right-click and choose "Add Host" using its static IP.  
  
Accept certificates and check the status of the connection.  
  
6.2 Form a Group  
  
Test-Cluster is its name.  
  
Turn on features:  
  
HA: Medium priority for host monitoring and virtual machine restarts  
  
DRS: Moderate threshold, fully automated mode  
  
6.3 Configure Dispersed Networking  
  
Make a brand-new vSphere Distributed Switch (vDS) called vDS-Test.  
  
Connect the switch to all three ESXi hosts.  
  
Establish port groups:  
  
Network Management (VLAN 0)  
  
VM-Network (VLAN 0)  
  
For consistency, move vmk0 interfaces to the distributed port group.  
  
6.4 Configure NFS (Shared Storage)  
  
Install a virtual machine for an NFS server (such as CentOS at 192.168.146.104).  
  
/nfs/share is the share directory.  
  
Using vCenter, mount the share as a new datastore on each ESXi host.  
  
Shared-Datastore is its name.  
  
7. Examining functionality  
7.1 Set up virtual machines  
  
To create virtual machines on the cluster, use the vCenter wizard:  
  
Guest operating system: Windows Server or Ubuntu  
  
VM specifications: 20 GB disc, 2 GB RAM, and 2 vCPUs  
  
Storage: Datastore-Shared  
  
Network: VM-Network  
  
7.2 High Availability (HA) Test  
  
Turn off ESXi-Host1.  
  
Keep an eye out for HA failover activity in vCenter.  
  
Verify that the virtual machines on ESXi-Host2 or Host3 restart.  
  
7.3 DRS Test  
  
To replicate resource contention, create more virtual machines.  
  
Follow vCenter's recommendations for automatic load balancing.  
  
To redistribute virtual machines among hosts, use vMotion.  
  
7.4 Recovery and Backup  
  
Install a backup device, such as Storware.  
  
Enter your admin credentials to access vCenter.  
  
Set up daily complete backups to the shared datastore.  
  
Restoring a virtual machine to ESXi-Host3 will replicate a recovery scenario.  
  
8. Safety and Surveillance  
8.1 Access Control and Lockdown  
  
After deployment, turn off SSH on ESXi hosts.  
  
Turn on the standard lockdown mode.  
  
Examine vCenter user roles and implement least-privilege rules.  
  
8.2 Monitoring Performance  
  
To view host metrics, select the Monitor tab: CPU, memory, and disc  
  
Configure personalised alerts (such as CPU utilisation exceeding 80%).  
  
Set up email alerts (SMTP setup required).