

# **VW WARE 5.5**

## **NOTES**

**1.VM WARE 5.5**

**2.VSPHERE 5.5**

**3.VIRTUALIZATION**

**ZOOM TECHNOLOGIES**

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### \* Virtualization:-

It is a solution to optimize resource available in our organization or IT infrastructure.

Optimize - "Good use".

### \* Components of IT Infrastructure :-

- Servers
- Desktop
- Storage
- Network
- Applications

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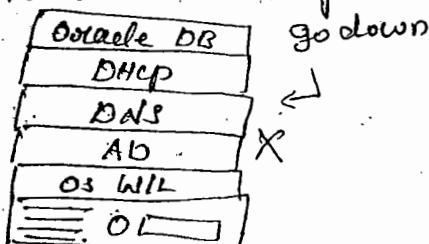
### \* Traditional Server Architecture :-

Resources :-

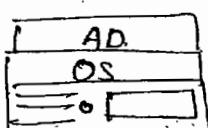
CPU, RAM, HD, N/W.

In real time we use a service in a server.

This is not possible in real time because if machine crash all process go down



eg:-  
we are one service in a machine

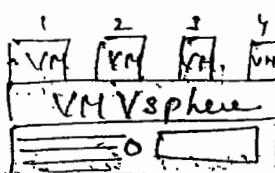


→ under utilization of resources.

only 10% is an average, the CPU is utilized. So using VM we are making use in optimal level.

### \* Virtualization Architecture:-

Virtual Machine - functionally equal to normal Machine on physical Machine (or) logical Machine.



→ creates virtualization layer

in a logical  
75% optimal usage.

## \* Why Virtualization?

Saving on

- Hardware
- power.
- space.

Overall saving > 40%.

only saving ~~or~~ anything else? downtime !!! reduction possible.

We have "planned downtime" on server. This is for maintenance of server in an organization.

(Planned downtime eg: Sunday 6-7 pm)

In this time all the production work will be stopped. So anything possible through VM. Migration of VM.

Migration of Virtual Machine from one Server to another is known as "V Motion" i.e when Virtual Machine is running.

## \* History of Virtualization:-

First implemented in 1960's - 70's by IBM on Mainframe platforms.

(approx) That machine occupy 3000 sq ft. That machine can run one instance of db @ a time. Then small pc came so the

Virtualization had not developed.  
1980 four core → 1998-99. VMware is the pioneer company.  
In 2000 they came with product.  
they installed on x86 Machine.

8086 was 8bit → developed from  
 $16 \rightarrow 32 \rightarrow 64$  bit

8086  
Processor(Centri)

In 2009 Nephrite 4.0 was launched and used in datacenters  
Then 5.0, 5.1, 5.5

## \* Technology:-

The technology behind Virtualization is called as Hypervisor.

x86 architecture has two type of Hypervisors

Type I Hypervisors are known as "Hosted Hypervisors".

VMware - workstation, fusion server.

MS - Virtual PC, server.

Oracle - Virtual Box.

They are used for testing & training

Type II: They are called as "Native Metal Hypervisors".

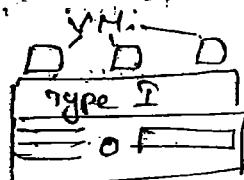
VMware - vsphere

MS - hyper-V

Citrix - Xen Server.

Oracle - Oracle KVM

Open source - KVM.



## \* Cloud computing:-

IaaS - Infrastructure as a service } without VM this

PaaS - Platform as a service

SaaS - Software as a service } is not possible i.e (Cloud)

There are various steps to implement a cloud on data centre. But VM is the base for this.

Cloud Computing = data centre operations.

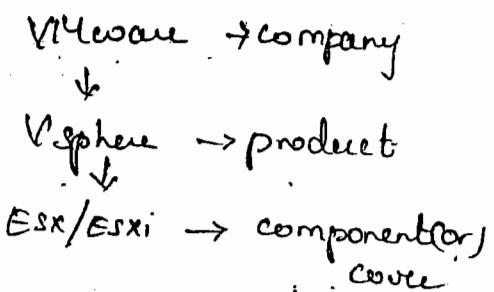
The service is accessed by us.

But it is situated somewhere?

## Vsphere Virtualization Technology:-

### \* VMware Vsphere product Suite components.

- ESX/ESXi (Type I)
- Vsphere Client
- Web client
- VCenter Server
- Update Manager
- Vsphere Data protection
- Vshield endpoint
- Vshield standalone converter
- vCCI, vMA



### \* ESX/ESXi

- Type I hypervisors
- Elastic Sky x / Elastic Sky x Integrated.
- It is an operating system

### \* Vsphere Client :-

- API - Application programming Interface
- This is developed using DotNet framework.
- Therefore Vsphere Client can be installed on windows machine.
- Can be installed in laptops too

- It is not available for some purpose

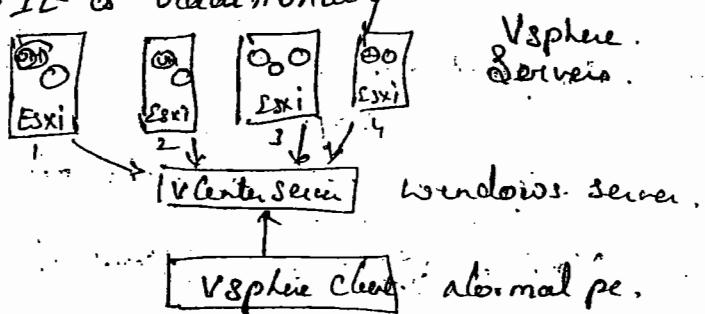
### \* Web Client:-

A user can use browser and manage  
Vsphere <sup>web</sup> clients.

It can support Linux, windows platform,  
mobile, tablet etc.  
similar to vsphere clients.

### \* VCenter Server:-

- It is an application
- It runs on supported OS.
- It is traditionally runs on Windows server.



- It is centralized management server provides centralized management and administration.
- This is essential & Advanced task is possible with this.
- Vcenter Server application is not available for Linux platform.

### \* Vcenter Server Appliance or VA!:-

- It is VM.
- It is pre configured & ready for use & OS installed & it has an application which is used for specific tasks such a machine is called "Vcenter Server Appliance"

Vcenter appliance has been developed as there is need from the industry & demand. So VMware developed "Vcenter Server Appliance".

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#### \* Update Manager.

It is an application which provide centralized patch management on ESX/ESXi-OS.

Similar to "Yum" in Linux  
SCCM. in windows.

#### \* Vsphere Data Protection:-

Vdp:-

using this tool we take the backup of Virtual Machines <sup>not ESXi</sup>. It is a "Virtual appliance".

Virtual appliance is a pre configured Virtual Machines.

#### \* Vshield End point:-

- By itself it is not an antivirus solution. It "help in implementing Antivirus solution" in Vsphere or Virtual infrastructure.

- It is a service on ESXi host

- Antivirus solution prevent the machine from Virus & Malware.

## \* V Center Standalone Converter :-

- It is an application
- using this tool we can convert a physical Machine to virtual Machine (P2V) (only process of a physical machine)
- This can also convert a virtual Machine into a virtual Machine (V2V)  
(This is because the virtual machine can be different Virtual Machine running on hyper V or type II. So to make it work on Vsphe platform (ESXi/ESXi) we use V2V service)

## \* V CLI :- Vsphe command line Interface

- 99% can be managed using GUI
- But 1-5% we have to use CLI for trouble shoot.
- VCLI is an application. It is also known as SDK. It is developed using Perl Scripting
- can be installed normally on Desktop & laptop.
- VCLI is available for Linux & windows

\*

## \* VMA :-

- Vsphere Management Assistant.
- It is a Virtual appliance.
- Here the application is VCLI installed in VMA. (veerna)
- It contains VCLI  
- used in large infrastructure  
All these components are used to manage ESX/ESXi host.

## \* Release History :-

First Release 2001, ESXi 1.0

ii - ESXi Release 2006-2007, ESXi 3.0

Vsphere 4.0 Release 2009 ESX/ESXi 4.0

Vsphere 4.1 Release 2010 ESX/ESXi 4.1

Vsphere 5.0 Release 2011 only ESXi 5.0

Here ESX is face out.

Vsphere 5.1 Release 2012 ESXi 5.1

5.5 in 2013 ESXi 5.5

## Kernel :-

ESX

Kernel - VML kernel.

## Console or Interface :-

The console is hidden.

- VM integrated another OS.
- Then the console of RHEL is used.

### VMkernel + RHEL kernel (console)

||

cos → console Operating system

- VM thought this is more secure.

### ESXi

kernel = VMkernel.

- Here no (redhat) RHEL kernel
- It is very small as less compared to ESX
- But research were going in ESXi 6.0.
- They thought they thought that  
ESX was more secure as it has RHEL kernel.
- But, ESXi has no firewall. so they thought it is less secure than ESX.
- But later they identified ESXi is better. But how less the difference

ESX	ESXi
1. 750 / 760 is size the installation file	300 / 350 Mb is the size.
2. <u>patch</u> More patch is required as it is large.	less patch is required to ESXi as code is less so it is less vulnerable.
3. More code it is more vulnerable	

Hence VMware thought which one to choose ahead in 4.1 both version was there.

In 4.1 the VM kernel is open to end user  
which was once hidden

"Testing the water" as this they released

it

Then in Version 5.0 only ESXi was released.  
Here a firewall was introduced.  
It is a basic firewall.

In 4.0

\* DCUI

- Direct console user Interface
- Basic user interface
- user can add ip address, host name, DNS,

configuration etc....

- But original console is hidden.

- The console is disabled.

In 4.1 the console is called as "Tech support mode"  
and in 5.0 we call it as "Shell access"

- we have to enable console using

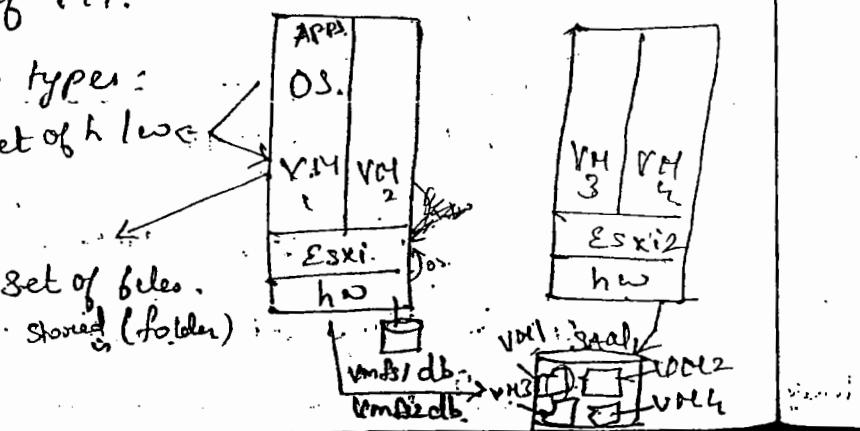
DCUFI.

\* perspective of VM.

→ Two types:

set of files

stored (folder)



- From the perspective of OS VM is considered as hardware.
- From the perspective of ESXi, VM is a set of files or application. This is stored in folder.
- folder is stored in hard drive.
- VMFS - Virtual Machine file system. It is a file system similar to NTFS or windows.
- as VMFS is file system used ~~VMFS DATA store~~

VMFS DATA store - Hard drive is formatted using VMFS

It is known as VMFS data store.

VMFS data-store-Container where we can store data.

Virtual machine stored in VMFS Data Store.

Virtual machine stored in VMFS Data Store which Virtual Machine is stored.

The name of the folder is "Name" stored

of Virtual Machine. If it is concerned it

is called as "New Virtual Machine"

Every file system has a feature same as

that VMFS has features

Shared

> It is clustered file system

i.e. whatever the data stored

in VMFS it is being shared by

default. (When share there is lack of security)

> Distributed Locking &c.

This is locking mechanism when

the component access other component  
cannot access the data

- The sharing is with system.

There are two type of sharing

- System Sharing

- user sharing

When it is powered on only one

Component<sup>(sys1)</sup> can use because it is locked  
when not powered on it can be accessed

by another component (sys2)

Where as when sys2 is powered on <sup>then</sup> sys1 cannot access, as it is powered on and  
it is locked.

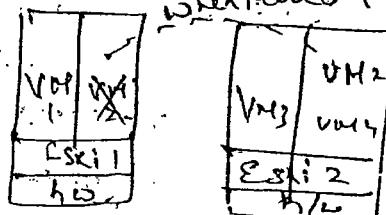
Why Migration possible?

Due to clustered fs we can move  
a running Virtual Machine seamlessly from  
one VM to another. This movement is known  
as Migration.

VMFS is the foundation for migration.

⇒ It is shared by default (clustered fs)

when moved (migration)



Now ESXi 1 cannot

access VM2 as it

is locked.

locked & unlock mask auto-revert

\* crystallized  
on Vm

Note #

\* Terminologies in Vsphere:

	APP	APP
Hosted VMs	OS	OS
	VM1	VM2
	ESXi	
hardware		

Applications/Services (run on guest OS)

Guest OS. (it's guest because it is not running on its own of physical machine)

Virtual hardware.

Hypervisor. (Virtualization layer.)

ESXi host

## Machine learning & xi

If we come to know guest OS. That  
it is running on VM.

- \* When app fail it will take care by some APP address eg. Oracle.
  - \* When OS fail we may or may not take responsibility.
  - \* When VM or ESXi or h/w (Entire machine goes down) you have to take responsibility.

*hints:*

On a single Server 512 VM can run

Vsphere Support of Guest OS

two kernel cannot co-exist but "Yes" in Virtualization

VMkernel + RHEL

Here RHEL is virtual. It is running on virtual machine.

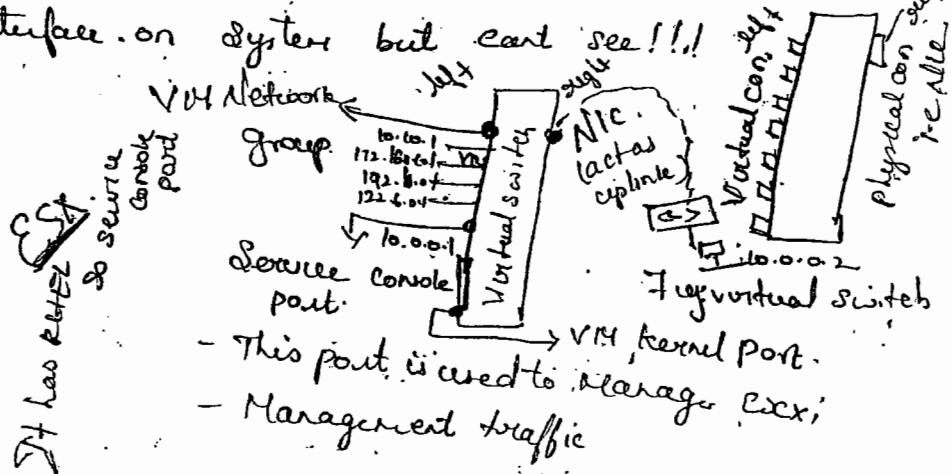
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## Virtual Networking:-

- Virtual Network adaptors
- Virtual switch.
- VM get connected to virtual switch.
- Virtual switches get connected to physical NIC adaptors
- physical NIC adaptors get connected to physical switches.



Virtual switch is viewed on  $^2$  interface on system but can't see!!!



Every operation in ESXi is happened through  
Virtual switch.

VM kernel port:-

It handle 4 kind of traffic

- iSCSI
- NAS
- VMotion
- Fault tolerance. (FT)

One VM kernel port is not recommended  
so we create Multiple (eg. 1 for each traffic)

physical adaptor act as uplink (it  
just get & send data)

Explanation:- IP is normally assigned on OS  
on TCP/IP stack and not on NIC. NIC has only  
MAC.

The IP of ESXi is on "Service console port".

In "VM kernel port" we have to

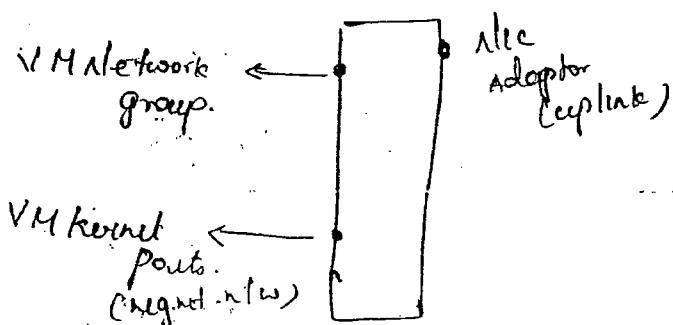
Configure IP

ESXi:

VM Kernel handle 5

kind of traffic

1. Management
2. iSCSI
3. NAS
4. VMotion
5. Fault tolerance



The first part configured is for Management, but it can handle 1300 & 1400.

But for others separate part are recommended. (reduces fault tolerance)

The Virtual Switch or esxi is Layer 2 Switch:

Similar to normal switch it has MAC address table, forwarding frames, STP.

\* Difference: • Physical switch can inter connect among themselves, sometimes create loop to avoid it has STP.

• Virtual switch cannot be interconnected internally. ∵ no loops, no STP.

Physical adapters cannot be shared. i.e. each connection on VM is made through Virtual switch and virtual switch connects to NIC through adapter and finally NICs will be to switch.

The second Virtual switch that does not have connection (NIC) is called Internal only switches.

Port on which Virtual switch can be configured is VLAN, access port, trunk port as Normal switch.

Sec

\* Different aspect of virtual switching

- Normally on Server 2 NIC.

The range of 4, 6, 8, 12, 16, 18, 20. .... 32 NIC.  
NIC is

in a ESXi host.. i.e. there is huge traffic in  
ESXi... This is y more NIC. 18 NIC is seen.

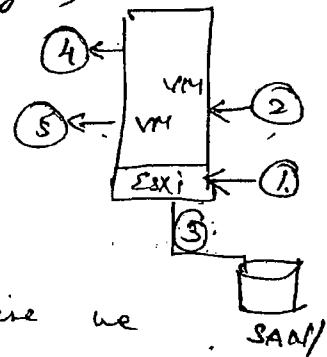
Types of traffic :-

1. Traffic related to Management of ESXi
2. Related to VM Network. (AD, DNS, DB or DHCP etc...)

3. SAN / NAS traffic (Storage)

4. V Motion

5. Fault tolerance traffic.



Consider for each of these we have 1 NIC & 1 for redundancy ∴ 10 cards.  
for VM we have 1 consider 3 VM ∴ 3 & 3 redundancy. so we have 16 NIC....

Even we can create VLAN for these.

Each process Traffic

Note: If there is no VLAN in physical switch we don't configure VLAN in Virtual switch.

## \* Virtual Datacenter Infrastructure :-

### Server:-

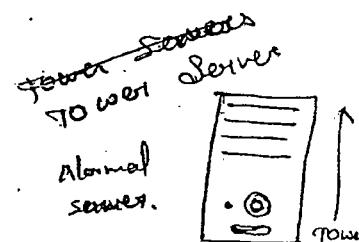
- Tower Servers
- Rack Mount Server.
- Blade Servers.

" Name given to a technology is based on logic "

e.g.: server - serve.

### Nw:-

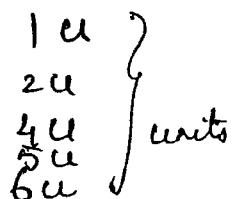
- Ethernet
- Fiber optic
- Switches, Router, firewall.



### Centralized Storage.

- SAN  
FC SAN, iSCSI, SAN
- NAS

### Rack Mount:



### Blade Servers:

They are sleek. can be replaced easily it has Chassis and slots available. Blade server are connected & removed.

Chase you can connection for power, n/w it has pins for everything. That's why they are blade servers.

### Centralized:

- Integral part of storage.
- Shared are used where clustering involve.
- advance feature of virtualization applies here

- SAN & NAS

II

Server Virtualization SW (hypervisor) VMware Ksplice

- VMM.

- V. Networking

- V Storage.

• Guest OS.

• Apps

• Internet

- leased line (dedicated line).

- broadband (shared line, telephone line)

- VPN (cisco VPN & sw upn)

• Cloud computing SW.

- VMWare vCloud Director. (SW in VMM)

- we can build private & public

cloud

- It can create IaaS & PaaS

Cloud SW -

SCVM is Microsoft.

vCloud Director, vCloud automation

Open QRM, Cloudstack, Openstack

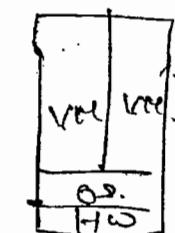
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## (X) # ESXi Virtualization :-

without Virtualization you can run one OS at a time, i.e. However, you may install many OS in your Machine but you can use one at a time.

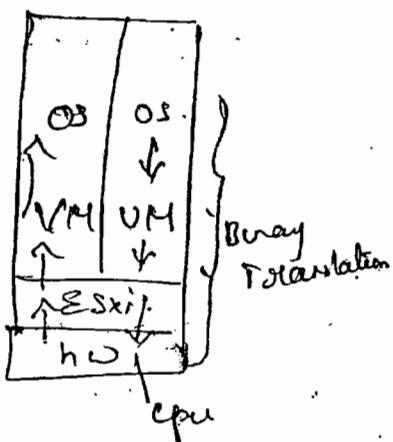


is the h/w.



Emulated CPU becomes flop due to low performance.

Emulated CPU works similar to a Physical CPU, but it is like SW based, but this concept got failed due to its performance.



VMware is the first company to provide this solution.

ESXi traps all instruction comes from OS running on VM.  
& ESXi provides switching to CPU & CPU performs & gives to ESXi then ESXi to VMs.

This process is known as "Binary Translation".

What happens when you use Virtualization:-

### Resource sharing:-

- VM's running on ESXi host are allocated a portion of physical resource (RAM, HD, CPU)
- Hypervisor schedules VM's allocate memory & schedule VM's to run on various CPU.
- VM's share Memory & Disk Bandwidth.
- VM can be allocated with specific resources.
- Default setting: All VMs on a host receive equal share of resources.

### CPU Virtualization:-

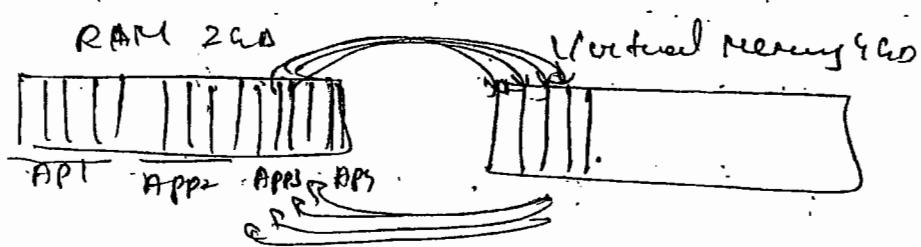
- Emphasize performance
- Hypervisor runs instruction when needed to make VM's operate as if they were running directly on physical machine (i.e. it makes a CPU into <sup>Core</sup> and makes it think CPU is busy when "CPU contention" happens i.e. scheduling)

Multiple VMs running on ESXi host may compete for CPU resources, ESXi host time slices the physical processor across all VMs each VM sees as if it has specific no. of CPUs.

## Memory Virtualization:-

- Swap & Virtual memory in Linux & windows
- It is created on hd. (partition)
- Swap we create, Virtual Memory sys creates.

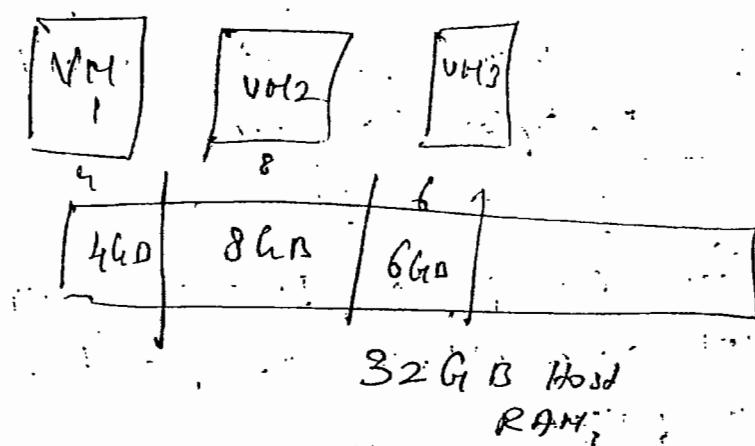
It identify the process using "Virtual Memory space address"



It identifies the data that is sent to virtual memory using "Virtual Memory space address".

VM:-

It allocates contiguous Memory Space... one



ESXi allocate Virtual Memory address for VM.

#### Host Memory:

- When a VM started Hypervisor creates contiguous addressable memory space for VM.

- Mem space is allocated & configured when the VM is created & has same properties as that of Virtual address space.

- This allow the hypervisor to protect the memory of each VM from being accessed by others.

20 | 1 | 15.

#### VMFS :- Filesystem.

- Clustered file system (Sharing by default).

- Distributed Locking. (It is used to lock VM.)

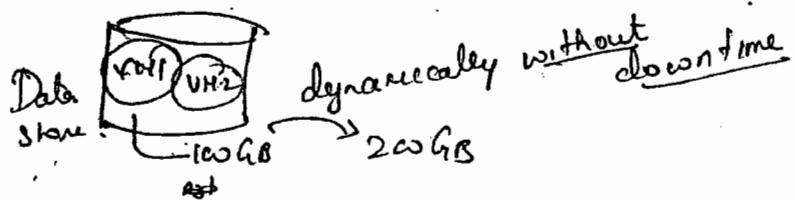
- VMFS uses Distributed Journaling of its file system meta data changes to allow fast recovery in the event of hardware failure (keep a track of changes that happens in ESXi (Metadata))

In Linux & Ext 4 has this feature  
RAID has this feature

This allow us to recover the change (last change) during hardware failure.

- VMFS is the foundation for VMotion, SVMotion, Storage VMotion, automated restart of VM's & FT, FT.
- VMFS provide an interface to storage resource to access data store on which VMs reside.

- \* - VMFS data store can be dynamically expanded with no down time.

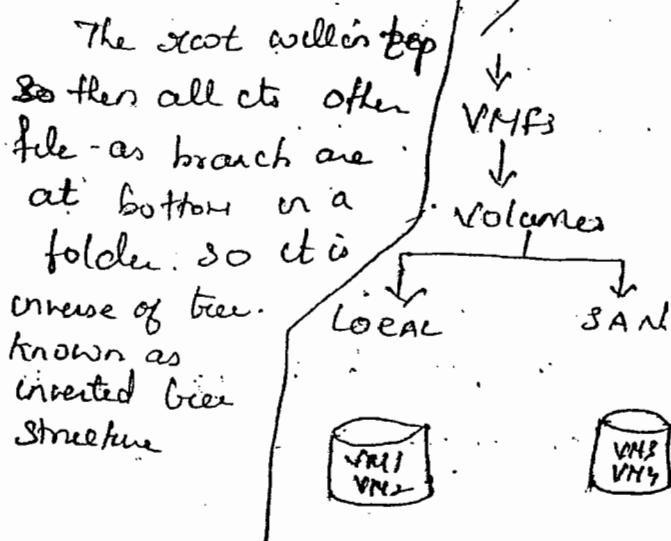


- VMFS stores all the file that make up a VM in a single directory.  
 (This store all data of a VM or data that make up VM in a single directory or folder)

The data in VMFS can easily shared & so this we have distributed locking.

- VMFS data store uses a file structure similar to inverse tree (Inverted tree structure)  
 (storage and devices use inverted tree structure)
- Each data store is mounted to a folder.

Inverted tree structure:-



## Installing ESXi

### ESXi Version

Version are similar to edition

- Free Version VMware VspHERE Hypervisor  
(can be use as standalone can  
create VM, no central Hgnt, no features)

Licenced Version.

1. VspHERE Essential - 50+ \$  
VspHERE Essential plus.
  - It is for small organization
- VMware VspHERE Standard → 1200\$  
Enterprise → 2000\$  
Enterprise plus → 3000\$

Most advanced and has all features.  
last 2 are used in large organization

The liscence is based on no. of cpu.  
or per cpu model.

Cores is not problem and not based  
on cores. it is based on no. of cpu.

For each cpu you have to get.

1 liscence liscence.

The approx cost is 1.75 lac.

## \* How esxi is Secure

- 1. - Memory hardening
- 2. - Kernel Module security.
- 3. - Nested platform module

Explanation of above pts:-

1. ~~Memory Hardening~~:- moving from one location to another.  
This allow data to smeared in RAM.

It is difficult to identify where the data stored.

This make hard to hack.

2. Kernel module.

Here, VMware has policy - only digitally signed drivers are getting integrated or installed; unsigned drivers cannot be installed.

3. Nested Platform:

~~check~~ the authenticity of device drivers  
~~do a mechanism to~~ when they are getting loaded during boot process.

This make Esxi a more secure.

~~Note~~

## \* Where can I install Esxi

- HDD
- SAN LUN's
- USB Device
- SD card.
- Directly into Memory (Embedded) Flash.

\* h/w requirements :-

- 64 bit OS : only 64bit processor is needed  
X86 (More 2 cores is needed)

• RAM : 4 GB - 2 GB - 2 GB.  
Clock speed.  
Intel Xeon

- RAM, 2 GB MIN
- Ethernet card  
(1 GIG / 10 Gigabit) preferred More.
- Storage

SCSI adaptor, FC adaptors, SATA, SAS  
adaptor, internal RAID controller

- Disk

SATA, SCSI, FC

### Processor :-

- upto 160 logical CPU (Core or Hyperthreads)

#### \* Hyper threads :-

It will convert a core into 2 logical

Processor core is a processor.. They are logical.

If no hyper thread = 80 G

• 512 VH / host

- 273 RAM.

ESXi will not get on any h/w. as ease.

It need its compatible Machine

Vm has a compatibility mode and  
visit it.

(\*) Due to device above issue it will not allow to install in any machine. Because those machine does not support these feature.

### \* Installation:

- Have an ISO file or boot from DVD or flash drive.

Auto deploy is similar to "Windows deployment system on 2012".

Auto deploy is used to installed from Network.

- Make sure the selected disk is formatted with VMfs.

- From Vsphere 5.1. user GPT format this support installation on disks >2TB upto 64TB.

⇒ GPT - GUID partition table.

GPT advantage over MBR (Master Boot Record)

- It support on 2TB But in GPT you can install more than 2TB.

- You can have 128 partitions

(\*) ESXi doesn't need swap memory.

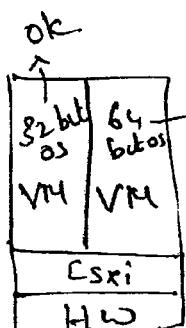
2. normally ESXi doesn't swap but if swap in extreme condition.

~~Scratch~~ Scratch partition will be created if you create ESXi in HD.

It is used to store temp logs, sys swap,

In extreme condition it uses scratch part  
partition to swap. But it is not swap memory.

only in HDD it happens. In SAN controller  
other you can create later if necessary.



- 64 bit CPU (xenon)

Here you can install 32 bit OS <sup>in NM</sup> if  
there is no virtualization technology in  
CPU. But if you have to install 64 bit OS  
in VM you need virtualization  
technology in CPU.

e.g.: VT-X or intel  
AMD-V in AMD.

But this is not required to install  
ESXi.

## \* Vsphe client :-

↳ - only for windows. (installed only in windows pc)

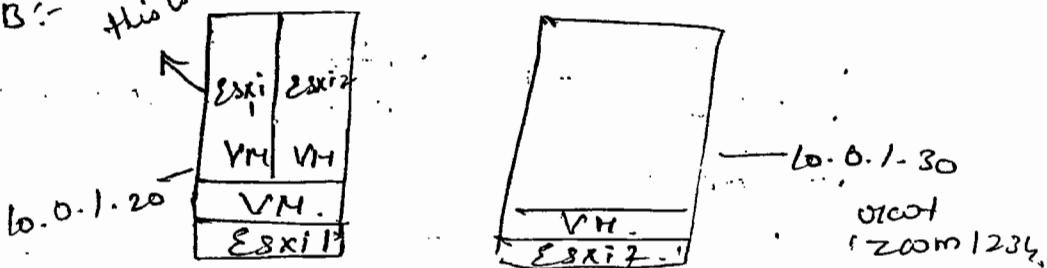
↳ - can be downloaded

↳ - can be installed from vcenter server  
installation media

↳ - It is a GUI used to connect to an esxi  
host or vcenter server to manage your vsphe  
environment

this is virtual esxi (for lab).

LAB :-



LAB  
Host :- ~~Physical~~ - configure is virtual  
practical on physical

10.0.1.20.

username : root.

pwd : 8oom1234

launch vsphe icon.

enter ip : 10.0.1.20.

username : root

pwd : 8oom1234

- login

ignore the warning.

Interface

new  
)

1. R.click 10.0.1.20 → new Virtual Machine → custom → next → name of VM (Esxi1name) → next → choose a storage.

tips of naming convention of VM:

- based on host name (name of sys)
- name based on os. (NT, Linux or Lx.  
Solaris)
- in LAB :- ESXi 1-name.

(Is shared) → next → next → choose other → dropbox 64 bit →  
choose core : 2 cores → next → 2GB → next →  
choose min. (Virtual) → next → choose next →  
Select a disk (create a new disk → next → 40GB →  
Select this (3rd option) → next → next → finish

234.

2. R.click Virtual Machine → edit setting → choose CD/DVD  
→ No Data store iso file → browse → click a choose a loc of iso. (you have to create exploded files  
to data store) → choose esxi 5.1 → ok. → check  
connect at power on. (this is for bud drive to  
power on for VM)

3. R.click Virtual Machine → power → power on.

R.click on Virtual Machine → console.

2 x AMD fx (8350) eight core processor  
2GB Memory

4. click enter → fill (agreement) → then choose  
a place to install. → choose local hd. or.  
Remote of SAN LUN.

- \* (star) indicates contain VMFS partition.  
If it is installing on LVM, it will appear  
in remote. choose a LVM without VMFS partition.  
So choose RAW partition to install ESXi

5. Then assign a password → confirm password → ~~enter~~  
~~warn + enter~~ →

~~server~~  
doesn't have h/w virtualization.  
~~solution:~~  
how to expose physical cpus to VM is shown  
later.

→ F11 to start installation → success → ~~enter~~  
Remove cd if this is physical server → ~~enter~~

6. Press F2 to customize log. → credential →  
this is direct console interface (DCUI).

7. Set the clock password and give permission. →  
configure Management network → ipconfig →  
drop and set static → space to select →  
drop and give ip. (eg: 10.151.151.20)

In lab class choose 10.0.0.0  
10.0.0.1  
10.20.30 }  
} IP range

Gateway - 10.0.1.20 → DNS 10.0.1.20 →  
host name : esxi-it-hayeeb → ~~enter~~

DNS suffix : ~~exam.com~~ → esc to exit: → Y → it  
will restart management nw. → esc to exit.  
The shell is in DCUI.  
Alt+F1 to go to shell.

Alt+F2 to back.

Open B: Rest expanded then to DCUI → ESXi  
Shell is disabled → click enter → it will enable. →  
enable SSH below it.

To go to shell Alt+F1

Login :-

Login with username: not  
pannel :-

The command are stored in skin

# cd skin

# ls skin

esxcfg are commands (go commands)  
it is used to manage various things in

ESXi eg: esxcfg-vswitch (This is to  
configure virtual switch.)

# cd ..

# esxcfg-vswitch

(It will show option.)

eg: # esxcfg-vswitch -l ↴ (select out switch is  
output: Vswitch 0 ports used config 0 128 128  
128 ↴ uplink. VMnic 0 allocation)

# exit

then Alt+F2 to default screen

Then connect to client VM.

Give name: —  
Power: xeon 1286,

Set warning

Then

it enters

Tab is ESXi

- = Scenario
- = VM.
- = Resource
- = Performance
- = Configuration → new health status  
↓ SW
- = Local users
- = event
- = permissions

ports are hidden and  
its internally used by  
VM. & 120 port will be  
available

Change made require  
a reboot then  
start next config.

21/1/15

### Virtual Machines:

- VM is a set of discrete files
- set of virtual hardware
- supported OS can be installed

\* File that makeup Virtual Machine:-

→ .Vmx.

It is the configuration file of  
Virtual Machine

configuration file = hardware information or,  
hardware specifications.

The Virtual Machine cannot be powered on  
without this file.

= Two file associated with

→ .Vmdk, (descriptive file of virtual hd)  
→ Flat .Vmdk (data file)

These file get formatted with depends  
on ~~OS~~ OS that we use.

- vfat/cfs in solaris
- ext3/4 in linux
- ntfs in windows

System boot without hd bios is the  
Reason to it. Bios is also like an OS

Here VM also has a bios. ~~is~~

Here nvram.

↳ Bios file of Virtual Machine.

Phoenix

↳ Bios of Virtual Machines

### \* • Vswap

- Swap file of virtual machine.

### \* • log

- parent log file

} associated with snapshot

- Vmsel (snapshot descriptive file)
- Vmsn (snapshot state file) (common)
- delta.vmdk (snapshot disk file) Created when snapshot

• vmtx (template file)

- rdm.vmdk (Raw device map file)

VM has additional lock file if it resides on NFS

VM has change tracking file it is backed up with

Vmtx :-

- Master image copy of VM.

- by performing template task

- If we perform .vmtx is created. else no such file

NFS

UDP

Virtual host use virtual disk some time it need LUN to store data. LUN is physical disk.

Adv :-

- Stored in single location

- Better performance because we have hard disk with more rpm

- SAS HD 10k to 15k rpm.

- These are not possible in physical disk

To This we have to Map.

- vdm.vmdk

- This is to map raw disk to your virtual machine

- If not mapped. This file is not created.

If stored on NAS.

Then VM will have additional lock file. If it is in VHD or SAN. This file does not exist.

→ VDR/VDP:-

This file will be created if you take backup of VM. This is a change tracking file.

Vsphere data recovery (till 5.0)

Vsphere data protection (after from 5.1)

\* From the perspective of HW:

VM + W:

CPU — upto 64 VCPUs

Memory — upto 1TB RAM.

Depend on 2 aspect.

System should have 1TB RAM.

Depend on Virtual Machine hardware version

(Enterprise+)

Depend on 3 things → vsphere license

on host you must have 64 processor or 64 core.

depend on guest os installed on your machine

XP support only 2 CPU.

RHEL support 64 processor

Hw versions:-

It is related to Vsphere releases.

Vsphere 4.0	VM Hw version 4
Vsphere 4.1	VM Hw version 7
Vsphere 5.0	VM Hw version 8
Vsphere 5.1	VM Hw version 9
Vsphere 5.5	VM Hw version 10

The More new hw versions we have

Sophisticated usage ~~from~~ from Version 8  
~~at least~~ ~~from~~ ~~1.7B RAM~~

is supported. All Version 7, 256 GB is supported.

The Advanced features will be developed only for web client. but we can use Vsphere client to only. This is to face out the Vsphere client after a stipulated time

- NIC:-

upto 6 NIC

- SCSI

- upto 4 scsi adaptors 15 device / adaptor

1 scsi adaptor can connect 15 device

∴ 4 scsi can connect 60 device

- | IDE controller 4 device
- | USB controller 20 device.
- upto 3 parallel ports
- upto 4 serial / com ports
- | floppy controller 2 device

HDD audio

Hw 3D (NVIDIA) from 5.5 we have  
Intel & AMD  
Graphics

Keyboard

Mouse.

- upto six PCI Vsphere Direct Path  
device to a VM.

⇒ Vsphere Direct path technology:-  
using this virtual machine ~~VM~~ can  
access <sup>PCI</sup> devices directly. depend on opa  
available.

- Telecom apps
  - Telecom products
  - and some other products
- we use PCI devices.

CPU :-  
VMware vsphere

~ Virtual Symmetric Multi processing:-

This allows us to configure  
multiple processor to CPU

In short V SMP (Virtual symmetric Multi  
processing).

# Virtual Disk :-

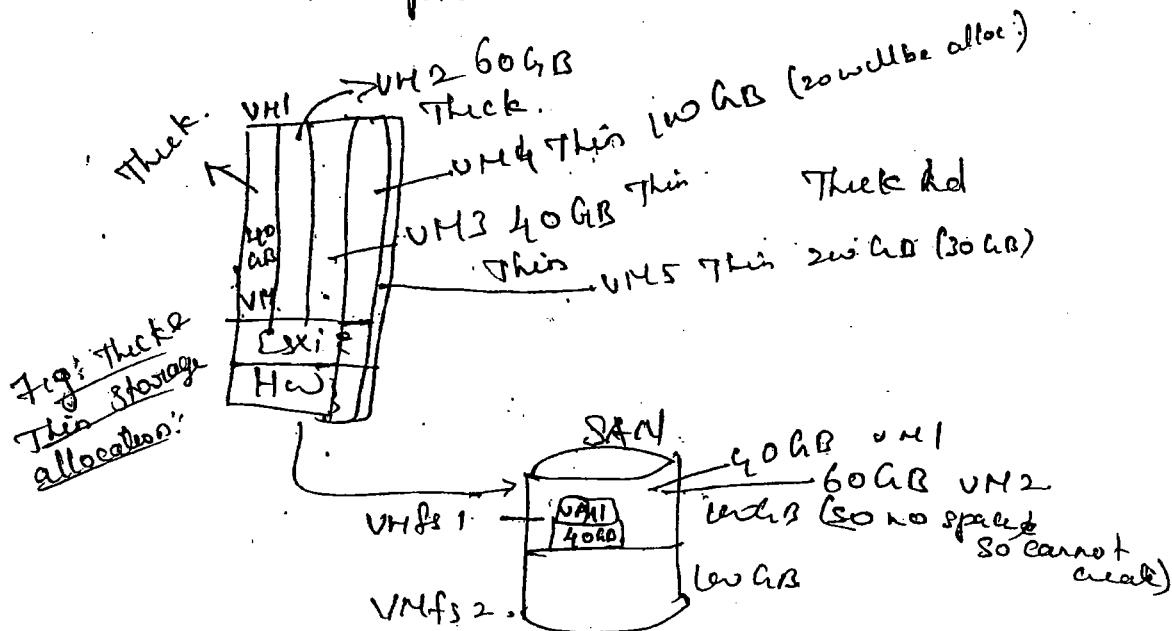
- connected through SCSI adaptor
- 4 adaptor available VMware /  
Bus logic parallel, LSI logic  
physically available parallel, LSI logic SAS &  
VMware paravirtual  
not physical - VM will use one of these  
first three are highly used.
- These adaptors are emulated  
adaptor (physical adaptor or physical  
here emulated)
- first 3 are emulated
- VMware paravirtual is not  
physical device. It is selected  
for certain diverse versions.

## Types of virtual hd.

Thick      Thin — two types  
 lazy      eager.

coning

- Thick provision, lazy zeroed
- Thick provision, eager zeroed.
- Thin provision



### Thick:-

- In Thick hd Entire space will be allocated. eg: 40 GB full 40 GB will be allocated.

### Thin:-

When configuring with thin provision, only commitment, not allocation of full space. This is not allocation of full space. eg: I had committed 40 GB. consider only 10 GB needed so 10 will be allocated, and 30 GB will not be allocated.

This:

- This allow us to optimally use of resource.
- no wastage of memory.

Drawback:

when it need the corected space  
then that <sup>will be</sup> problems with SAM !!. It will  
run out of memory space : )

Three :-

Drawbacks

- we allocate complete space.
- But it may use or may not use. In that case the space allocated will become waste.
- + ... no better usage.
- May cause wastage.

\* Difference between <sup>block</sup> lazy zeroed & eager zeroed

\* When virtual disk is created the space come from physical disk. So the HD should be prepared to create.



Scratching of zeros. It will fill zeros in all blocks of each sector when writing up of data is finished. It will write data.

in the block by removing zeros.

In lazy<sup>zeroed</sup> it will occur later.

In eager zeroed it will occur during creation.

VAD 2nd part.

\* But then it will be like this

In this it occurs when first data storage is made on disk.

(\*) Thick provision eager zeroed:

Thick provision eager zeroed is prerequisite for fault tolerance. else no fault tolerance is possible.

- Better performance

- This is need to enable fault tolerance

## \* Virtual NIC:

- flexible.

3 types

32 bit Guest - flexible      ↳ since generation of AH  
for 64 bit Guest OS.      ↳ Large NIC.

for 64 bit Guest OS.      ↳ e1000, e1000e, Intel gigabit

- VMxnet2, VMxnet3

This depend on VM that you select

without device drivers OS cannot communicate with hw.

- OS - collection of files

- OS contains certain drivers in-built.

These are known as generic drivers.  
Generic drivers are available in OS installer.

But... is normal how it ask for  
drivers But in VM it is not! why?

When asking for which OS you  
need:

Windows 7

When you choose this it will  
collect the hardware according to the  
requirement of OS and generic drivers  
So it is not asking for drivers after  
installation of OS in VM.

Based on OS you select it  
Select the right hardware features  
when you install generic  
drivers especially selected on it.

All will be allocated the  
same.

If 32 bit OS selected then  
flexible size is selected.

- e1000 and e1000e.
  - depend on physical adaptor on host.
  - eg:-  
(if physical adaptor functionally equal  
to e1000 it will get e1000)
  - for 64 bit os.

- vmxnet 2

↳ advance of vpxnet

- dumbo frames
- supported for certain (lenovo)

Vmxnet 3:-

- not related to Vpxnet2 or vpxnet
- from 6.5 version support
- from RHEL6.

Note:

If running any lenovo or choose  
Vpxnet 3. (good for 2012)

\* VHvare tools:

- Suite of utilities
- install after installation of  
Guest OS.

## \* Features :-

- Replace the Generic drivers with VM drivers.
- Device drivers: VGA, Display, VMnet, Balloon driver for memory management, sync driver for queuing I/O, improved mouse.
- VM heartbeat (in Hibernation)
- VM was hot source for time sync.
- Ability to shutdown VM.  
(Shutting down without logging)
- Adds additional performance monitoring option
- Reduces reboot when upgrading new version of VM tools.

## \* Virtual Appliance:

Preconfigured VM with guest OS & required app. It is designed for specific task such as firewall, backup and restore utility etc.

- Deployed as an OVF template
- OVF is a platform independent, open packaging & distribution format for VM's
- Download from VMware VAM Marketplace
- Deployed using vsphere client on vCenter Server or ESXi host inventory

CAB 2:-

cont:-

Configuration → networking

\* To create another VM network port

1. click add → Click Virtual Machine → name (can be based on app, dep or VM) eg production, (port can config as active, vLans, trunk) next  
Select <sup>nic</sup> ~~Virtual~~ (25. so 25 will be assigned to all)

Note: Create vLans if created on physical n/w → next.

<sup>finish</sup> → close & for V Motion part.

2. Go to properties → VM details → name (V Motion)  
→ check use this for V motion → configure ip → OK

→ I want to dedicate NIC for traffic.  
properties → network adaptor → add → (physical

adaptor will be listed, choose of concerned / select one → next → finish → close

Create multiple VSwitches if you need  
to dedicate 1 line for traffic

Remove all if you are allocating for  
Management.

How to dedicate 1 for a group:

Create one switch

prop.  
add → next → select one → generate  
(Production) → VM - ok

for test:

prop - VM new → new switch → label d.  
(test) → VM - ok

VM test

Add net - VM level → new switch → next  
label → select <sup>the creation</sup> IP → next - for b

Fault

Select - VM level - new switch → next

label (fault to leave) → select second fault  
option → IP → next → finish

VM kernel port should have IP

Consider you have

2 NIC of 10 GIG.

it can be shared by Multiple nw.

To bring collision or Multi cast down use  
Vlan.

e.g., Vlan 10 Management

20 Vnet0un.

30 fault tolerance

40 CSCI

50 NIDS

80 production

∴ This reduce collision.

\* Miscellaneous config:-

• Time:-

- Identical time on all switches

problems:-

- logs. report wrong time

- scheduling of job fails.

- AD auth may fail

- auditing is problem

NTP servers are used

Network Time protocol.

Esxi host can sync with NTP server  
for time management. i.e identical time.

2:

\* How to config ntp server:-

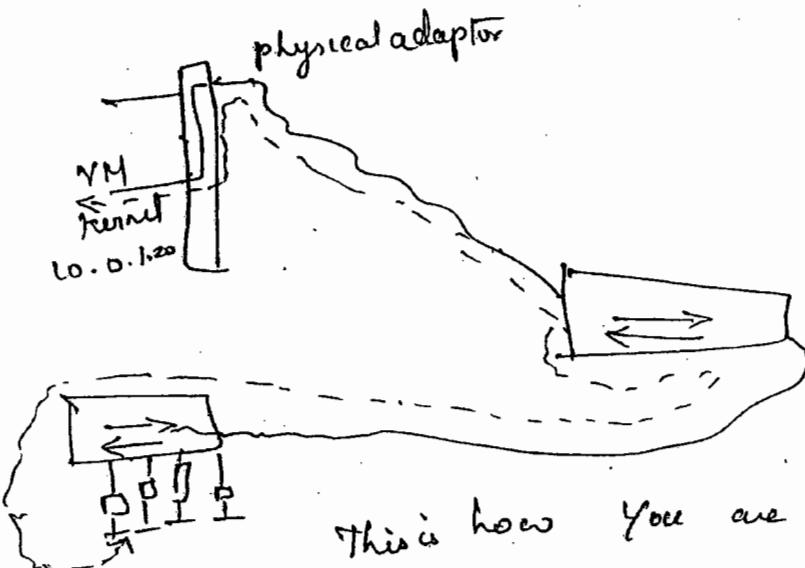
hw & sw → Time config → prop → check  
ntp client enable → options → ntp.set → add →  
mention IP of fully qualified domain → ok. →  
online:pool.ntp.org.  
restart → apply → ok.

on ~~the~~ configuring VM's  
on VM tools we can sync time on VM's

\* IO server barter:-

config → sw → start & shutdown →  
prop → allow start & stop auto → select  
the sys & move upwards  
each machine will be started by  
120 sec (default)  
min 15 sec.

28/01/15



This is how you are able to  
view your physical Server on your client  
Machine

When you 'add hosts' nice you need to  
restart

#### \* VCenter Server:

- = Traditionally developed for windows server
- = provides centralized regist. in vSphere
- = can manage <sup>host</sup> clients & other VM running on it
- = it is a service
- = It can Manage 1000 ESXi host.
- = You can have 15000 VM registered on 100 host, 10,000 VM can be powered on @ a time.

\*

To-15 VM for - industry  
One Machine of server.

= This provides most advanced features

- + VMotion
- + Clustering by HA
- + DRS, FT
- + VM ware vsphere
- + SV Motion.

= Multiple Vcenter Server can be joined as a  
center  
Vcenter linked Node group.

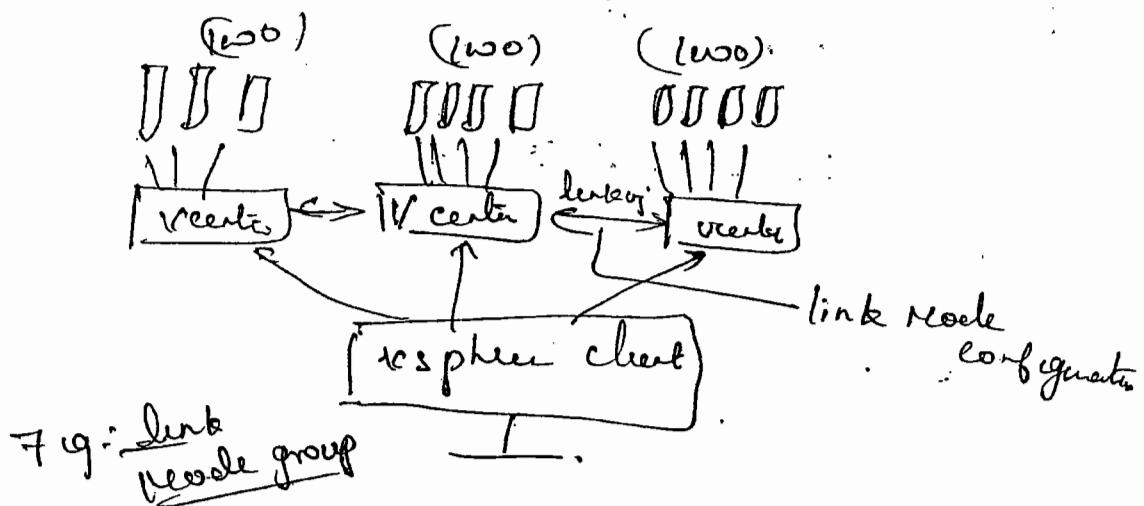


Fig: link  
node group

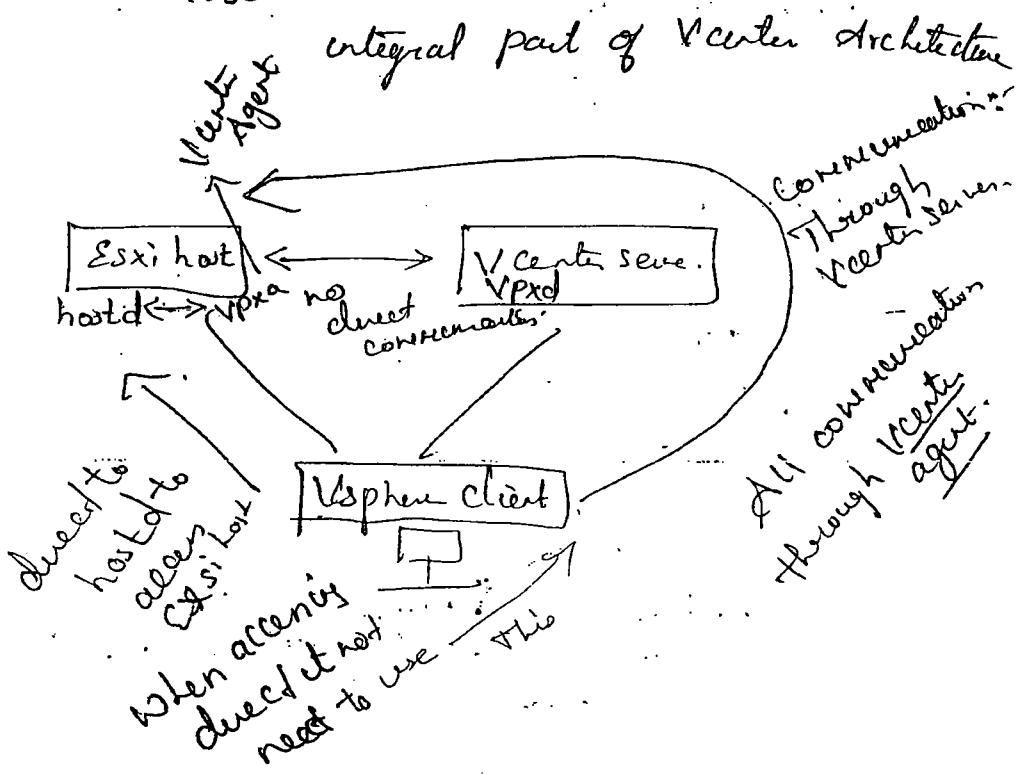
There is possibility to Manage host  
we can link multiple Vcenter server and  
linked together to form link node group

Single instance - can Manage  
multiple host server.

possible through link node group

## \* Veenhu Architecture:-

- VM ware Vsphere client
  - through this getting connected to other
  - V center server db (critical)
    - here db details are stored. gathering entire V center info & store. it reads & write. if it received nothing possible. so it is critical. Regular back up should be there
  - Active directory Domain
  - Security is build on windows security
    - When we access the service we have to provide credentials. This is security build on windows security.
  - Host & VM.



hostd process:

When get connect to esxi host from a vSphere client - it happens through this

Vcenter agent - adding a esxi host to Vcenter server this is added.

Vpxa - Vcenter agent.

- Running as a process on vsphere

When communicating directly with vsphere host through hostd. Vpxa has nothing to do with it. It is problem when some else access so we use....

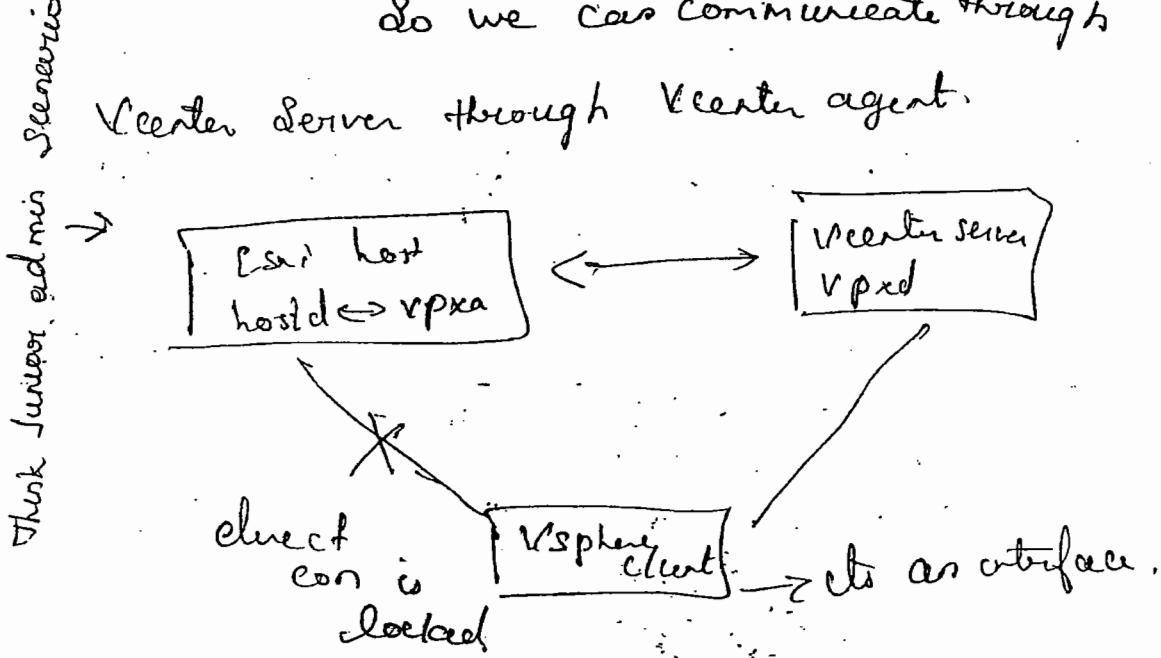
Lockdown mode:

.. If we enable lockdown mode

then ~~we can~~ enable all communication directly to esxi host is blocked

So we can communicate through

Vcenter Server through Vcenter agent.



but in some case vcenter server will be down. in that case we use direct connection and we access esxi host.

vpxa is an intermediate mediation between vpxd and hostd.

vcenter server process - vpxd.

Every information of vcenter

when adding a esxi node host we can enable lock down mode option.

i.e

hostd  $\leftrightarrow$  vpxa  $\leftrightarrow$  vpxd

\* Vcenter Server Service :-

3 types

- Core (main, default)
- Distributed
- Additional

• Core Service Host

Config of ~~host~~ & VM

Scheduling

Managing resources

Task, Statistics - log, Mgmt of alerts & events

## • Distributed Service

- VMotion
- SV Motion
- DRS
- HA
- Some configured for these services
- Matter on VSphere Service

## • Additional Service

- not coming with core package

- To install separately & but they have to get integrated with ESXi.

eg: - VMware vSphere Update Manager,  
    ↳ patch management service  
    it is used through Vcenter Server

- { - DB interface
- AD interface
- VSphere API & VSphere SDK

Lvcli

VCLI → Vcenter  
Vsphere API  
running

→ Vcenter Service  
    Vhostfile

- Update Manager
- Site Recovery Mgr (SRM)
  - + App use to replicate data from primary site to Different site
  - + similar to seed redundancy
  - + for disaster recovery process
  - + it is done through replication here SRM or site recovery Mgr helps.

- These are application that add add'l feature in Vcenter Server.

eg:  $\xrightarrow{\text{integration}}$  Vcenter Server.  
 SRM

- These Module have server & client component
- |   |  |   |
|---|--|---|
| ↓<br>- installed<br>Vcenter Server<br>(or)<br>Separate<br>machine | ↓<br>- downloaded &<br>installed<br>in Vcenter<br>Client | ↓<br>- it is a<br>plugin<br>- local<br>system |
|---|--|---|
- Server :-**
- Installed on Vcenter Server (or), Separate Machine
- Client :-**
- downloaded & installed on Vsphere Client

## \* Vcenter Server plugins:-

need not installed installed

default.

- Vcenter Storage Monitoring Service
- Vcenter hardware
- Vcenter Service

update storage information of Vcenter

update hardware info of Vcenter server

update status of service of Vcenter server

## \* Vcenter Single signon:-

Single sign on may also  
Google is best example

Generic term.

Single Signon - Generic Service

Multiple soln & service you have to  
use multiple credentials but managing  
it is hard.

So Single pass credential for  
various soln & service

In order to provide this  
service we use Single signon Service

- Basically used in web based soln.
- Google offer is soln. is the best eg. (over web)
- Google also uses some sort of Sign on Services.

### Vcenter 5.0 :-

involve two components

- { Vcenter inventory Service
- Vcenter Server.

→ put together form Vcenter 5.0

This completes Vcenter,

But from Vcenter 5.1 new component added now. 3 components

- ~~↓~~ New  
↓  
 1. Vcenter single sign on service  
 2. Vcenter inventory service  
 3. Vcenter Server.

So 3 components are installed.

\* Why introduced single sign on:-

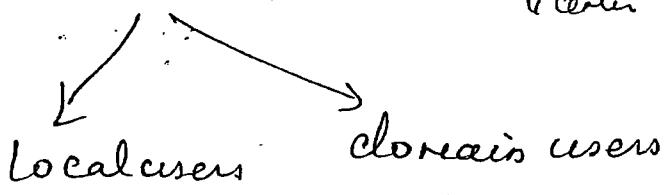
- ① Because it offers multiple solutions

- Vcenter Server
  - Cloud director
  - ⋮
- } So single sign on  
make it possible  
for multiple services

(2)

This is installed on on a windows machine. Security is based on windows security.

1. local admin
  2. local users & group
- 
2. windows Machine member of domain so domain Admins and domain user can use.  
i.e. windows Machine with Vcenter



SSO servers have ability to create group of own but it's not possible

Why org use this:-

- Specifically web based App

## Benefits

- Speed up operation of auth the user
- less complexity
- Support for Multiple Active & non active directory repository
- Trust between components
- Support Open std protocol SAML2.0/WSS-Trust
- Better architecture

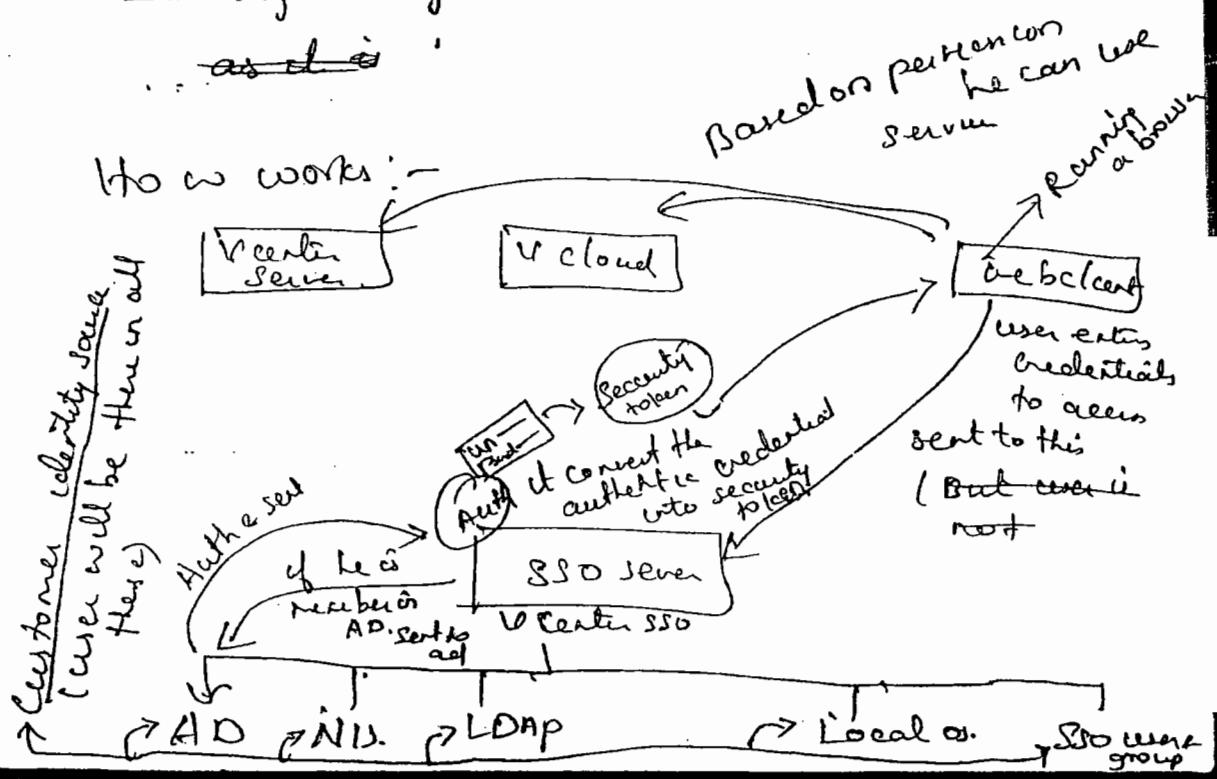
## features

- Auto discovery of Vcenter Server is a network.
- Vcenter 5.0 require one time Manual reg.
- user can view all Vcenter instance in single view
- Linked mode not required

→ Single signon works on webclients

~~as well~~

How works:-



SAML :- Security Assertion Markup language

→ convert user credentials are converted  
into security tokens.

i.e. after returning to client  
it gives security token

So hacker if open he cannot  
understand.

- V Sphere soln: vcenter, inventory services
- V sphere platform services: auth (SSO)
- Customer identity source: AD, open LDAP,  
NIS, Local OS users, SSO users.
  - user log on to webclient
  - credentials are sent to SSO service

(~~to~~ check slide)

## \* SSO components:

- STS Service issue (SAML) tokens

- SSO Ad registration server: Configure SSO

Servers & Manage user & group.

- Lookup service contains topology info

abt vcenter infrastructure

i.e. it auto discovery of vcenter

SSPI (Security Support provider interface)

- NT based windows API

Like NTLM of \$-local Machine  
kerberos of AD domain

## \* Vcenter 5.1 supports:-

- Open LDAP version 2.4 & later
- AD version 2003 & later
- Local OS users.

## \* Installation of Vcenter Server 5.1:-

### Components

- SSO Server

- inventory service

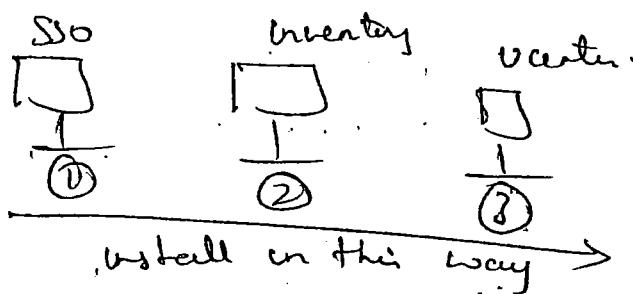
- Vcenter service

Require a db.

(of small infra - single machine  
in large (production) one on each machine)

- How requirement for SSD on separate Machine
  - Intel / AMD dual core x64 processor
  - 3 GB RAM
  - 2 GB Disk storage
  - 1 Gbps NIC

Virtual Machine



do in process. (Installation)

in 5.5:-

If you install vcenter it will install 4 components ..

- SSD
- webclient
- inventory
- vcenter

Get installed on same Machine

## \* Vcenter Inventory Service:-

(list of components you hold or  
Manage. It Manages Host & VM.)

- Stores Vcenter <sup>sever</sup> apps & inventory data
- Search and access inventory of multiple Vcenter Server linked.
- Support logins by SSO
- used by VspHERE web client

H/w:

Same as SSO in previous page.

## \* Vcenter Server

- H/w req:-

• Intel/AMD X64 20 or more core  
2.4 GHz

• 4GB RAM

• 4GB disk

• 1Gb network card

Require a db

Support on

64 bit OS

64 bit DB } from S.I.

## \* Vcenter Server db req:-

- - MySQL server 2005 SP3 (SP4 recommended)
- Microsoft SQL Server 2008, 2008 R2 express
- Oracle 10g R2 & 11g
- IBM DB2 9.5, 9.7

1. These db supported only on windows Machine <sup>or</sup> vcenter server.

• Vcenter appliance  
~ support only oracle.

2. Link mode is possible in Vcenter on windows

• not possible on Vcenter appliance

(A.B.)

Installation of Vcenter server 5.5 :-

- { Pre requisite }
- In windows Machine with 64 bit
  - Make it Member of domain <sup>Processor</sup> <sub>as a  
service</sub>
  - install Vcenter app.
  - install as a domain user

a) login as domain user or administrator

xoom.com/administrator

Soom-1234

1. file VM → guest → install or upgrade VM tools →  
Ok. The tools will get mounted on machine  
host computer → double click on vmtools.

2. wizard → next → choose Typical → install.

finish → Typical if on only system  
reboot → complete if using another VM like  
Yes ↗ fusion or other  
& login after boot as admin

3. Mount iso

VM - edit setting → cdrom click → iso file.

browse → VM-iso (second) → select & mounted.

→ In My Computer it. is mounted → double click  
to install

→ ~~wizard~~ simple install. (all one.)  
Custom in each machine one.

→ wizard → simple install → install  
double click on.

Style selection. write.

→ next → agrees → next → next →

administrator, administrator@vsphere.local (5.5)  
admin@system-Dorian (5.1)

(Zoom-128) & char type

Configure parallel → configfs parallel → next

Side name → part 7444 → next →

→ default loc → next → install  
(Leave it)  
option

7444  
↓  
Port no  
of such  
signa  
port number  
7443/3  
9090

in 5.5  
JVM gets here Vcenter  
Inventory  
Service

in 5.1 It will  
come with Vcenter server.

JVM - Java Virtual Machine

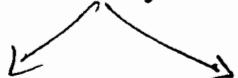
Vcenter Server install Tomcat  
Server in background

It can be installed on webserver

23/1/15:

## Storage:

Storage



### DAS

- Direct attached storage

Storage

+ connected to system

+ not using any hw device  
between storage & sys

+ such as DAS

+ eg: HDD, SSD..

### Shared Storage or Network storage

- Device not directly  
connected to your system

- Device access through  
network between sys &  
storage

- network device used

- Ra

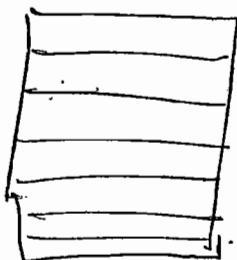
## Shared storage -

SAN  
- Storage area network

NAS  
- Network attached storage

### \* SAN :-

Storage area Net.



SAN

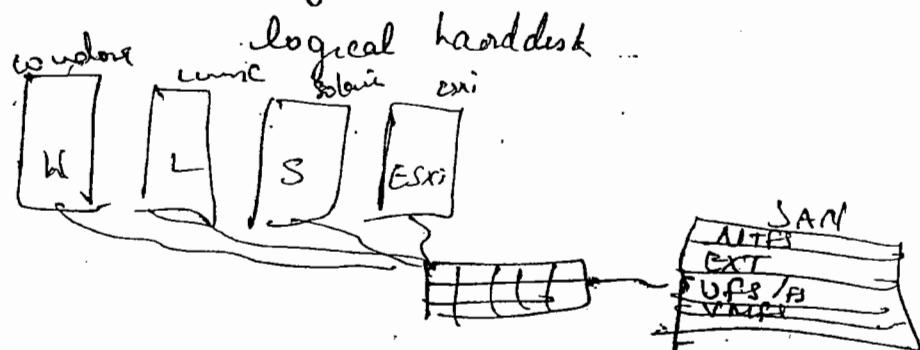
Hard disk is block

It is a Machine. This Machine contains multiple hard disk. e.g. we can do some sort of RAID for redundant purpose. so no data loss such as RAID 0, 1, 2, 3

using that we create RAID set or volume.

- RaidVol or Bigsize volume is partitioned into logical unit called LUN.

LUN - logical unit or



SAN present Block as local Block to  
Systems.

It is in SAN But OS consider as  
hard disk of Machine.

LUN & Block

Scenario consider LUN is accessed by  
Windows Server. But it thinks as local hd  
and that block is formatted in NTFS  
and system store data & i.e stored in  
LUN & LUN on SAN.

The

If <sup>medium</sup> is fiber then

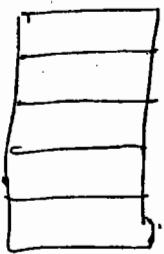
fc is my protocol, FCoE  
*Fc frames are transferred over fiber channel*

If medium is ethernet then  
My protocol is ~~ISCSI~~ iSCSI

FCoE - Fiber channel over Ethernet.

If fiber medium is ethernet.

\*NAS:-



- We can search for redundancy

- It won't provide block -

- It provides folder as local

folders.

so data are stored in shared folder

- cannot format.

- no visibility of drive or hd.

∴ these hd are already formatted  
with the file system that is used by  
your machine

(consider you are using windows  
Your disk is already formatted with  
NTFS and you use shared folder.)

We use different protocols to

Share data folders in the network.

used to  
trans for data  
over network } { CIFS  
SMB  
NFS - Network File System } file system  
but technically  
it is protocol!

However Esxi support only NFS

Protocol on NAS

NFS:-

- NFS developed by sun Microsystems
- It is for Solaris
- created to share data over network

- NFS is file system based storage.
- It provides folder
- SANP is block system based storage
- It provides block

④ The Folder in NFS :-

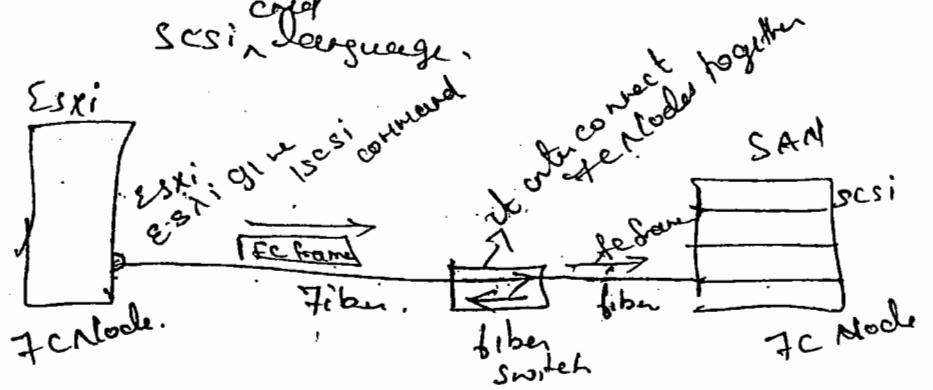
↓

It may be a folder, or a partition or even a hd. and it can be treated as a folder & shared over network using these protocols.

\* Shared storage:

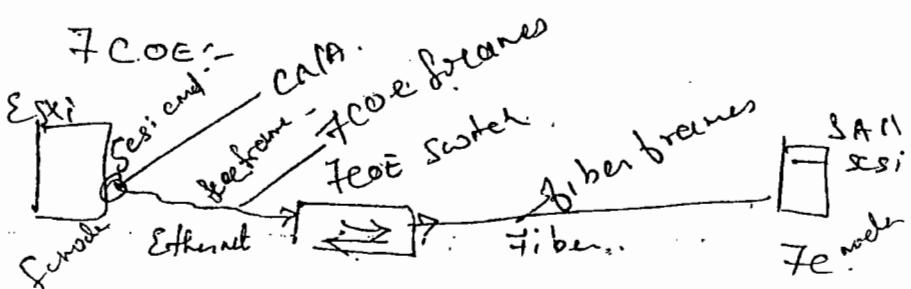
- Logical container that holds files (data)
- Types of data store
  - VMFS - data store formatted with VMFS (if it is already formatted with VMFS)
  - NFS - formatted with filesystem (NFS) of data storage provider.  
(Formatted already for OS or your machine)

- Storage technologies,-
- DAS : Direct attached storage
- FC : fiber Fiber channel protocol.
  - Protocol used on SAN.
  - SAN has scsi hd.
  - ESXi communicate with scsi - so we can copy scsi language.



FC protocol).

- ↓
- encapsulate scsi commands into fc frames. FC frame are transmitted on FC node.
  - ↓
  - A system connected with fiber channel (fc) it is FC node
  - SAN is fc node.



- Scsi command → fc frames → fcoe →
- fcoe command are sent through ethernet cable.
  - we use fcoe protocol.

## \* Iscsi :-

scsi transport protocol.

i stands for internet

Scsi - <sup>give</sup> Access to storage over TCP/IP network

∴ it is known as Iscsi

- Because in ethernet but

we need scsi protocol.

## \* iNAS :-

provide access to storage shared using file system (NFS) over TCP/IP network.

- NFS Protocol.

\* VMFS can be deployed on scsi based storage

- DAS, FC, iSCSI

ESXi support NFS version 3 over TCP/IP uses a lock file.

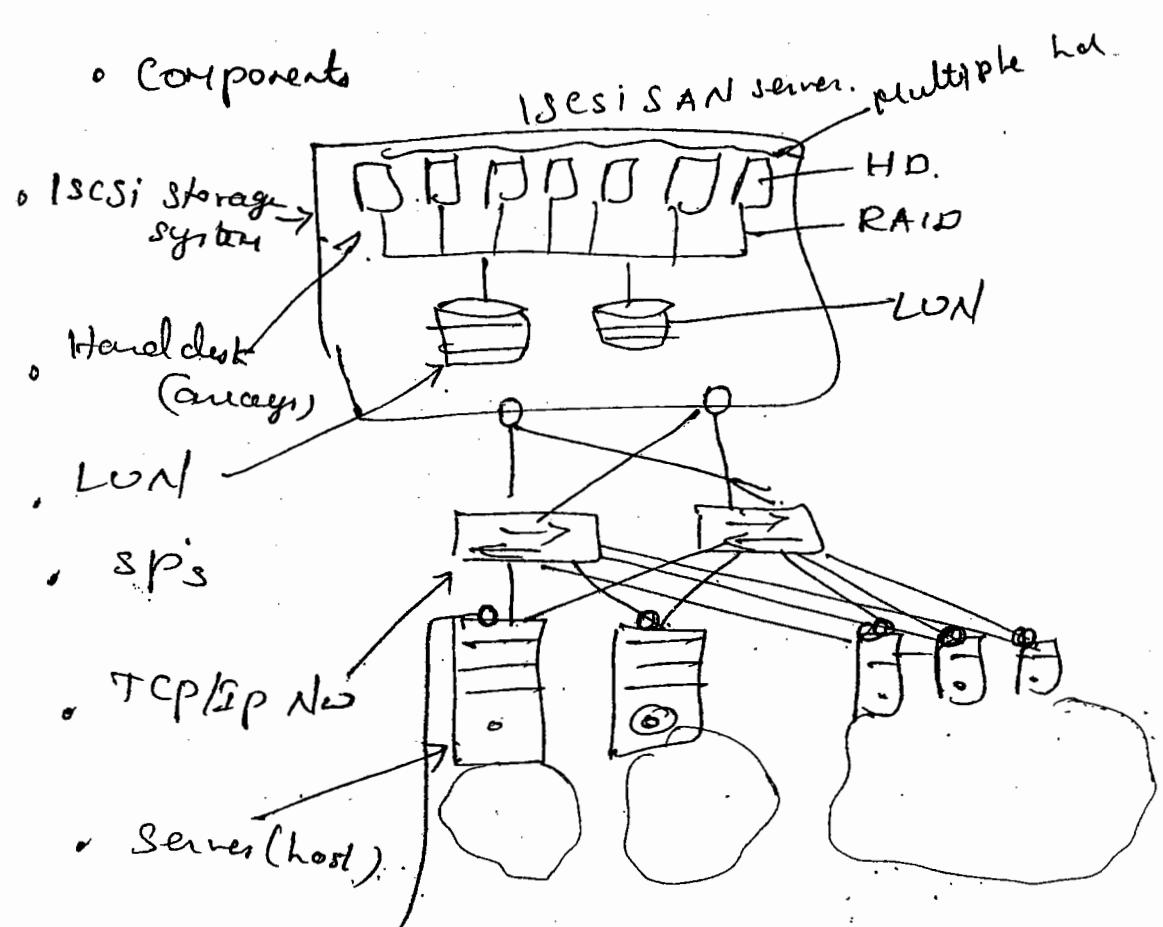
• lock - Field id (lock file)

- it is used if stored on NAS

when ESXi stores data on NAS it is used. It is for security.

## 1. iSCSI SAN STORAGE:

- Components



iSCSI initiator      Esxi host access these storage,

Normally they can't access iSCSI for  
that we need some components. That are called

iSCSI Initiators

2 types of iSCSI initiator (Server can only one)

- Hard ware iSCSI initiator,

(Special kind of iSCSI card)

iSCSI HBA

- Software iSCSI initiator

(Instead of hardware initiator)

Normal file is the used.

iSCSI is needed for file to access iSCSI server.

On each host you need s/w initiator

- Esxi also provide Sfer i.scri initiator

it appear as deduplicator

- They initiate con with Target on  
lscsi SAN server

- Target will present LUN to  
initiator

. Initiator  $\rightarrow$  LUN

. Initiator  $\rightarrow$  Target  $\rightarrow$  LUN

### Access control :-

A LUN can be shared with  
multiple system or not

$\therefore$  it is known as shared LUN

It is prob of security

### Scenarios:-

cliff dep store data in

SAN eg: exchange  $\rightarrow$  Mail (eg. W<sub>N</sub>)

DP  $\rightarrow$  data (2TB W<sub>N</sub>)

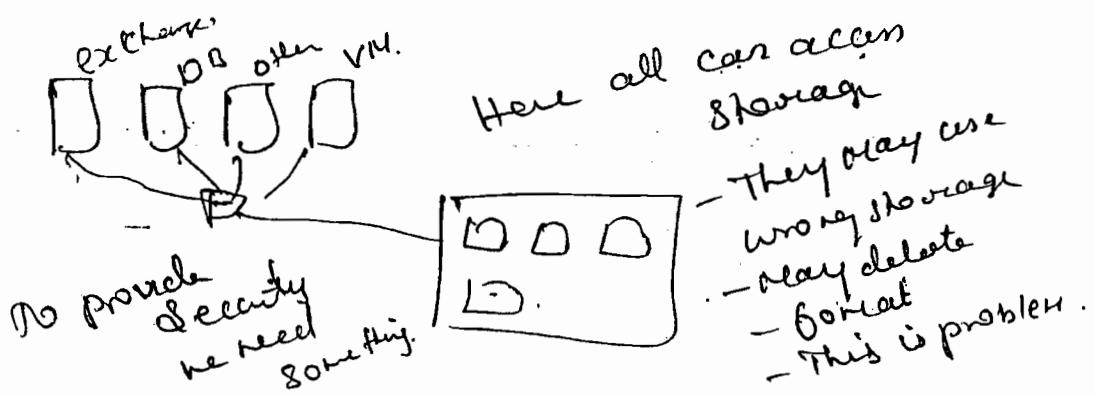
each team store data in

SAN (2TB W<sub>N</sub>)

VM ware (2TB W<sub>N</sub>)

$\therefore$  Admin has to create

Point 2TB LUN



- Some mechanism need for access control of these LUN. i.e granting access to each dep. for the storage.

In order to provide security, need to provide access control on iSCSI SAN!

There are Methods, They are:

Initiator ① → Access Rights

e.g: Thomas  
Siva  
Karan  
Hari

(In Target we specify the initiators)

\* how sys. Target identify Initiator?

Only to them  
at provide target  
There is done sought. of addressings

In iSCSI SAN we have special naming convention

- IQN - iSCSI Qualified Names.  
- Targets are identified using this

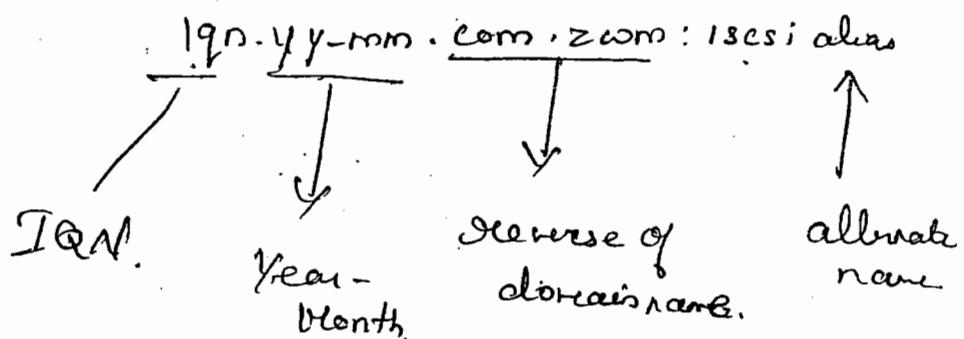
Initiators can be identified by

IP, host name, IQN and  
MAC address too.

TQDN.

host name followed by domain name

IQNL has also a format.



\* We secure data using this

## ② CHAP:-

- It is heterogeneous protocol
- Network or platform.
- All machines support this protocol.
- Generate Chap user name & key & share with particular dep.
- alias with key it allow access
- CHAP encrypts the data
- one way / two way authentication is possible

13CSI addressing : 2QN can be 255  
Character.

EUI

- extended unique identifier

- 16 character with 64 bits address

64

→ 24 bit - company

→ 40 bit - unique id of Target

EUI followed by 16 character no.

e.g:- EUI 0123456789 abcdef

\* IScsi Initiators:-

• Software based initiators.

dependent (Broadcom 5709)

Independent. (QLE 4062c)

Independent:

Special kind of cards. HW cards.  
(SCSI; HBA).

dependent:

• certain NIC support IScsi  
but depend on OS.

These are dependent h/w.

• SCSI security uses eLabs.

ESXi support uses Multipath (port bonding)  
(redundancy like for that)

- we need another card in ESXi. This is easy. no port bonding
- If in software you need some support that is port bonding

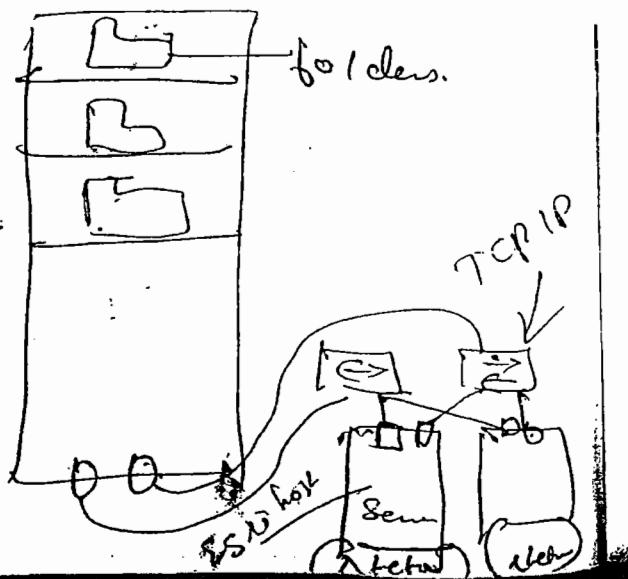
• iSCSI traffic is handled by VM kernel port.

Port bonding is bonding of VM kernel port

∴ if one port is down another will handle.

\* NFS :-

NFS  
Components:-  
NFS device / NFS user



Folder share has configurations  
access or deny.

They don't give root access to  
folders. But ESXi requires root access  
consider he is sharing folder without  
root access. Then ESXi can't access that  
folder.

→ (Granting root access is need)

no-root-squash option

no root → overriding the rest  
— Grant root access

General: { <sup>LAW</sup> Squash petition — overriding rule }

- Physical switch need port bonding  
then only Multipathing is possible.

ESXi support Multipathing

## \* FC SAN:-

FC components

FC storage system

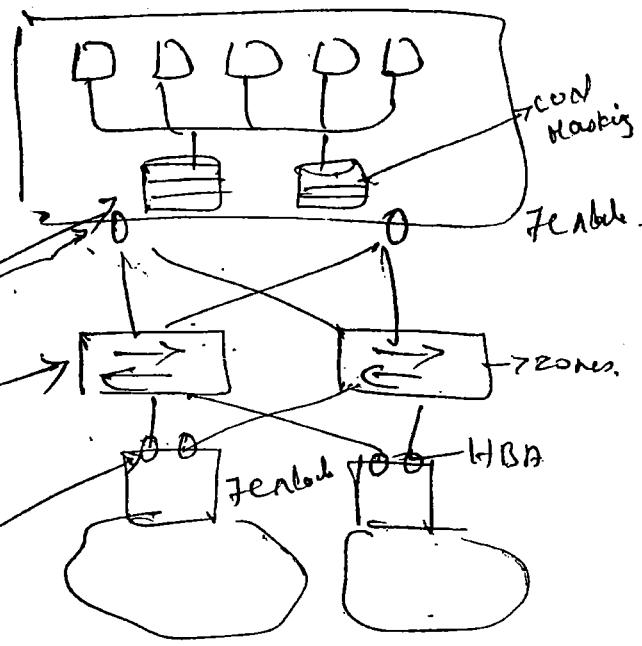
Disk drive array

LUN's

SP's

FC switches

ESXi host  
with HBA



(X) If using 2 HBA use same manufacturer

Similar to iSCSI:-

But no terminology Target & Initiator (But sometime used)

As the medium is fiber. No NIC or iSCSI cards.

We use HBA

↳ Host Bus adaptor.

WWN :- Worldwide Name.

— 64 bit address;

— unique address assigned to FC node.

Security to access here is of two types.

They are

↳ Lun Masking

+ It is configured on SAN as

+ It ~~helps~~ hide certain LUN to

certain servers

→ Zones (or) zoning.

+ Configured on Fiber channel switch

\* Tone :-

Zone decides which HBA has access to which

(understand this)  
Storage processor & controller

HBA are auto-configurable. (if basted)

→ if it is exposed it config by auto

\* Fiber channel :-

Range. 2 - 16 Gbps.

Depend on 4 things (if need 16 Gb con)

① - HBA (it need to support that range (2 - 4 - 8 - 16 Gbps))

② - FC switch (it also support cryptofrom 4 - 8 - 16 Gbps)

③ - SAN Device (not all SAN support)

④ - OS in Server (ESXi support but not all)

only then you can have end  
to end 16 Gbps.

#### \* LUN :-

- Logical unit number
- Address of logical unit
- logical unit is unit of storage which can store data.
- LUN can be JBOD / RAID

JBOD - Just a Bunch of disk

Chaining disk together

RAID: Grouping disk together creating a Vol

Difference JBOD & RAID

Both are Bunch of disk

JBOD - No redundancy

RAID - Redundancy possible

JBOD/RAID can be made into  
partitioned set of LUNs.

SP+

Storage processor

- This is component which

- This make partitioning JBOD/RAID into  
Multiple LUN's.

- component restructuring to particular

host Server accessing do LUN

\* HBA

Connect esxi host to fc network

\* fc switch

- fc node may or may not contain fc switch  
fe fabric:

fc network is called as fe fabric.

But we need to use atleast one fe  
switch. if no fe switch then not fe fabric

Te switch:

This forms fe fabric, interconnect  
Multiple fc node, it add source &  
destination address to the packets

General:

60-70% of traffic goes to SAN  
Very Very costly

Brocade No.1 fiber channel switch  
Manufacturer

Basic has 16 ports out of which  
8 are enabled - support 16 Gbps by default 8 Gbps

Cost 1.7500 (25k) Basic support -  
~ 2 lakhs

To increase the no of ports or  
Speed we need to pay extra  
licensing.

### Top 5 Companies.

IBM

HP

Hitachi

Emc<sup>2</sup>

NetAPP

SAN.  
leader 80% of

Market  
share

leader in NAS

24

### Unified Storage.

Original Manufacturer come  
with this - it can also give all  
Protocol & in single box all LUN,  
NAS can be clubbed & it gives  
one interface and it is GUI  
Storage Admin job is easy  
80% of storage depend on zone

feature is all about Virtual SAN.  
Virtualization

Perfstor - first Virtual SAN company  
underline has not exposed. it  
abstract & create pool

VMware - Vsan.

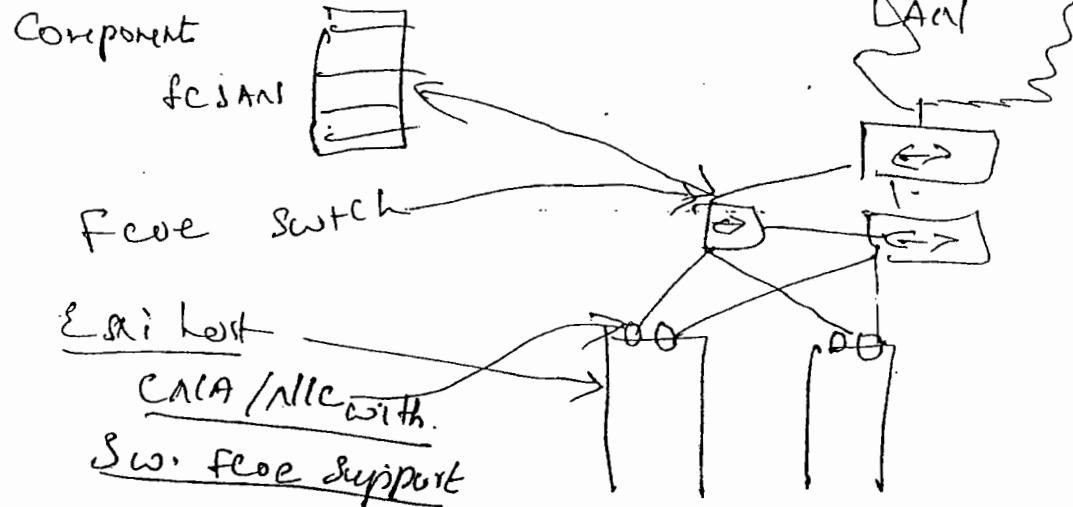
Create pool of storage by  
abstracting hw.

General ends here .....

24/1/15

ESXi support 16 Gbps. FC support Multipath  
kernel scan that ranges from 0 - 255.  
i.e. from 0 - 255 it can search &  
send over network

# COE:



## CNA - converged network adapter

Suppose no CNA.

Then can use s/w FCoE  
but NIC has to support  
this feature.

Special NIC cards support FCoE  
(Fibre or Virtu)

Fiber HBA

HW iSCSI HBA  
FCoE  $\rightarrow$  CNA.

S/w iSCSI supported by all NIC but  
Not all NIC support FCoE

CNA are 10 Gbps cards that come  
with server. normally they support. They  
are CNA. They can convert FCoE &  
Ethernet frames.

It requires FCoE switch  
(can handle FCoE & Ethernet)

Idea

Basically FCoE switch acts as  
converter Ethernet  $\rightarrow$  FC frames

## (X) Storage Device Naming

OS gives name for all device. It has naming convention

eg for HD is disk0

ESXi also use naming convention. It is used to differentiate a disk from other.

ESXi require this. It could be local storage or LUN. (SAN). SAN provide an ID to it. It is known as SCSI ID, unique ID of LUN.

ESXi use same name given by SAN. It is used to differentiate a LUN.

SCSI storage device use various identifiers on ESXi host. Various <sup>naming</sup> conventions of naming are used. They are:

Virt kernel require a identifier generated by storage device

Identifier - (1) Canonical Name (NAA ID)

• NAA ID is LUN identifier

• Starts with NAA

• Network authentication authority

naa-xxxxxxxx  
↳ followed by series of n/a  
↳ LUN ID & ESXi use this for  
differentiation

(2)

## TIO IO:-

- Starts with TIO
- assigned by IETF
- same as IEEE, IANA.

Cannonical name of TIO

both these are persistent. They are permanent, unique. They won't change even after reboot

Suppose if Esxi kernel find such cd on storage device. Then it provides its own id to it  
That starts with mpx.

## • mpx :-

- non persistent (not permanent)  
Change after reboot
- used for local device
- VMware name space.
- name start with mpx
- Every device will have a serial. If from SAN it will have Canonical name or TIO. If not esxi will provide.

local hd may be a RAID (raid controller)  
RAID is logical volume. it will get a  
NAA ID (canonical name). It is an  
internal hd. but it consider as  
remote (can be considered as remote)

However: if no RAID config. it considered  
as Local HD.

Whatever they will have as  
LUN

#### \* RUN TIME Name space:

Along with this SAN will have  
a Runtime Name space. issued by esxi  
having convention  $vmhba:Nrc:T:L$   
 $LUN \rightarrow Nrcid. vmhba:N:c:T:L$

- every device will have 2 IO  
Naa + Runtime Name space
- TIO + Runtime Name space

- Not persistent

\* Why are need these device naming?  
- Created by Esxi host.

If there is no space in cont. you  
request storage address in 2 levels (expand a  
existing on new LUN) Eg (w-20, 6B  
When increasing there could be multiple

LUN. How to differentiate?

HBA using these let you can identify

∴ we need to know what these

are!!!

Fiber Channel:

HBA allow reclassification of exposed

LUN. Just use them.

iSCSI :-

- H/W or SW iSCSI initiator
- same config on host.
- creation of a LUN, provide access rights & other tasks of storage admin
- we have to access those local & format them.

Lab related  
to storage.

How to create LUN, Target, accounts  
are given & what config to be done  
& format with VMDK & use as VMFS  
data store

SW based iSCSI  
Openfiler  
- Stein One

(Or) configured from  
... vendor

hp, IBM, Cisco<sup>2</sup>  
etc.

If know one can manage all.

### LAB.

IP → R. can never server option folder or datacenter

#### \* Vcenter Server Inventory :-

↓  
list of objects which we manage.

tree

hierarchy of objects i.e components  
we manage (host, server, storage) object  
can be folder or object we manage.

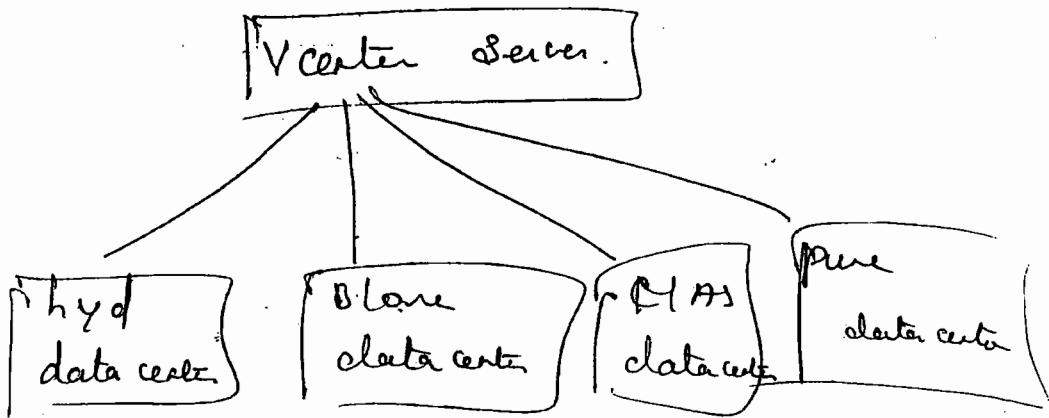
Folder allow to combine group of  
objects.

• simple ease of administration  
so we can

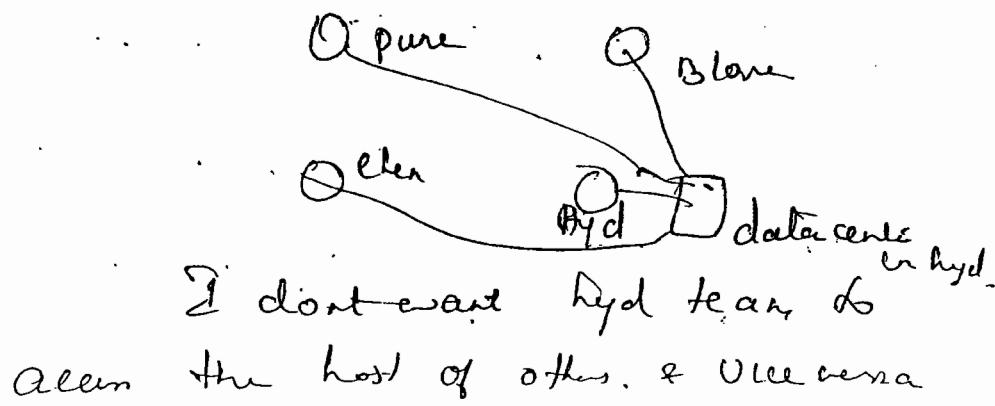
• assign permissions

in Vcenter datacenter - logical container such  
as OV or 2012.

it is to manage a group  
data center may represent an  
app, development, test products etc..



consider data center or hyd & 4 branches which occurs to exist in that res. occurs app & VM associated with hyd, Blane, pure, MATS operation & 4 teams for VM in each branch.



How to give permission without giving hierarchy of objects.

If connected all objects are exposed. Then how to give security  
 ∴ hierarchy of objects is necessary.

∴ each branch can access their operation & person can gives just like that. When connected he can view all components but can manage to only what assigned to him.

This may be represent physical data center but for vcenter it is logical container.

how many data center?

logical center for ease of admin

∴ inventory has to create inventory creation:

R.c new data center & give name (production)  
(prod host are added) prod@hyd

P. create healthy from -> audience

e.g. prod@pure.

Adding esxi host to server:

(prod@hyd) R.c data center → add host. loc. 1.0.20

next, zoom 123 → see warn (yes) → (host)

next → next → click enable (in real time) → next → next → finish

it will ask descenc. key (25 char)

it will work for 60 days.

Vcenter server <sup>Hypervisor</sup> licensing info. it is license.

ceptu two host it can occur.

(Just adding a host so it works  
credentials)

General: what happens when user logging on domain?

When logging into domain first

System logs into domain and then  
user logs into domain

i.e. for all everything is

Object system, user, etc...

- if workgroup no logon

- user name & pw is secret

between AD & system.

- password regenerated every 40 days.

When user access account  
through Npx account

- S2Chap password, regenerates every 36 days.

Through vpx account Vcenter access the host.

It is vpx account. Every host will have vpx account.

Whenever user uses some it access through

vpx a/c

### [SCSI SAN Creation]

Some 2012 → Add features → iSCSI target provider, NFS server → install.

Select NFS server. If you want that file act as a NFS storage.

iSCSI → To create LRSI → Click →

next → Select drive → next → Name (LUN) of iSCSI

(Virtual disk) (eg iscsi 1.) → next → Size (10GB) → next →  
new iSCSI Target → next → name (iscsi 1.) → next,

Access Server (here we add initiators. They are identified by IP address etc.. → Add → Enter value: Choose IP address value: 192.0.1.20 & 192.0.1.30 (i.e. only these server can access. Only access others not) → next → enable auth & assign to user (chap) → next → Create.

If chap matches access - else not.

Here in VSphere:

Can be done through host (or) vcenter

Server (it is not prerequisite).

#### \* Creation of storage adaptor:

Go to host → choose config tab → click Storage adaptors → click add → add iSCSI adaptor → ok → <sup>(msg)</sup> ok. (Adaptor will be added in storage adaptor).

#### \* Configure to acm so can access LUN.

Select adaptor → beneath properties → next → click dynamic discovery tab →  
Add → 10.121.123.125 port 3260 → ok.  
Let will add iSCSI san server in  
dynamic discovery. ∵ discovery will occur  
auto & LUN will be exposed based on  
acm rule) → close → <sup>scan</sup> Yes. (established  
a con & exposed).

#### \* Format the LUN with VMFS

Made it data store

Go to storage → add storage → Next.

Select the LUN → next → (VMFS 3 → next → <sup>partition</sup> partition  
next → name (VMFS-shared1-test) → next →  
choose block) <sup>VMFS 5</sup> → next → partition <sup>56A</sup> → next →  
name → custom <sup>56A</sup> → next → first.

## Types of VMFs formating options

- VMFs 3 (all 4.1) (old sys)
- VMFs 5 (newsys)

### \* VMFs - 3 :-

- Every file system will have block size
  - VMFs also have block size.

General  
blocksize  
info.

Footer, 1/16 60KB  
NTFS; Ext 4 KB

1.block = 512 bytes  
320 KB  
2. 1 KB  
2048 1024 KB  
1024 512 KB

### \* VMFs

Min block size 1 MB.

- It gets partition of 256 GB. Juju!

If you select 2 MB

It get 512 MB

10 MB

4 MB - 1 TB

8 MB - 2 TB

Max is 64 TB

DELL ENTERPRISE  
DATA CENTER  
SOLUTIONS  
HYDERABAD

### \* Then comes VMF 5 :-

Here we don't have choices

Select default is 1 MB by default

2 TB upto 64 TB

### Two differences

Multiple block option but one option

2 TB 2 TB 2 TB etc. Multiple extent to reach 64 TB

in 5 → - single extent 64 TB

Two difference.

VMS 3	VMFS 5
- Multiple block size to reach. 1, 2, 4, 8	Single block size only 1
- Multiple extent to reach 64 TB as 2TB, 2TB, 2TB.	Single extent of 64TB space

That's why this storage are useable after  
class

1. Local is shared

2. Local is formatted with VMS.

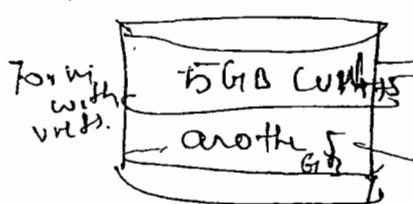
VMFS is shared by default.

\* How to increase Volume of data store:-

Space will be provided by

Storage admin

2 Method he can provide.

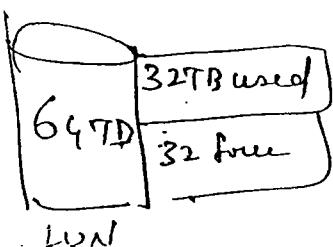
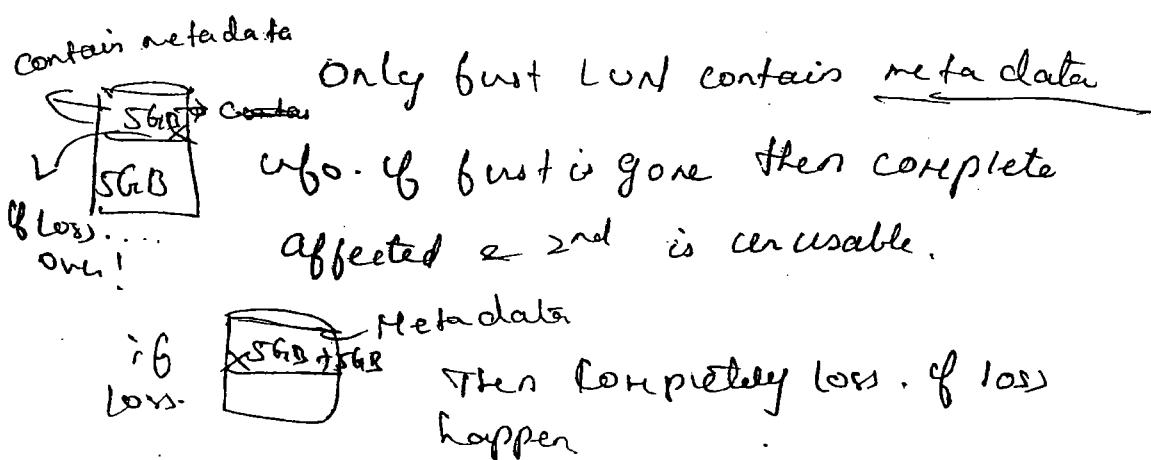


1. He may expand 5 GB CDFS to 10 GB

2. He may create new level of 5 GB & give

- ⇒ If we increase then same methodology.
- \* Increasing size of volume:
  - Select the data store → properties →
  - Increase → (LUN appears) (existing or new LUN)  
 Identify with regard if it same same as  
 Existing new name then new LUN) → Select
  - next → Namespace → finish

Even if there is multiple LUN  
 It shows as one storage.



If less 7B  
 only 64 allocated  
 and clean for  
 same datastore.

free 32 can be used  
 for same datastore  
 but cannot be used for  
 new datastore.

One LUN - one datastore

1. add your vcenter
2. use this (10.123.124.125).  
to create WN.  
to 10 GB each.

28/1/15.

## Managing VM.

### \* Clones & Templates :-

Cl

Capturing the present state information of VM and storing in form of files.

It captures setting state

2. Memory state (optional)
3. Disk state

Files of snapshot.

- (1) - .vmsd (snapshot descriptor file)
- (2) - .vmsn (memory state)
- (3) - delta.vmdk (data file)  
(keep track of snapshot)

These files are created when you perform snapshot.

These files are used to perform patch operations

Application sequence Patching. After patch the app may crash. When upgrading from low to high version it may perform weird.

- \* How to restore OS?
- \* Is there any guarantee of restore?

Before to apply change perform snapshot.

It stores the data. Then patch it. even if it got crash no issue. You can revert at back with help of Snapshot. in few min the

General

System restore is available on windows

You can restore. but you have to logon

Machine will be back.

Don't keep on the snapshot for longer time. Then there will be degrade in

Performance.

- ④ \* Snapshot work as a temporary or emergency backup solution

because these file store on VM or a folder.

If VM deleted Snapshot will go off.

If VM deleted no revert possible.

\* How it works?

- .vmdk

- .vmdk is the Virtual disk.

- delta.vmdk

~~delta~~

- delta.vmdk is created. It is also Vdisk.

before snapshot only .vmdk of snapshot

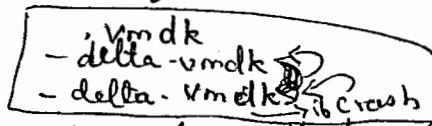
Performed you will have - delta.vmdk created.

It freeze data writing on it <sup>(.vmdk)</sup> - ct

Store is - delta.vmdk.

Q- 26 You go to previous state you will go to .vmdk.

Multiple .vmdk can be created so it will go to best previous state.



But the present will be lost when it crashes. So you can take & store it present.

\* What happens if you delete snapshot?

If deleted then the changes will be gone. and data and settings will also deleted.

So what to do ???

## consolidation:-

The data in -delta.vmdk are consolidated and can store in .vmdk disk.

\* consolidation - bringing all data together, merging, combining if you delete the data it will be consolidated automatically. It will get stored in .vmdk.

## \* Clone & Templates:

### -Clone:-

It is a copy of something. here it is copy of a VM (exact copy, its a VM). You can create clone.

exact copy - config, OS, data, app are same.

host name, IP, SID will also be same in a clone. <sup>or security ID.</sup>

You can use these clones but power on Machine and change host name, SID & IP. Tell you change these will be conflict.

(OS)

## Guest customization:-

- We can customize guest os

identities

- You can give new identity to VM

- You can change all as defined

above.

## \* Clone : how it helps?

Instead of installing OS  
on a Machine

Sometimes, you can use clones  
as backup - but it is not permanent  
Solution "clone is a VM."

- clone is a single operation.

- Templates :- .vmx file associated

- Master image copy of a VM

- It is an image

- It is not a VM.

- You can create multiple identical  
images.

- It is used to create identical  
VM.

- Template can be used on multiple  
operations

deploy identical

VM

- image will be same as that.
- same host name, IP, ports. It cannot be reused.

How? Customize the same with guest customization.

Where are we now?

OS: We create template for various OS.

Consider new project. You need 10 Machines with Linux RHEL 7 with updated patching.

If you have Template just do it;  
just like that....!!!

ideal

Apps:

⇒ You can create template for application

eg: Oracle, SAP, etc...

clones, templates & snapshots are highly used in testing & production departments

### LAB:

clone, template, snapshot.

for snapshot You can do in ESXi and VCenter is not necessary.

Cloning & template possible only through Vcenter server.

#### Snapshot:

##### 1. How to take snapshot:-

R. c the vm → go to snapshot → snapshot

→ name (patch-10256) → description (date & time)

→ Ok

here the files are created

.vmsd & .vmsn are created

##### 2. How to open the stored snapshot:-

Browse to data store → go to VM folder →

Open → check the file .vmsn -delta.vmdk.

##### 3. How to restore if vm crashed? how to do:-

R. c vms → go to snapshot → revert to

current snapshot

snapshotmgr → select the snap and

click → msg will popup (check) → yes.

snapshotmgr → and delete (when

deleting it will consolidate & store

## Clone:

1. R.c VM → Clone

2. Name (clone DC-x.com) → choose datacenter to store. → check customize using customizations wizard → select → next.

3. Ask questions answer it (name, host name or use virtual machine name → parallel → one zone → custom setting or typical setting → domain name → credentials → generate new iso → check the options don't scare → finish..

① VM tools have to be installed.

② It supports Vista and later  
in Server 2008 and later

In ~~Windows~~ windows:-

Sysprep tool :-

It is used to give new

identity to VM. It is not on XP or Server 2003.  
Windows gives from Vista & later & 2008 and later

In Linux

Perl package has to be installed

and

#

## Templates:-

Re VM  $\rightarrow$  template  $\rightarrow$  Convert to template

~~is not highlighted if power on.~~

Convert to template

It will convert into an template (mag.)

here .vmx will be converted into  
.vmtx here after no VM only template

## Clone to template:

VM will be there but a

clone will be created

- \* how they are created:
  - + first snapshot then clone is created
  - + first snapshot after template is created

when you create snapshot you have to  
delete manually but on above operations  
it will be deleted auto.

Choose clone to template  $\rightarrow$  select host  $\rightarrow$   
data store to store - create

\* How it happens:-

Here first snapshot  $\rightarrow$  clone will  
be created & ~~then~~  $\rightarrow$  clone will be created  
as template.

After creation of template  
clone will be recovered & snapshot.

### Terms:

Snapshot - image

Clone - VM.

Template - Master copy

Cloud home

Create VM & template → can view  
full template

cont... after <sup>Vapp</sup> theory

Template

### \* V App:-

- container for one or more VM.

- why to group? -

because it may interdependent to do something.

### Java site:

Java depends on 3 servers

Java code

- webserver (http, https)

- db server (calculations and db.)

- Java Server (J2ee server)

To our app.

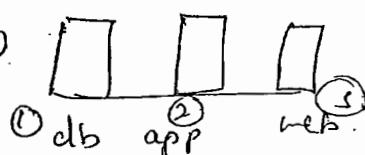
In order to run  
their site 3 Machine  
has to work. If not no connection

Power on technique. or flow.

1. db.

2. application (java)

3. webserver



If you have 20 x 3 machine

∴ 60 machine.

No power on you can use -

"V App"

You can tell flow & it will do it.

multiple Vapp is also possible. Resource  
can also be allocated.

- It is an object
- allocate CPU, Memory.
- configure startup & shutdown order.
- Vapp also be deployed using OVA/OVF

VMware → OVF - Open Virtualization Format

Xen source → OVA - Open Virtualization Archive.

- OVF has an XML file sumdk of VM.
- OVA is from Xen source or as archive file which has files that belong to OVA directory

CAB:

R.C on VM  $\xrightarrow{\text{host}}$  vapp  $\rightarrow$  name  $\rightarrow$  next  $\rightarrow$  finish

- container will be created
- add VM to ct (webserver, appserver etc)

(drag & drop)

- R.C on  $\xrightarrow{\text{vapp}}$   $\rightarrow$  how to setting  $\rightarrow$

Start order choose it.  $\rightarrow$  OK.

(Now this has OS and can manage it.)

R.C on ct  $\rightarrow$  power on.

It will run in order.

1. whether it is similar to OV?
2. difference between Vapp

# In template :-

R.c on template  $\rightarrow$  clone . . .

after clone R.c template  $\rightarrow$   
connected to a VM.

thereafter It will be made as VM.  
continue the process.

## Migration of VM

5 types

- cold
- suspended
- Vmotion
- Storage Vmotion
- Enhanced Vmotion

#### \* Cold :-

Cold : VM is not running & you are  
Migrating (Power off state)

1. Migrate from one host to another
2. migrate from one data store to another
3. migrate from one host to another and  
one data store to another simultaneously

#### \* Suspended :-

- VM can be suspended . It can be paused. (freezed in same location or position)
- identical to hibernate option
- file gets created here
  - VMS<sup>S</sup>

↳ Virtual machine suspended state file.

When you migrate suspended VM  
it is suspended migration.

You will get all 3 options.

\* Vmotion:-

- VM is in power on state (running)
- Migrating running VM to another.
- live migration, hot migration
- it occurs seamlessly (no data loss, downtime and service is/w running).

\* Storage Vmotion:-

- VM is scanning. it is performed.
- migrating VM from one datastore to another.
- The files that make up VM are sent (the data of VM). This is done when VM is scanning.
- host host is migrated

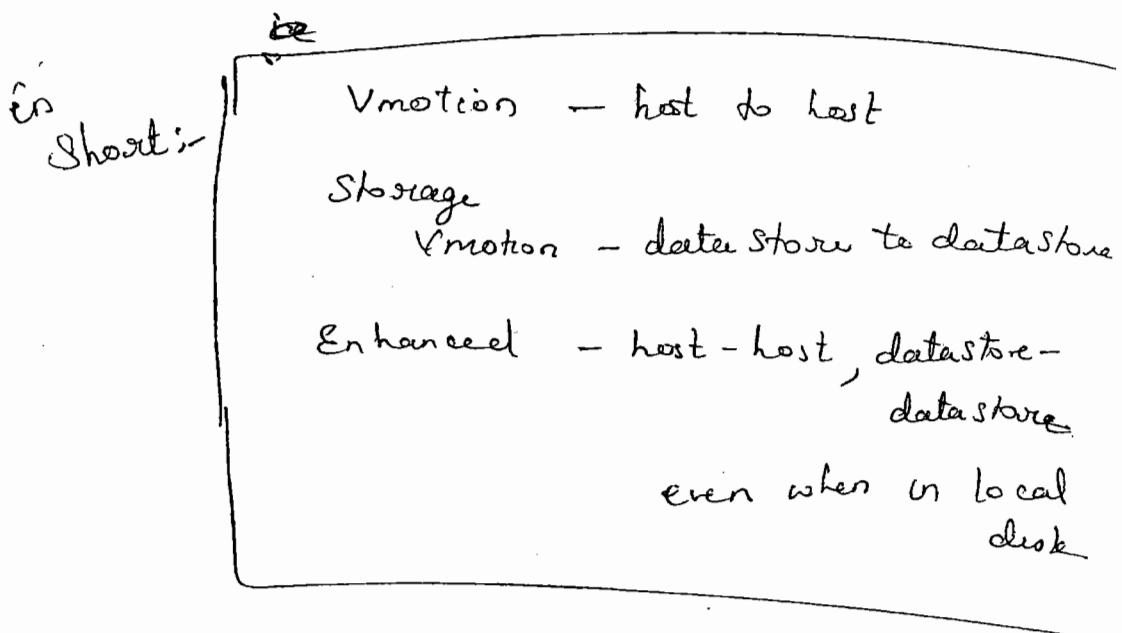
\* Vmotion:-

Pre requisite :-

- VM should be on shared storage
- If VM is local disk Vmotion is not possible.
- ~~also small\co~~
- we need SAN.

### \* Enhanced Vmotion:-

- without requirement of shared storage  
i.e. we migrate running VM <sup>from</sup> one host to another (without shared storage) and data will also be migrated simultaneously.
- combination of Vmotion & Storage Vmotion.



- \* Max of 8 simultaneous Vmotion, cloning, deployment, 8Vmotion, access to VMFS-5 data store.

only vMotion & Datastore.

\* 128 concurrent Vmotion / VMFS datastore.

page

vms host

\* 4 concurrent Vmotion / host on 1Gbps n/w

\* 8 concurrent Vmotion / host on 10Gbps n/w.

\* 5 prerequisite of Vmotion :-

(F) Pre requisites of Vmotion :-

1. Cpu compatibility between host is required.

- ② - Identical Cpu should be there  
(doesn't mean model no., CPU instruction sets should be identical  
ie intel - intel (✓)  
AMD - AMD (✗) intel - AMD (✗)

Cpu instruction sets :

2. SSE3, SSSE3 or SSE4.1 Cpu instruction set

Consider I have host processing in  
SSE4.1 when migrating if other host  
doesn't have SSE4.1 → it won't work

3.  $\text{AVX}/\text{XOP}$  Cpu technology.

↳ AMD  
↳ Intel

This provide security to  
apps running on it

Guest or host use this technology.

∴ Vmotion <sup>May</sup> doesn't move stealth if so disable  
this feature of the Migrate.

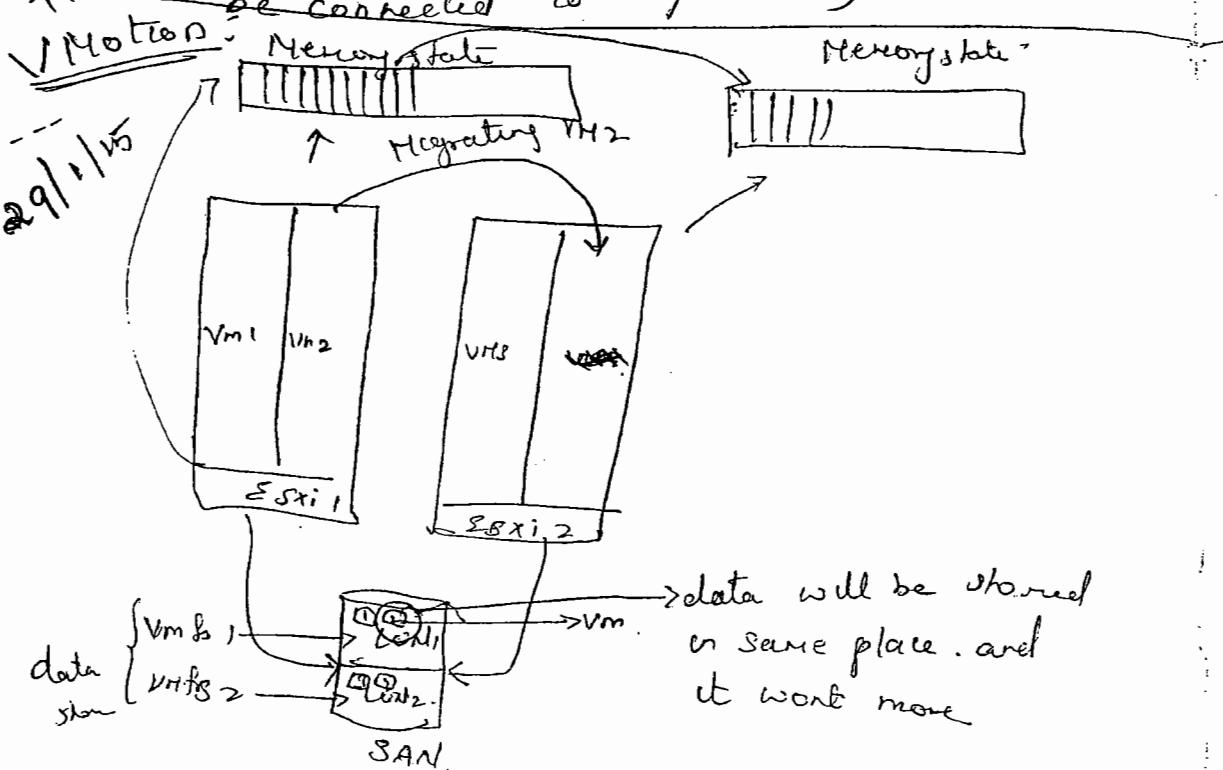
→ requests

- VM should be on shared storage

③ VM kernel port ~~for migration~~ <sup>has to be</sup> configured for migration on host.

④ VM network port group labelling & settings should be identical on hosts.

⑤ VM should not be accessing any of the local devices on host. (should not be connected to any devices)



physical machine  $\rightarrow$  os in it  
when you run it load os files to RAM.

Now the VM is in VMFS1 SAN and it  
is loaded <sup>in</sup> to ESXi and with the resource  
allocated to it.

.. what is getting migrated ??

The process are getting migrated.  
The process are stored on VM of ESXi  
The process is VM  
VM state is getting migrated. It has

2 information

+ Memory state

- entire memory state is migrated.

+ HW information of VM.

(or)

Settings info

(or)

Configuration info

This is VM state. It gets Migrated  
when Vmotion happens.

There will be continuous change,  
in memory state when it is running.  
we have to keep track of changes.

To keep tracking changes we use  
"BIT MAP FILE". this keep track changes.

Then.... 98-99% of Migration gets over  
and the 1% is "but not complete".

I could get certain time to change  
memory state. If no the process will not  
get completed.

\* How to get the time?

Operation occurs. Here comes "Queuing of Input/Output  
↳ ("Pausing input & output operation")

During that Migration VM is on.

ESXi 1 & now it will be in ESXi 2.

∴ The register VM is ESXi 1 get  
unregistered & registered in ESXi 2

Note:

continuous ping:- There will be a ping loss when

Queuing of Input/Output operation occurs  
(check in cmd.)

The packets are moving from  
ESXi 1 after migration it should be.  
routed to ESXi 2 for continuous access  
of resource

Here "RARP" comes into picture

## RARP - Reverse Access Resolution Protocol.

first it was in ESXi now in ESXi 2. It get connected through Virtual switch. Here we had not migrated the Virtual switch.

I can't migrate a switch or a port group.

∴ Similar kind of port group labeling & setting should be there.

(Visit pre requisite 4<sup>th</sup> point)

Hint :-

Memory state

Host information

Registration in ESXi 2.

Bit map

Queue

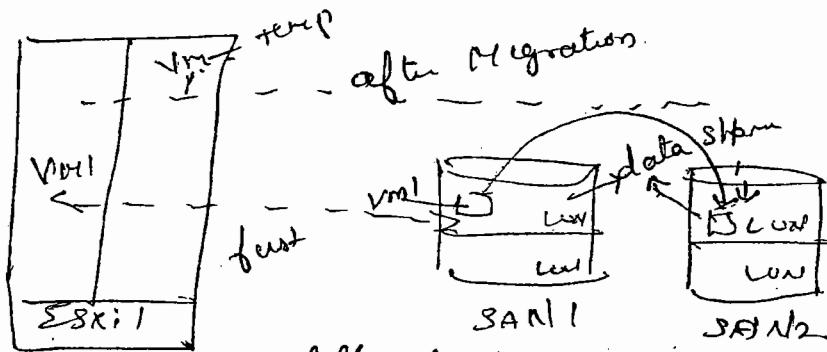
RARP works.

Finally changed to ESXi & reconfig

Vmotion migrate the VM entire state from one host to another.

## \* Storage Migration :-

- Similar kind of technology as VMotion.
- VM is on same host . but data is transferred from one datastore to another



Data store can be of different storage type.  
When transfer of VM from one datastore to another

one of these two components may use

- VM kernel data Mover.

or

- VAAI



VSphere Storage API Array Integrator

### \* VAAI :

\* It can be used only of SAN

Support . if this is not supported , then  
kernel data mover is used

?

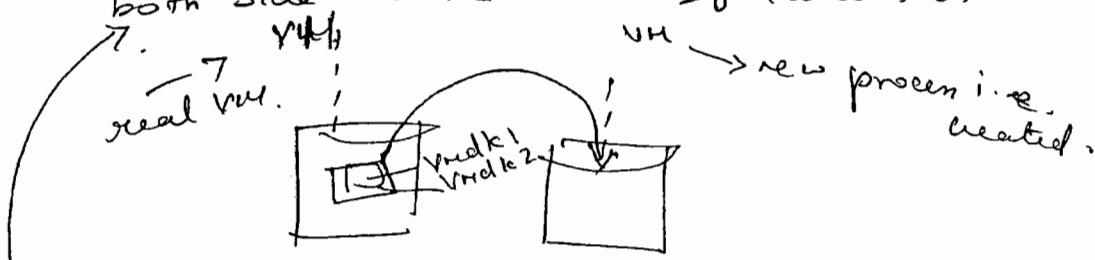
\* Files are getting Migrated from  
one datastore to another when VM is  
running . it store & access file  
simultaneously .

Here no concept of "pause" concurrent  
Migration is happening along with changes  
made in data.

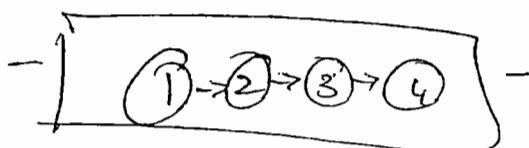
(hidden process)

- ① A new VM process is created and it saves the data that is created present and stored in second data store. However other files are getting migrated simultaneously. ② > ①  
③ After creation in second place the data in first data store will be deleted.

- ② It will check for the data in both side to be same. If same then



- ④ Mirror driver is used  
(∴ data is stored in both places)

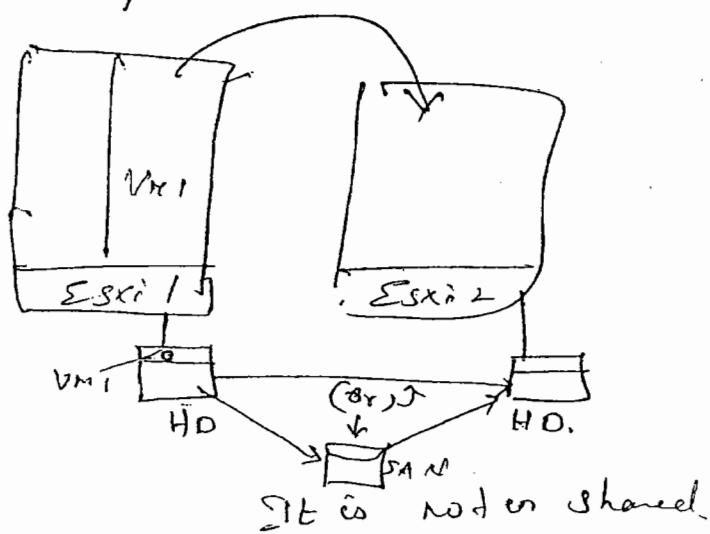


- Storage Migration performs upto 4 parallel disk migration / storage migration operations simultaneously each will be moved but are moved ~~one~~ <sup>10</sup> parallelly.

- Parallel disk Migration apply only between two diff. data store.
  - 2 concurrent VMotion can done in a host.
  - 8 " " " " " " " datastore
- RDM → Raw disk Management
- RDM - VMs must be in persistent mode
- Migrate Virtual RDM's mapping file or convert thick / thin if destination is not NFS Data store
  - physical RDM's Migrate only the mapping file.

#### \* Enhanced VMotion:

Migrating VM host & datastore  
Simultaneously without a Shared storage



VM & Storage has to migrate to another machine.  
(state or data)

- Enhanced VMotion is possible on webclient only, not in Vsphere client.
- "Host must be on same data center & same Network" — (Same for Migration)
- "only 2 concurrent enhanced VMotion per host."

hint: except shared storage are remaining are same in Enhanced VMotion

... it is possible only in ~~webclient~~ webclients.

## LABS

### \* cold Migration:

VM is off state.

#### host:

R C VM → migrate → change host → next.

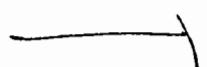
Choose location. → next → finish.  
C:\20. → D:\30.

data store Change data store → next → choose (or cancel)

⇒ (data store 1 to 2) → next → finish

Migrated folder will not be there in source, but it will be in destination

\* check the folder in destination



\* host & data store :-

R.com  $\rightarrow$  migrate  $\rightarrow$   $(0.30 \rightarrow)$   
 $\nwarrow$  host and database  $\rightarrow$   $20 \rightarrow 10.20 \rightarrow$  VM to Shared 2-1  $\rightarrow$

next  $\rightarrow$  finish

\* Suspend:

Suspend VM (pause) & migrate it as  
same.

\* Motion:

- VM screening
- Replications from one host to another.

R.com VM  $\rightarrow$  migrate  $\rightarrow$  choose host  $\rightarrow$   
next  $\rightarrow$  choose location ( $1.20 \rightarrow 10.30$ ) ~~if the migration~~

will be error.)

because the pre requisite are  
not met. Read the error and  
make changes.

Resolve the issue.

Make sure: VM is on Shared  
storage.

~~if successful~~

after solving errors choose  
location ( $1.20 \rightarrow 10.30$ )  $\rightarrow$  reset  $\rightarrow$  finish.

\* Storage Motion:-

1.) R.c on VM → migrate

2.) Change data store → VMFS share 1-2 →

-1 → next → finish

R.c screen → edit settings & make changes

Changes.

**MANOJ ENTERPRISES**  
Plot 40, Gasathri Nagar  
Ameerpet, Hyderabad

### \* Enhanced Vmotion:

<https://10.0.1.201:9443>

### \* Clustering:

- why do we use clustering?

For reliability, fault tolerance etc...

- if you need clustering?

Prerequisites:

#### ① Clustering Service

OS provides (or) application

e.g.: MS clustering service

e.g.: Veritas cluster

#### ② Shared storage

No shared storage no clustering

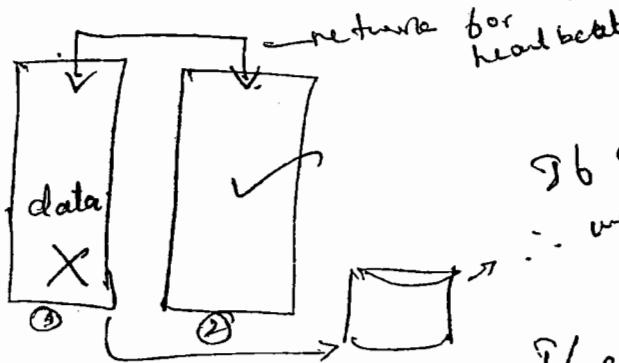
### \* Basic idea Behind clustering:-

Cluster - group.

Clustering: Group of host or server working together as one to provide high availability

## Mechanism behind it:

- 2 servers are required



→ b data loss → gone  
 ∵ we depend shared storage

## If clustering:-

Receiving some appr  
 If no cluster; data.  
 If server goes down  
 then gone.

When one server  
 goes down other server  
 will provide service

clustering depend on this component:-

[122 in previous page]

### ③ Network Heart Beat.

↳ This is to mention that  
 component is working

i.e. When a server down.

after indication it take the role and  
 provide the service

each server monitor the other  
 whether they are alive. If down take up  
 of role.

## \* Cluster in VSphere:

When 1 server goes down VM  
 and other will be gone

that's why we need clustering.

This gives VM and other service even when server fail. and another will give service

clustering is group of ESXi host & its VM's with VMware HA & DRS enabled.  
VMware HA AND DRS.

VMware HA - <sup>High availability</sup> (it is for VM),  
DRS enable - VMware DRS cluster

DRS enable - VMware DRS cluster

If both enable then

VMware HA:

Max of 32 host per cluster.

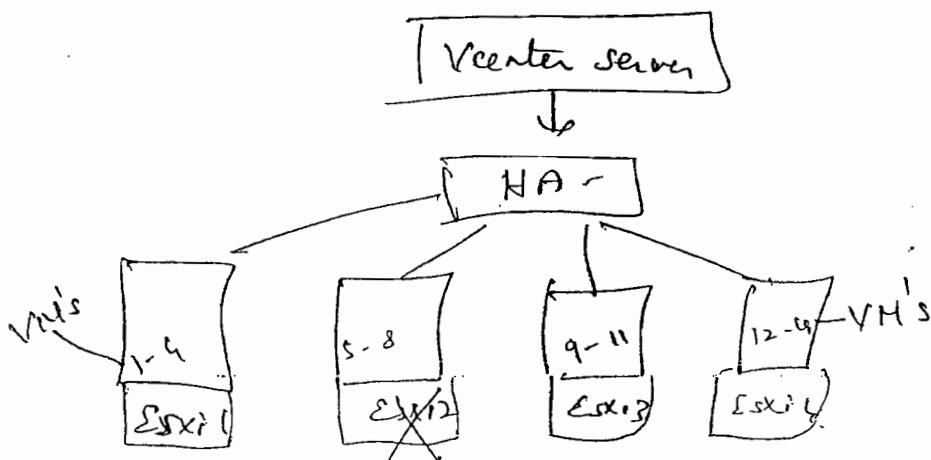
3000 VM per cluster

512 VM per host

\* Provide high availability  
- ESXi host failure  
- VM/Guest OS fail  
- app failure

\* Configured & managed, monitored on

Vcenter Server.



\* Host crashed due to some technical issues. ESXi went down then all VM gone.

when host append they append memory  
- host runs when you rectify the

problem

e.g.: replacing mother board.  
it takes couple of hrs, week to

Are you to wait.....???

If so huge down time

we dont need. Thankfully  
these are part of ~~the~~ HA Cluster.

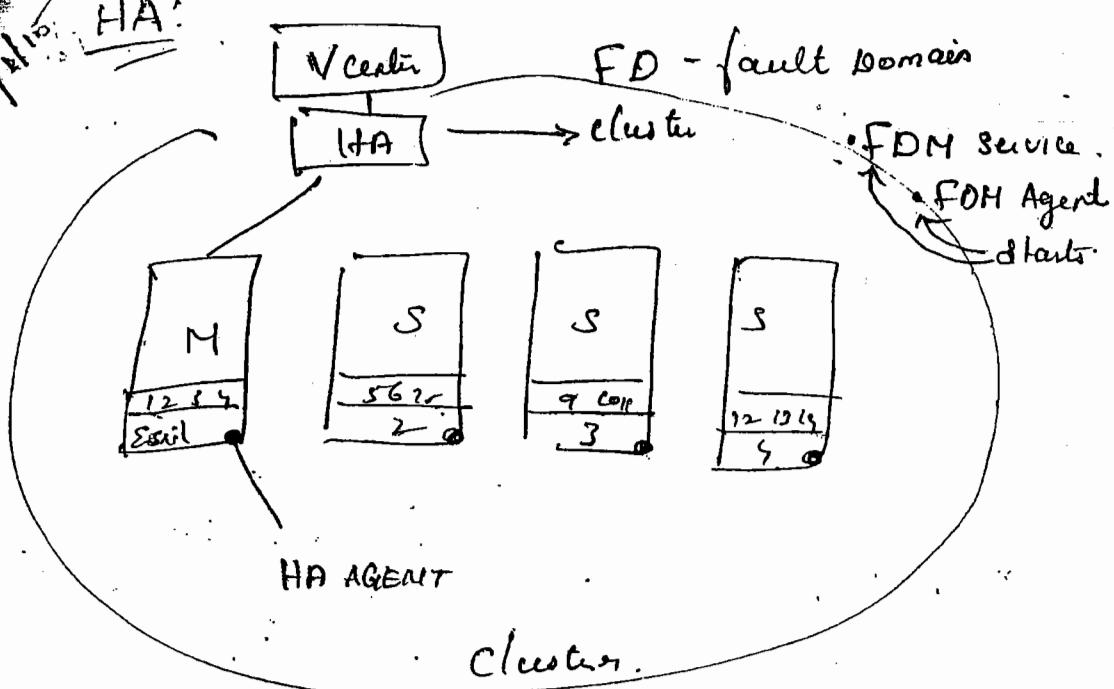
"when host goes down HA  
cluster will restart failed VM in  
some other host within 3 minutes"  
(Machine)

i.e. HA:

It provide availability against  
host failures.

In simple -

because these machine are  
grouped to give high availability  
 $\therefore$  it is possible.



FDM - Fault Domain manager.

4 host are there. Every host in cluster will have master & slave relations. One will be master, remaining will be slave. Election process occur to select Master.

Election process depend on the following

① host which access max no. of data store.  
eg: 1 access 5  
and other 2 so 1 is master.

If tie happens....

② host which has highest no. of MOID  
or Max

↳ Manage Object W

~~How No ID issued?~~

No ID issued by VCenter. <sup>Service</sup> to Host  
No ID & BB is

Master: The first host which selected well get highest ID and he is Master

\* What Master do?

- Managing entire cluster.
- Master host send heart beat to slave & slave respond to it

∴ Master directly monitors slaves

\* If slave gone? Endirectly monitor Master that component value

If a slave not respond, its gone.

then host fail thereafter Cluster will restart those VMs or another host in

3 min

\* If master gone?? -

Don't worry...! Out of remaining host an election will be made. and one will become Master then failed VMs will be started or another host in

3 min.

Microsoft Cluster Service

2 NIC

1 dedicated for VM  
1 for Heart beat

In vsphere it is not based on Nic.

A component is responsible for exchange of heart beats.

i.e "VM kernel pools" HA!....

"Management Network like VM kernel part" is responsible for exchange of heart beats

Scenarios:

There is scenario that I may lose mgmt network:-

If lose what happen?

If no heart beat - Machine is gone.

but VM running

26 vsphere HA considers heart beat is Then it unnecessarily restart running VM on other machine

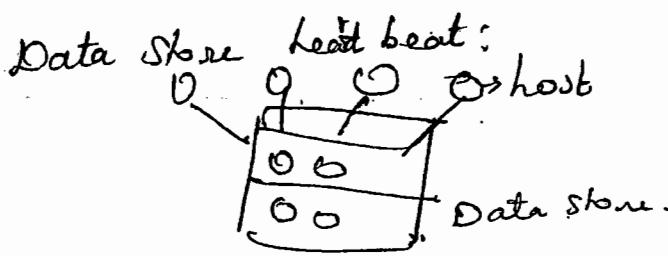
∴ it is not depend on heart beat.

2 things are there in consideration

(P) Network heart beat

(2) Datacenter heart beat

∴ both these are gone, then host is considered as failed host. then Start in some host.



If host is down then

only new host is gone but Data center heartbeat there. it is not considered as failure but considered as

"ISOLATED HOST"

If host gets isolated then what about m?

When you config cluster there is an option for it.

We do something if host isolated.  
we don't want HA to do something  
we admin do. There is a config.

(Leave as it is and we will  
make decision)

③ It also ping to gateway.

It is to check the network

is up or not.

Default gateway is known as  
"ISOLATION ADDRESS"

$\Rightarrow$  There may be scenarios may lose that gateway (Router failure)

"Then also it consider host as isolated"

\* "Can we avoid this isolated host?"

2 conditions of system gets isolated

2 }  
  | Heart beat  
  | or (And)  
  | Default gateway loose

1. Redundancy over Multiple kernel port is the soln. If one lost other will take care
2. creation of two gateway

Cluster config info are maintained by Vcenter Server.

.Vpxd

It maintains nothing but Vcenter server.

What it do?  $\Rightarrow$  It update config info to master host & Master update to slaves.

Scenario:

In short: 20 VM but 6 are running on host fail, 6 will be restarted in another host in 3 min  
The remaining Machine are protected by HA.

How HA knows VM occurring:-  
every host maintains a protected  
list of running VM and it is stored in  
data store. This is protected list.  
By this list HA restarts it in  
another host....

#### \* Vsphere HA Architecture:-

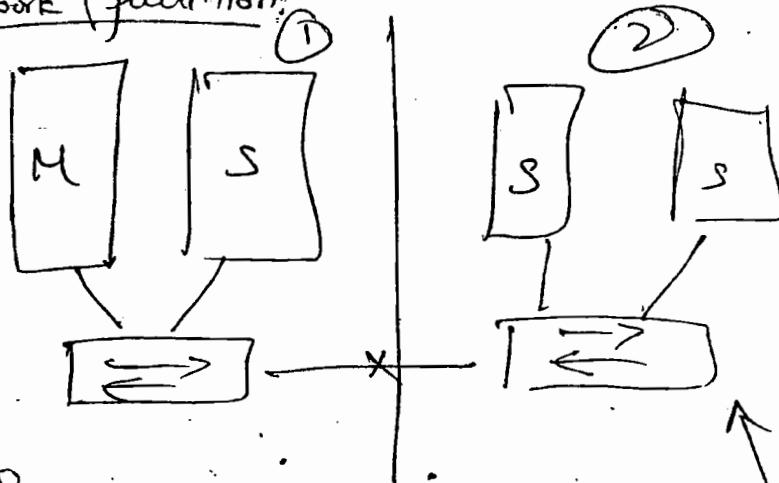
- FD is managed by Master host
- Cluster config info maintained by  
repctl proc & it updated to master agent

#### \* HA failure Scenarios :-

- Slave host failure
  - Master host failure
  - Isolated host
- Avoid isolated host scenarios by  
having redundant host heartbeat n/w / isolator  
adapters
- Network partitions

Sh:

## Network Partition



Scenarios:

Loss of link may occur.

If loose partition occurs

$\Rightarrow$  Partition cause the network to separate into 2

Temporarily as election will be made for Master & Slave.  
Because there could be no multiple slaves on a network.

## Configuring Vsphere HA:

- Enable host monitoring (<sup>HA Monitoring</sup> i.e., respond to host failure)
- <sup>Should enable this policy</sup> Allocation control refers to the amount of available resources that can be used to start VM on a ESXi host  
i.e. certain amount of resource are reserved in host. Then this resource is used to restart the VM if some host fails.  
We have to calculate & there is policy

base on that resource is ready

### → VM Monitoring

- \* VM/Guest failure: → HA provide high availability against

whether VM/Guest fails. it will restart the failed Virtual Machine.

It is done by enabling

### "VM Monitoring"

Eg: consider VM11 failed - HA will restart

How HA restarts??

by VM monitoring

- \* VM ~~mon~~ monitoring works? (Refer VM ware tools)

VM tools.

If HA agent doesn't receive heart beat from VM heart beat source in certain time it will restart as it is considered as failure.

∴ it is not used in production & it is disabled.

- \* Application failure (optional):-

HA provide high availability against application failure

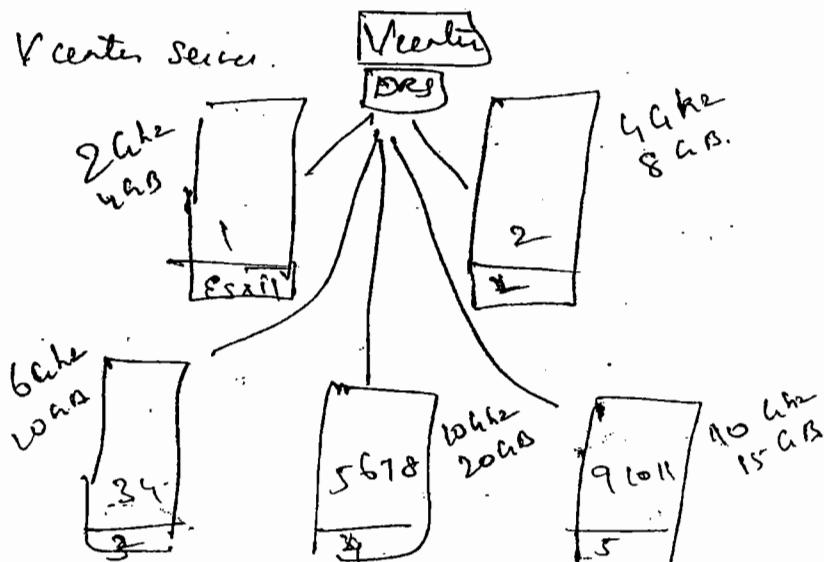
doubt

HA will restart the application  
The Application has to support Vsphere  
HA. others won't support these feature.  
Get the app & enable monitoring so  
it will do this.  
But this is "Optional"

### Second component -

Vsphere DRs:-

- DRs - Decentralized Resource Scheduler.
- DRs else is a cluster managed by Vcenter server.



It is not high availability cluster.  
So does not provide high service.

It is  
resource management cluster. It manages  
resource.

① Initial placement:  
It has resource right ~~available~~  
~~lets checkout~~...  
first scenario:

Consider:  
Virtual infrastructure has  
~~Consider~~ 20 esxi host. Each host  
has their resource.

There are certain VM running on it.  
VM running share resource. and  
Resource utilization is dynamic.

New project: Do you have to create.  
host 16 has enough resource &  
Started creating VM / config over. and  
VM created =

When about to power on the  
host resource increased to 90%.

(only 16) & you can't create. —  
Forget it..

DRS: - Initial placement:

① place all these 20 VM in DRS  
cluster. ② Host has 10Gib RAM & 4Gib processor  
available. Select host 1 & create 20 VM.

Once power on VM. DRS has resource management with an algorithm.

It uses that algorithm and check for resource available in Infrastructure & host..

VM is powered on on sys H., & in some machine

In few time all will be turned on.... Ha Ha...! :-)

"This is initial placement of VM in 20 hosts!"

#### Remember:

Once when VM is powered on it consume resource. else no consumption of resource.

#### Real time eg: Script:

Multiple shelves & some thing placed in shelves. based on size & space allocate you arrange stuff. The same DRS is doing

#### ② load balancing:

Resource utilization is "Dynamic".

It even do "load balancing".:-)

When you add machine into cluster.

Formula: it will become cluster resource.

Cluster resource = Sum of Machine resource

What DRS does?

It migrate VM from one host to another  
it does "VMotion" that too automatically

Depending on utilization of resource in host, the VM are migrated. The machine that has more availability will be given more VM/Guest

If space not available then they again do migration.....

### ③ Power Management :-

DPM - Distributed power management

DRS can save electricity ... !!

At 01.00 am

A machine running with less resources required

what DRS do ???

it will migrate the VM & shut down the host.

more 7 am

user are getting connected

apps are loaded.

Resource utilization

& Machine to be powered on.

see

Auto system power on option:-

By HP. ILO - integrated lights out

IBM

Tools

These should be available.

∴ in production environment it is  
not used.

So there are 3 things which is performed

by DRS

Affinity

HP brought first

ILO: special kind of card on your server, possibly

it is "remote agent card"

It is available in <sup>gray</sup> market.

\* DRS settings:-

2 types of DRS settings

- DRS affinity rules for VM

→ Affinity rules

→ anti affinity rules

⇒ Affinity Rules  
DRs should try to keep certain VMs  
together on same host

why need?

These settings are made into  
consideration before  
• initial placement  
• load balancing  
Then act accordingly.

⇒ Anti-affinity Rules.

DRs should try to keep certain VMs  
on different host. i.e. try to make sure  
certain VM's are not together.

e.g.: ADC & ADC

If host goes down entirely  
over. So we need Anti-affinity rule.

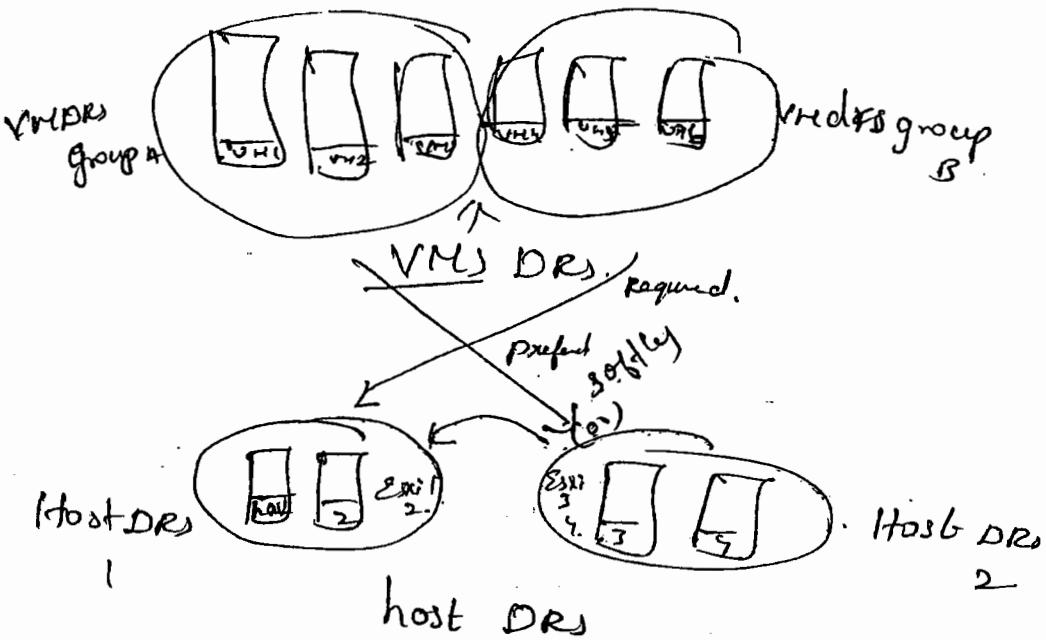
So place them apart.

So ~~if~~ once ADC is available!!!

\* Virtual Machine to host Affinity rules;

VMs → host  
group of VMs & host

VM DRs & host DRs are created



VM/host can belong to multiple DRs

Groups.

VM to host affinity rule specify whether a VM DRs group can run on specific host DRs group

Rules:

- preferred rule
- required rule.

preferred rule:

— VM of group A preferably should run on host DRs 2. ☺

— It is implemented softly. can be violated.

— i.e. if <sup>host DRs 2</sup> cannot allocate. it can choose group 1 (host DRs 1)

e.g.: counselling job placement on a branch.

## 2. Request cycle:

- Implemented strictly.
- cannot be violated.
- VM on DRS groups should run on host DRS group. even if it is unable to run. They won't move. They always stay group & wait to run on.

e.g: If a process need a resource and if it is in this group allocate them.

- ex - telephone cards, Auto dealing cards are his dependent for that Request cycle can be configured.

## \* Vsphere FT :- (only in VM)

### ⇒ Fault tolerance:

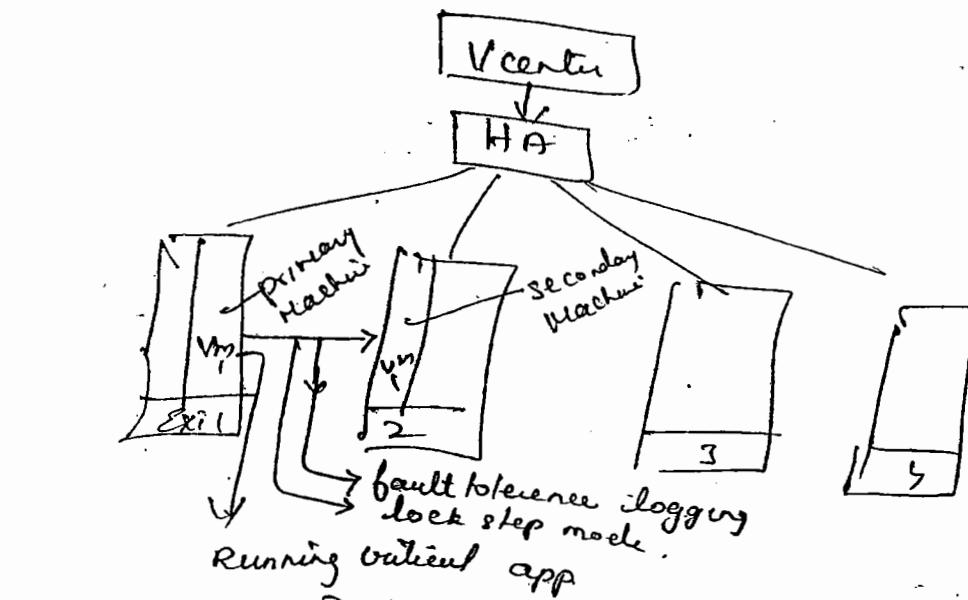
No zerodowntime is HA  
it need 3 ms down  
if need something without 0  
down time.

Here comes!

### Vsphere FT.

This gives 0 downtime, so critical apps can be used normally here.

It can be enabled only if we have Vsphere HA. ∵ it depends on Vsphere HA. Vsphere FT is enabled on VM. But HA is part of host.



I don't wanna lose even if host goes down.  
First vms  
Primary  
↓ Secondary  
But if host goes down we gone  
secondary. But FT says VM still well. & be

running even host fails. Even VM still gets fail also VM running.

How

Architecture: - shadow copy

An exactly replicated VM is created  
on ESXi 2. Both should run in simultaneously

Only primary is exposed but  
both are running "this is how no  
rep conflicts, name conflicts and other issues".

End user is primary & ~~some~~  
operation is made.

"fault tolerance logging" traffic  
is made between ESXi 1 & ESXi 2

This two <sup>VM</sup> machine will be in lock  
step mode.

If first VM goes down <sup>primary</sup>  
second machine will become primary

Here by secondary VM will be  
created on 3rd host.

The host which had primary  
process is now down. even after host  
is appended running. But primary is  
not available. Because it is  
process. it is killed.

If 2ndary goes down  
another is another  
host

Provide zero downtime and zero data loss for applications in event of unplanned downtime.

\* Pre requisite for FT:-

1. CPU compatibility for FT on all the hosts.  
(it should support VMotion FT)

2. Host should be part of HA cluster.

3. A VM kernel port configured for fault tolerance.

4. It is a limitation :-

→ VM should be configured with single virtual CPU.

5. VM & Virtual HD should be thick provisioned zeroed.

6. Can be used with DRS cluster

7. 4 VM/host (includes primary & secondary).

8. Disable BIOS-based power mgmt (host)

31/1/15

COR:

VMotion HA, DRS, FT

host logs to Vcenter ser. R.c on data

center → cluster → name → check HA → result →

1) enable - reserve memory (for failover capacity). The memory will be used by some other VM which is needed to restart //

2) if not enable - no reserve memory - Here all VMs try to start & it make prob for running machines //

check enable → (host) failure cluster to tolerate 1 host  
Max 31 because a cluster can have 32 Machines  
(the policy chosen here apply on all machines)

Choose percentage → next → (choosing priority dont do)

→ next → next → (Both hosts has 100% of all machine)

EVC (enhanced vMotion compatibility) → for vMotion  
(This is used to make platform for processor selection corner. Your office has various processor Gen 1, 2, 3, 4. Here Generation 1 is common in all processor ~80% it makes platform to support Gen 1. Then it will allow V motion)

Disable EVC → next → (swap file should be with VM) select options & left → next → finish.

⇒ Cluster created & it is empty.

Drag & drop host to cluster. (when added vsphere HA agent will be installed & HA is enabled FDR, elected, master...) → configured.

How to config DRS (see step H.)

R.C cluster → edit settings → click DRS →

Check vsphere DRS. (Manual it will give suggestion, partial - critical it will do and load bal will give suggestion, full - it will do auto)

Choose manual → aggressive → and select each option make settings → OK

How happens? power on VM → msg pops → power on

multiple Machine to see usage → (DRS will work only in shared)

1

Choose DRS tab → Run DRS.

2 RC <sup>choose</sup> go to edit setting choose partial (here auto power on, suggestion for load bal).

Choose DRS tab → Run DRS.

3 RC <sup>choose</sup> go to edit set choose full (here it will have every thing auto)

form

2)

e

sh.

bed

bed

enable FT on a VM.

R.C → Fault tolerance → Run on → nsg (it will turn this to thick <sup>sparse</sup>, ~~used~~, & memory will be reserved)

Yes → after the icon will be deep blue.  
it is primary.

continuation after update Hgr tab

\* update Manager:

- Add/ service of Rep Center server.
- Not provide Patch mgmt capability centrally → (Priority)
- Version mgmt (upgrading version)

Update Hgr 5.1 can be used to patch

ESXi 3.5, 4.x and 5.x

upgrade esxi 4.x - ESXi 5.x

- It is also used to upgrade

Vm tools

- you have to install separate -

- Vcenter Module

\* Components of update mgr:-

> update mgr server

> patch db

(to store downloaded data etc)

> update mgr plug-ins

\* HW requirement

> CPU 2 or more core, 2 GHz

> 2 GB RAM

> 1 Gbps NIC

\* Steps to install. 5 steps

(a) Download the patches :-

(Downloaded to patchdb)

all patches will be downloaded

(b) Create/attached base-line :-

(i) Base line :- Segregation of patches based  
on certain criteria

Separate 3.5, 4, 5 etc..  
separately,

Types:  
Critical & non critical, bug solve type

etc....

b) ii) Attach base line:-

This is attached to host  
i.e base lines.

(c) Scan:-

Already installed patch will be  
compared with these <sup>patches that are available in</sup> base line

(d) Review compliance:-

If scan result says it says it  
is not compliant. i.e the patch not  
installed

we have to install

If patch available it is compliant  
host-

(e) Installing the patch:  
<sup>2 steps</sup>

(i) Stage

It will download patch from  
update reg patch db and store in  
/tmp of esxi.

based

Getting the component & installing it  
this is stege.

ii) Remediation :-

Installation of patch on  
the host.

⇒ directly you can go for  
remediation but it consume time.

Scenarios:

in some infrastructure update ngr  
is used. Scenario nbs. no internet  
for update ngrs internet regime.

outside fire wall 1 update ngr  
it will download & other is inside  
the fire wall. and the other

Here 1<sup>st</sup> we'll download update  
and 2<sup>nd</sup> one will get it from patchdb  
and install it

such type is also.  
available.

2/2/15

## LAB:

### update Manager:

#### Server Component:-

Applications, can be installed on  
which vcenter occurring or separate

Mount vcenter install → double click to launch

Select updatemgr → click → continue

follow instruction

require a db. it will cost for  
db, use db if you have or use ~~standard~~ sql.

next → accept → next → next → it will  
ask vcenter detail (ip add, port, connection  
password → next → select db on sql it will  
update next → next → next → OK → install.

vsphere client  
connecting to esxi host : / vsphere client  
connecting to vcenter  
host using pathpatcher  
installing patch

#### Client component:-

Plugin

on local sys (xp/vista)

Home → exit

login from userware vsphere client

Thomas

plugin → Manage plugin

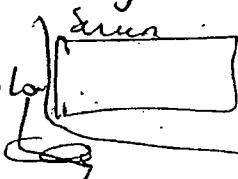
- 3 plugins installed
- ① Storage level
  - ② H/w level
  - ③ Server status

Download update mgr plugin → (it will appear after installing server component)  
(it will be downloaded & installed on client machine)

Run → ok → next → accept → next →  
next → finish  
ignore (see warn)

(appear after installing client)  
⇒ Home → update mgr.

→ config - download settings



Admin's view of update mgr

⇒ download schedule → Change schedule if need →  
(download daily)

Email → next/finish

⇒ notify → email → finish

⇒ file setting → snapshot ⇒  
⇒ exist host / cluster setting

In Maintenance mode no VM should run. If it is on cluster the running VM will be migrated to some other machine.

Till VM becoming it won't go for Maintenance mode.

& shutdown or suspend if they are in local machine.

There are some cluster setting for host to not enter maintenance mode. To install patch you need maintenance mode -  
so disable those setting temporarily

=> vapp :-

— Vapp may contain 2-3 VM.

Smart box enable

=> How to upload Patch Manually,

config tab → download setting → choose import patch → click → browse → choose patch → open → next → ignore

(Power on VM.)

double click to create of patch,

Select a patch →

(2) To create baseline :-

click create give name →

fixed - will not update . add Manually

dynamic - will update when new  
patch found

choose dynamic fixed → choose

a patch → select the patch → next →

we can add many. it won't  
change too.

(3) Attach bas line

choose host/vm → update mgr →

Scen windows R.C → attach

click scen →

Staging :

patch will be download in /tmp

click demediate → next → decryption

→ immediate → next → next → next → finish.

Go to task & events → click → click

description.

Disable the option tasks.

Reboot  
see change of patches

## FT LAB

R.C or VM - Fault tolerance  $\rightarrow$  mun or  $\rightarrow$

Yes

Primary & secondary can be seen.

It will be in protected mode.

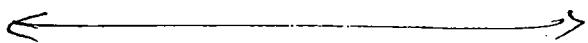
Primary will be exposed

Secondary will be in grey

Failover test:

R.C VH  $\rightarrow$  Fault tolerance  $\rightarrow$  Test failover.

It will change secondary as primary & kill <sup>old</sup> primary process



\* Access Authentication:-

- Security play an important role.
- If vsphere is wrong land then may cause prob. because destroying VM is simple.  
 $\therefore$  we need quite security.  
Access rights need to be given who manage. But all does not require all privilege. Give only to few.

How many ways we can access vSphere

- vCenter Server
- Directly connected to vSphere
  - ↳ different security
  - > diff security.

Direct:  
use own credentials.

vCenter: 330 credentials

using default acc we don't access  
vCenter server.

Direct:  
eg. my team is user - 15 account.  
each have an account but y?

- privilege prob
- auditing

If company is large integrate  
ESXi with Active directory.

vCenter Server:

Various domains user has  
access based on privilege will allow  
him to access.

Co.  
de

- How to start and stop security service?
  - How to manage firewall
  - how to enable / disable lockdown mode  
are discussed here
- = Access ctrl:
- + privilege:  
define action that can perform  
(action)
  - + role:  
Set of privilege  
(set of actions can perform)
  - + Object: target of the action.
  - + user / group: who can perform the action,
  - + permission: Role + user / Group + object  
are given based on user  
his role  
group & its object to do.

### LAB:

Task not possible through ucenter.  
only direct connection is possible:  
log in on client with credential to  
direct connect) direct server → local user & group → R.C  
on empty area → add → assign a password  
name, click grant to share → ok.

local user created;

Creating user won't grant permission.

R.I.C add permission → select the user →  
Permissions → drop down roles choose one  
check privilege → save

In large org:

attach with AD.

Choose config tab → s/w → authentication  
→ Select auth service →

properties → select AD & Mention Domain  
name → join domain → mention user name  
& password.

Create users & group in AD.

2 group created but

~~1~~ group will be added because  
other had not named as  
"esx-admin". If "esx-admin" will not be is  
not given as name it will not added.  
we have to give name.

If any other name then won't add.

On every object we can add

permissions.

� c add permission → add → find server (Ysphere.  
local) it is sso server

⇒ Only through web client login with  
admin credentials you can do these changes.

login in webclient → administration →  
users & group → Goto identity source (+) →  
add active directory group name (add other  
group member) → ok.

Security profile:

Goto host → conf → software → security profile →  
properties → go start → restart  
firewall.

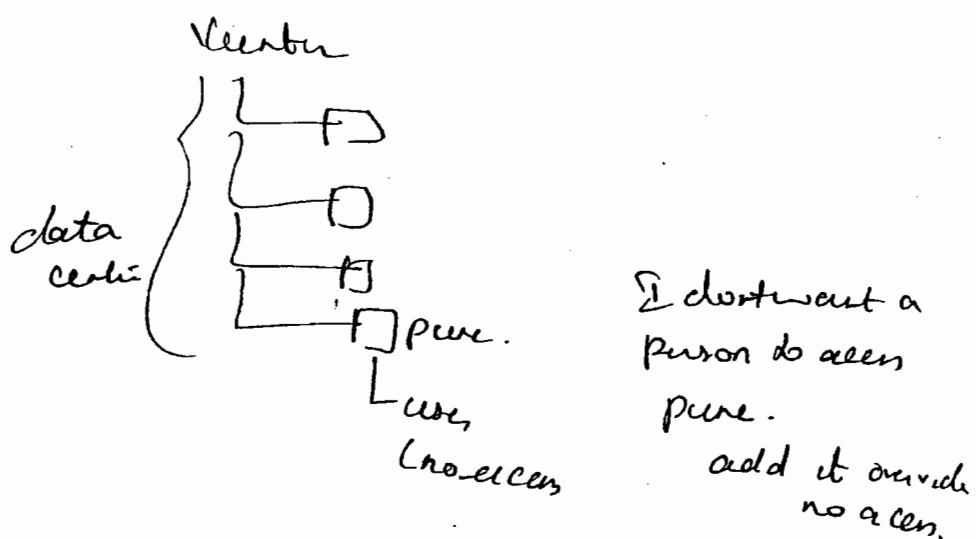
click properties of firewall & make changes.

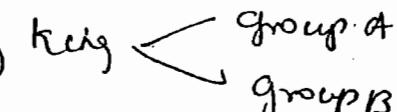
Port no:- Make a list for  
interviews

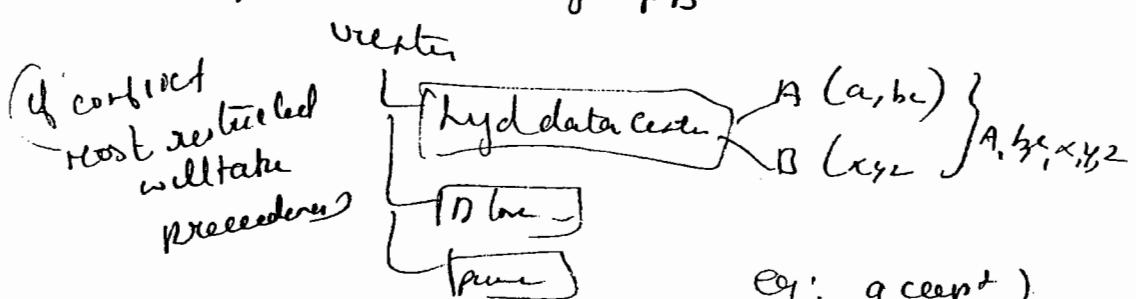
lock down mode & enable ordinance

## Permissions Scenario:-

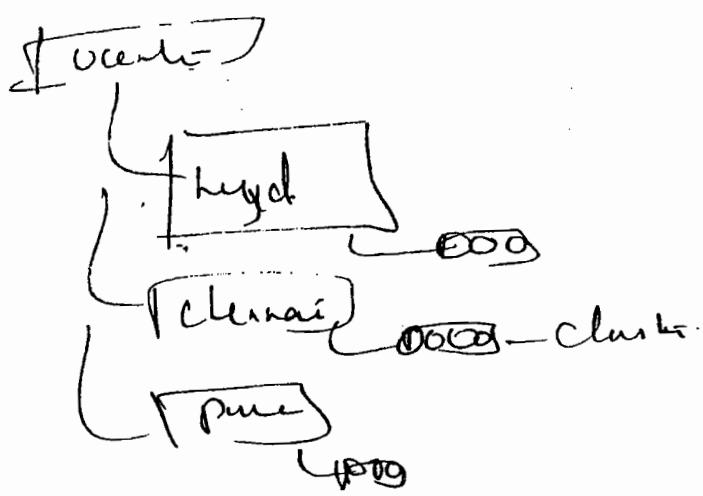
1. Permission can propagate down the object hierarchy to all sub-obj, You can also explicitly override a permission @ lower level obj ?



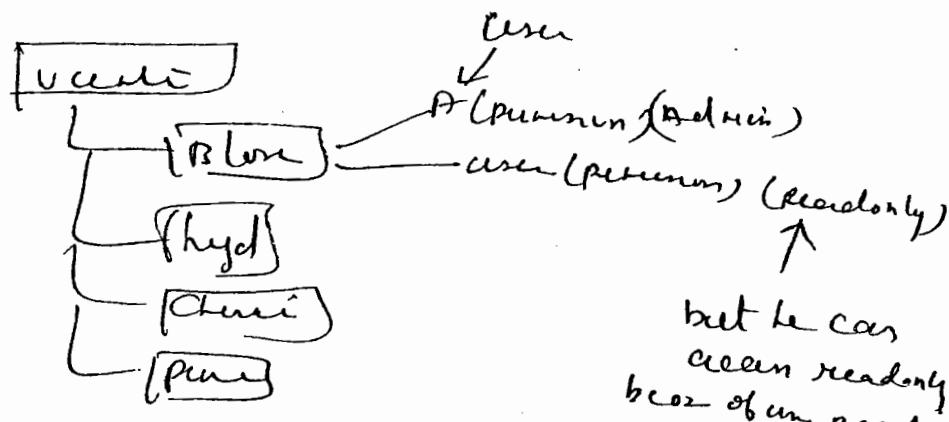
2. user member of multiple group with permission on same obj - The user get both permissions  
(only if no conflict) 



3. When a user is a member of multiple group with permission on diff object both rule propagate to child object



4. Person can define explicitly to whom an object  
take precedence over all group permission on  
same object.



He will have both permissions  
but user permission will take more  
precedence

denied  
will have  
precedence

## ~~P2V:~~

- \* Vcenter standalone converter: App installed on

Physical  
Virtual

~~Type 1~~

normal host

Virtual to virtual.

(or)

i 2 V

Image to virtualize

## \* P2Vi:-

### - Manual

- + install VM & do all process
- + no scanners
- + time & lot of prob involve
- + back up & restore.

### - auto

Vcenter standalone converter

P2V.

## \* V2V:

From hypervisor  $\rightarrow$  Type 1 hypervisor

Other org hypervisor  $\rightarrow$  VM hypervisor

Virtual pc  $\rightarrow$  Type 1 hypervisor

## \* T2 V:

o)

- Symmetric
- Parallel
- axis
- Storage cap.

} common

Here, usage can also converted to VM.

lab:

- 1)  $\Rightarrow$  Standalone client  $\rightarrow$  double click to launch
- 2) Screen appears.

3. Convert Machine  $\rightarrow$  choose an option by dropping  $\Rightarrow$  (powered on physical machine)  $\rightarrow$ 
  - Choose remote & give IP of Machine. e.g.  
~~60.22.15.147.47~~ subnet) username password (admin)  
Choose OS family  $\rightarrow$  next

4. Converter agent will be installed on that host

it will pull the data  $\rightarrow$ ,  
take a snapshot & store in VM.

5. Choose automatic  $\rightarrow$ 
  - $\nabla$  Choose automatic it will install converter agent automatically
    - $\nabla$  after deploying Service who will be given and installed & build the same in VM.

3/2/15

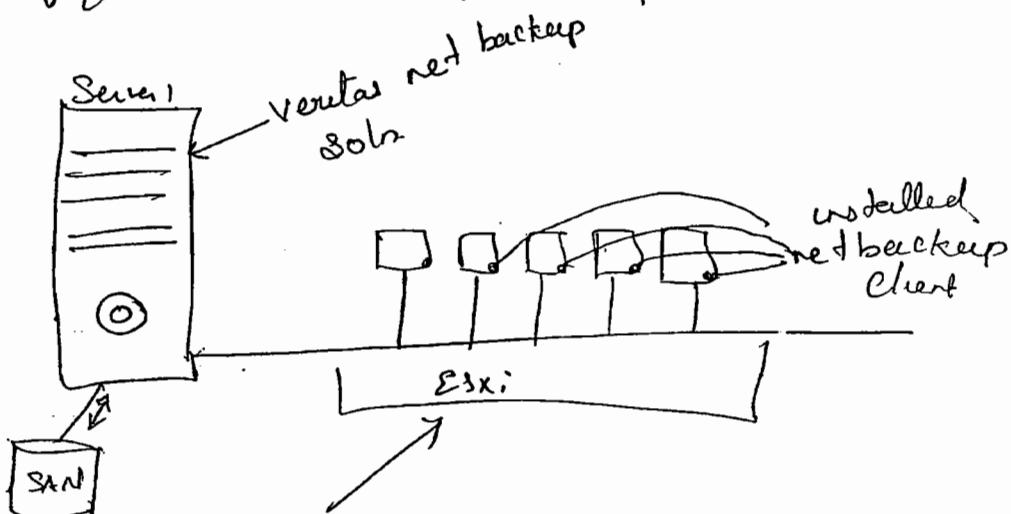
Thomas

## Vsphere Data Protection : (VDP)

Traditional Backup solution not suitable  
for virtual architecture

Tool that is used to take backup  
of VM.

Best security soln is taking backup  
of your data (best practice).



Consider: These machines are Virtual now.

The backup client is responsible for extracting data & server soln is responsible for storing data. This is old solution. we have to  
store data in all machines.

Backup Client  $\xrightarrow{\text{Install}}$  in all Machines  
 $\Rightarrow$  more space

Then there is need of more space to these backup clients this will reduce the performance of machine

so there will be wastage of resource  
and this is old method.

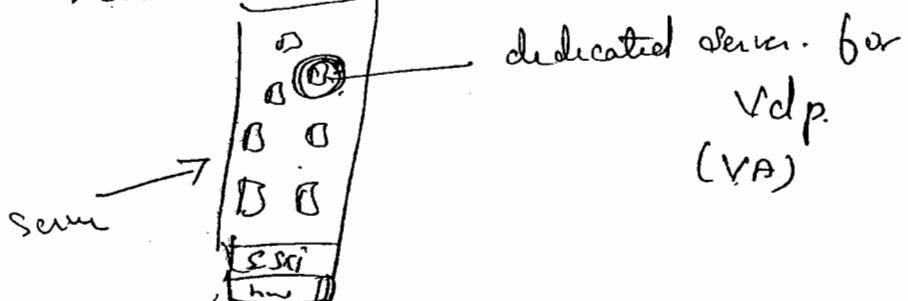
How to overcome this ??

Soln: Now all the Machine are VM & not physical.  
Rather than having backups client on each VM.

lets have Backups client in ESXi. That is  
a dedicated backup server for this backup  
operation.

That is Vdp. It is preconfigured  
(VA). It is used to take backup.

Here, the resource required is the resource  
required for VM, so we need not to allocate  
more resources.



⇒ But !! How to pull the data from VM ?? ?

If it is ~~has~~ client on each  
Machine it will take data-backup

but here in VM no client is  
available ! How to take data??

i.e. All data of VM is available in database  
as all files <sup>it is in folder</sup> are stored in datastore

So it is possible to take back up directly from a data store.

But for this we need some Methodology.

Yes! ~~we~~ need API

We have API built into Esxi which is called VADP - "Vsphere Storage API Data Protection". This help to take backups of data using this tool <sup>even</sup> third party application we can also take backups of any machine.

Eg: Veeam.

If not there is no this API then such back ups is not possible.

#### \* Virtual backup advantage:-

- No backup agent on VM
- Backup processing is offloaded from Esxi host to backup server.

- Virtual host itself can be

(Thin provision, Snapshot functionality  
(No need to allocate more space)) It help to take backup <sup>can be used in need</sup>

- faster backup & recovery
- Single backup image (Restore the entire image or particular data may can be taken.)

This is available from 5.1.

7.

In <sup>2</sup> till we have.

VDR - Vsphere data integrity.

The file level restore is not available here.

VPP can take backup where ever the

data is <sup>either</sup> iSCSI, SAN, NFS or local.

VPP can take incremental Backup.

It is not default provision is there.

incremental Backup Advantage: only Modified data is

Captured. faster backup with less space of storage.

This uses a technology "CBT"

"Change Block Tracking"

(It track changes of the block.

of a VM on a virtual host)

→ Who keep track?

VM kernel port: ESXi has to keep track of changes i.e.

If we inform the VM kernel to keep track it will keep track of changes in Virtual Host

→ How to inform VM kernel to keep track of changes??

VM kernel port know <sup>only</sup> about each

VM configuration file. It also knows each VM uses its own config file

The configurations info are stored in

.vmx file.

When OS is powered on it checks through this and enable all task.

What to do?

- download .vmx file from VM.
- ~~RC VMX file~~  
Store in desktop
- open in word pad



Add 2 lines to it.

CtkEnabled = true

Scsi(0:0) = CtkEnabled

- Save & upload back to VM.

After that configuration change  
in VM kernel will keep  
track of changes in VM.

By informing through this .vmx file  
VM kernel part will keep track of all changes and inform  
to VD P. VD P utilizes this  
This allows to take incremental backup.  
This is eBT.

## \* VDP composed Architecture:-

- VDP appliance.

↳ ova format, VM with 4vCPU, 4GB RAM,  
SLES 11 64 Bit

↳ VR 15TB - 850GB, 1TB - 1.67TB 2TB - 3TB

↳ CBT, VSS is VMware tool.

↳ CBT, VSS is VM storage tools.

Volume shadow copy service :- (VSS)

You cannot take backup when  
data is use....!

But VSS allow us to take  
backup of data when the data is in use.

This is integrated with vcenter

Server 5.1

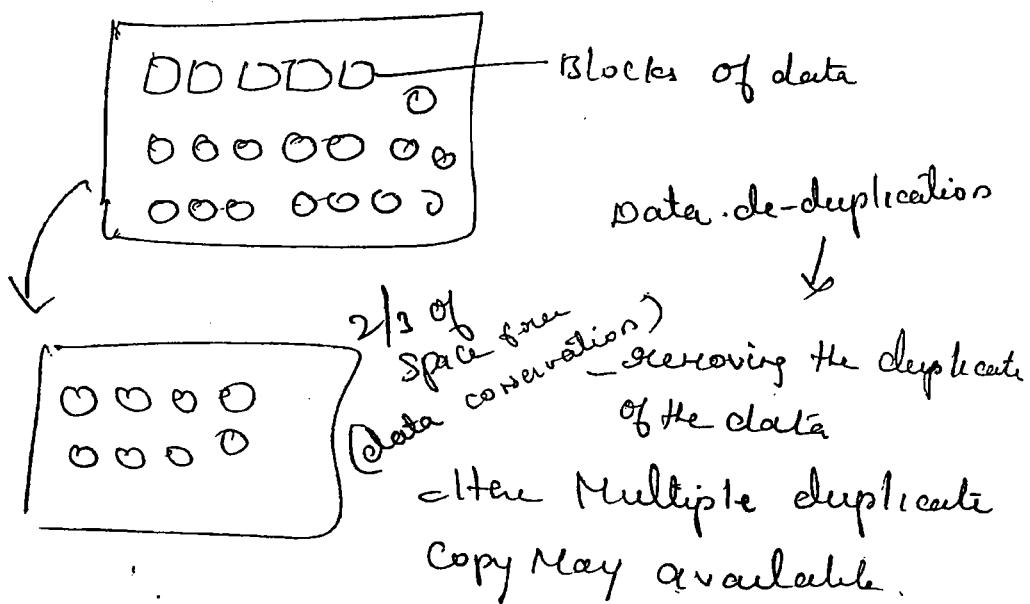
Managed only through webclient

~~The VDP~~

↳ Data deduplication store (.vmdk file)

- Vdp uses a patent technology  
to use this i.e "Data De-duplication"

Backup of VM is stored by VDP.



— Here it will find that and remove duplicate

e.g. daily, I take backup of a file. — so there will be multiple file.

so it will remove duplicates it allocate more storage. If we use this technology. it removes duplicates. Hence  $\frac{2}{3}$  of data space is free and saved.  
It is possible with "Variable length segment size".

This is the Methodology used in VDP for taking backup of de-duplication of data.

Many other technology like this is available and it is used in

SAN. But its "variable length segment size" is the new technology & it is patent of VSP.

creation

VDP:

File → Deploy <sup>OVA template</sup> → Browse → Vsphere data protection  
advance → open → next → next → accept → next →  
name (name of VM or no). → choose a data center and  
cluster to deploy → Then provisioning (if thick  
3. 1TB need) → networking info → next → finish

deletion

delete

Problem of powering on VDP. 2 operations

1. host & port are associated with this VDP on DAS server.

2. VDP has to integrate with Vcenter (<sup>Server</sup> will ask for vcenter credential) (use user ac with admin role on Vcenter, <sup>Normal administrative</sup> <sub>admin local</sub>)

Power on VDP → check scenario

creation

Enter URL or Browser.

Username : root

Password : change v

follow instruction.

Next → network setting → next → select

time zone → next → new password → next → register  
question  
nospecialchar

(different account not user in alc, (POf user  
(user with admin rights))

Server) → test (on → next → finish → Reboot  
(initial boot 20-30 min)

User name : root

password : new changed password

If new screen appears vdp success

Job done!!!

Log on to web client

Open a browser →

"Vsphere data protection" will be  
there. If not prob in installations

Choose vdp → connect → Backup

Click backup tab → click → action →

New → choose second → choose VM from  
Inventory → → select → daily backup → next →  
name → finish

Job submitted.

To start job

Select the Job → backtow

⇒ Choose Backup all source → end screen

Backup will start → first snapshot

The image will be stored in Vsphere  
data protection.

Using the image you can rebuild a  
new VM. It is an image.

You can restore. This is VDP.



## \* Raw device mapping:-

- rdm.vmdk.

This is to map raw LUN to  
Your Virtual Machine

on SAN Hd will be more RPM.

More speed 15000 RPM, or 10,000 RPM.

The tough & critical app can be  
used with these RPM.

Mapping raw device to your.

VM ( <sup>Adder</sup> Hd to VM) you need a new Raw LUN.

when Raw LUN

LAB: R.C on VM → edit settings → add →  
next → select hd → select rawdevice → select →  
next → rdm.vmdk will be created & stored in  
Machine → store is vms → next → (snapshot possible  
on Virtual hd) → physical → virtual → scsi (0:1) → next  
→ finish  
click ok. Now VM access that LUN

it's for VM.

⇒

If you have VM with ROM configured  
closing VMotion  $\rightarrow$  VMotion will not occur  
i.e. this VM is accessed by this ~~host~~ host so  
not possible. Make sure this VM is  
accessed by other host and Migrate  
if Migrate unmap & remap.

Instorage VMotion  $\rightarrow$  data - another data.  
VM cannot be migrated  $\rightarrow$  Mapping  
files are Migrated

### \* Resource Mgmt & Monitoring :-

Memory virtualization has 3 layers

#### x Resource Flight

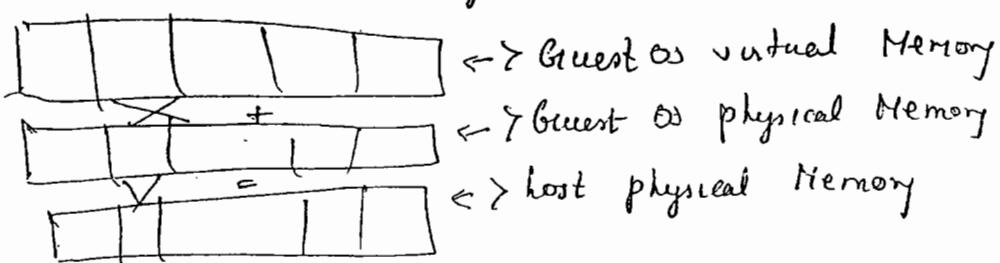
ESXi Managing & address manage resources;

+ how ESXi Manage?

(\*) memory espn

Memory concept

3 layers



⇒ Guest or virtual Memory:-

Partitions on ~~host~~ VM's virtual mem. Guest OS provides this. Similar to swap, virtual memory.

⇒ Guest or physical Memory.

RAM configured to VM.

= host physical memory:

Guest or virtual Memory + Guest physical Memory

Host physical Memory

VM Memory over commitment

I have 32 GB RAM & creating 4<sup>th</sup> each VM. I can create 8 VM. but Multiple can be used. More than 8, I create 12 but I need 48 GB.

Here Installed capacity is less than allocated capacity.

⇒ Over committing memory

Physical Memory < allocated capacity

Every VM is allocated certain memory but it not always reqd. It power on when minimum memory required.

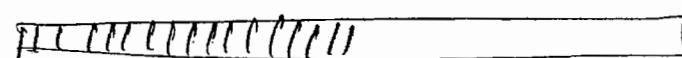
This is known as overhead memory

If no that memory we won't start host provide this

— Swap file (.vswp) size diff before allocated & reserved memory.

⇒ How this Over commitment is Managed by ESXi  
→ VM kernel memory reclaims techniques.

- ① - transparent page sharing
- ② - ballooning mechanism
- ③ - memory compression
- ④ - Host level SSD scrapping
- ⑤ - page VM Memory out of disk  
(VM Kernel swap)

⑥ 32 GB RAM 

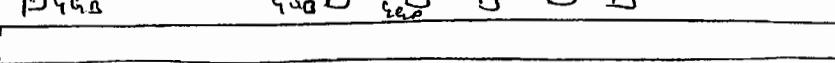
↑  
all are loaded here

Transparent page sharing find common blocks

Identical files. Consider to file - it will be same

q and Maintains 1 copy for all

⇒ It will save space that this one copy is not copied i.e. 1 copy is shared. ...

⑦ 32 GB 

from where memory comes from the above techniques.

Consider VM1 file has 4 GB and uses only

1 GB ∵ 3 GB will be taken for VM9. When VM1 require 3 GB <sup>space</sup> get from some other and allocate the 3 GB to it.

Why ballooning → Expand & contract Methodology

This is a driver when it need memory it expand and contract when not that much need

⑧ Compressing the space to access data

(4)

SSD solid state drive

It occurs only when ~~the~~ machine has SSD. It moves files from swap to this drive. This is extreme conditions here it "Swap": "files in memory are swapped to hd".

By default ESXi doesn't create swap partition. But how swap?

If on local disk only it will create. It creates 4GB it is used for swap. This is one of its operations.

(5)

When memory out of disk.

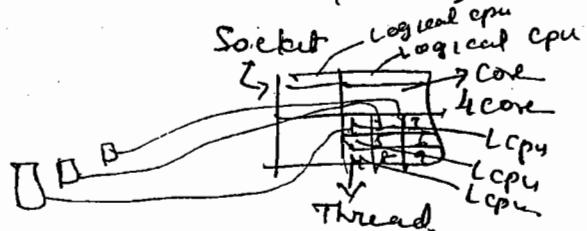
- DRS will manage it mostly
- This will not occur. In rare case
- If occurs add a space.

These techniques are used when require it choose one by one. If not possible by this it choose that. If nothing possible out of disk if not require it won't do this techniques.

## \* CPU Virtualization

The kernel schedule VCPUs on physical processor. (we don't have virtual CPU here) VM kernel schedule VM to runs on physical processor. (to manage load balancing in core)

- Socket, Core, Thread technology



Core is a processor.

4 Core - 4 processor embedded in single chip

Hyper threading :-

It will convert a core into multiple

logical processors.

- CPU load balancing:

It will balance load in a CPU with these techniques.

4/2/15

Resource control:-

From VSphere 5. we use a

or allocate

"Share Based algorithm" to share resources. To

VM. Memory, CPU and storage are shares.

By default esxi consider all  
Machine are equal & allocate equal share  
but admin can change this

Parameter that Ctrl VM access to a

given resource.

Parameters:

> limit (cannot exceed this value)

> reservations (reserved space) (VM to start)

> shares (Guarantees a certain amount of resource for VM.)

your Inform. may be large with lots. VH.  
It is difficult to allocate resources Manually.  
But we can do in groups (prod, sales, or as  
application etc).

- This is done through "Resource pool"

"Resource pool"  
Logical container of resources

or

Creating a Quota of CPU & Memory  
(resources)

- Divide and allocation of resource is possible by admin
- Storage pool attributes (this is how we allocate)
  - > share : low, medium, high, custom
  - > reservations : in MHz or MB
    - & direct or  $\#$  MHz & MB
  - > expandable reservation yes or no

Scenarios:- I have 100\$ how many share

1\$ = 1 share

1 cent = 1000 shares

not possible.

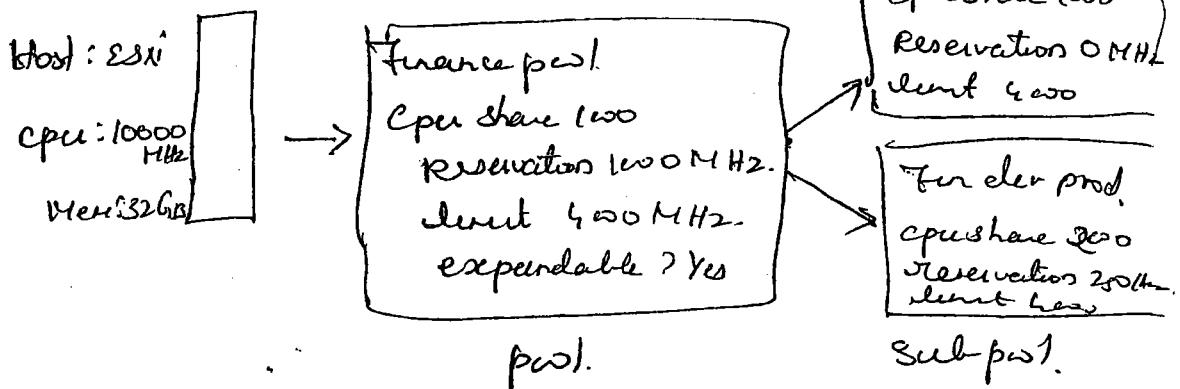
Consider I have 4 friends

$\frac{1}{4}$  100 shares to each friend.  
~~25~~ 100.

$\therefore$  each got 25% of my share  
irrespective of value.

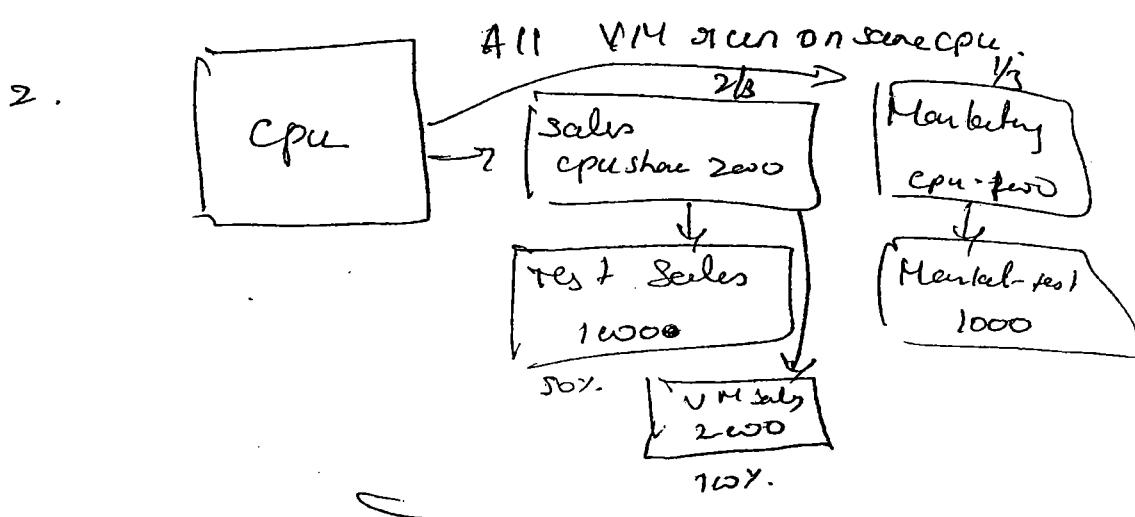
This is how share are allocated.

Resource pool scenario 1:



You can create Resource pool in

- Host
  - Cluster
- } Root resource pool.



everything is based on ratio's.

This is how we allocate resource.

To dep. and they use resource from that allocation.

LAB:

How to create resource pools.

Vcenter server → cluster → resource pool → choose  
attribute (CPU share, reservations, limit, expand?) →  
Memory share (share, reservations, limit, expand) →

Ok

Drag & drop VM in it ∵ VM will  
use those resources.

Individually you can allocate to a  
VM.

Individual → R.C VM → edit setting → resource &  
allocate → close

X —————— X

\* Monitoring:-

- Play an X role
- Running multiple VM on single server &  
it share resource. So we have to monitor
- Take need tools. The tools are

from Guest OS:-

- Task Manager
- Performance DLL

monitor  
- CPU  
- memory  
- network  
- disk

- iometer (free)
- Top (linux)

from VM were

- Vcenter perf charts
- Esxi system log
- resxtop and esxtop

Monitoring ok! but how to interpret

them.

~~VM~~ constraint

Ques:- VM cpu usage?

is my cpu constrain sufficient or not?

task mgr report high usage!!

Q 2. Since how long reported? day, hrs, mins

Q 3. Is there any task or installation going on?

- no installation, no task

Q.

This could be because host

Q 4: Are all VM you constrain? or host CPU

Q 5: Is load ~~on~~ CPU on host?

How to use

Vsphere client  choose performance tab →  
advanced → CPU usage

If low% CPU is not sufficient

Choose chart → stack graph / VM →

Select all VM → ZOK

Any ⚡ among the questions

will be problem

If DRS is there it will

Migrate.

"If migration is still high,

The resource is not sufficient allocate  
resource"

host memory constraint

choose memory

check ballooning. (If ballooning is high  
then indication of Memory constraint in  
VM.)

not

→ is host memory constraint?

choose VM → and check ballooning &  
swap.

If swap & balloon is reported high

then host memory constraint!  
it will migrate and do all still prob then add memory

not

→ Are VM disk constrained?

normally want occer-

check disk on performance

latency should not be more than

20 milliseconds. If more than 20 then disk

as constraint.

⇒ are VM n/w constraint?

no % want occer but no time

occur

switch to eth client options & select receive

packet drop & broadcast packet drop.

If packet drop reported - then n/w  
constraint add NIC or shift VM to other  
Machine

## \* VSS policies:-

↳ Native standard switch.

↳ Virtual switch on esxi

It has some new policy.

- Security
- Traffic Shaping
- NIC Teaming

VM → net config → networking → switch →  
edit → 3 tabs will be there.

## Security policies

- promiscuous mode
- Mac address change
- Forged transact

## Proxy mac mode:

- default set to reject

- security policy

- it is switch  
- if set to reject it will not

allow VMs receive by observing traffic

not (for them) intended for

virtualswitch



don't accept or enable. If accept then it will listen all traffic. Only unwanted traffic (don't do, security vulnerability)

Mac add changes:

- related to all Mac addres
- related to incoming traffic
- by default to accept

You can change Mac add.

i.e changing Mac add is accepted

- if it is to reject  
incoming traffic is blocked

forged broadcast

- related to all Mac addres
- related to outgoing traffic
- By default accept

If reject

- outgoing traffic will be blocked

⇒ Protocols need to accept to accept:

Suppose you are running monitoring tool.

it will send sniff packet. protocols does not allow sniff. in those case we do

change on port group not on switch

switch  
port group

\* Traffic Shaping Policy:-

- > Mechanism to ctrl bandwidth
  - default disable
- > control out bound traffic only

### Parameters:

kilo bits } Avg -  
peak -

\* all the teaming policy:-

- load balancing method (out bound)
  - Nic team is nothing but group of physical Nic (2 or More) (for load balance enable auto)
  - only outgoing traffic
  - 3 method
    - > originating virtual port id:  
(default) less %, dont waste change  
nic card is determined based
    - n source nic is determined. fast & simple  
load balancing
    - > source Mac hash
      - ↳  $\frac{\text{IP address}}{\text{VM}}$

VM  
NIC card is based on virtual NIC Mac. Low overhead, might not need traffic evenly across physical NIC.

IP hash :-

- 802.3ad std support needed
- better than source MAC hash
- 

\* Network failure detection:-

- Physical network failure
- Policy on VM
- it do with help of physical adapter
- 2 methods

> link status only (default)  
identifies

• new cable unplugged

• power failure on physical

switches

> Beacon probing

VM kernel detect all failure  
of link state & also detect  
wrong VLAN, port blocked by  
STP

\* Notify switch:

- physical switch are notified by VM kernel when a virtual NIC is connected to virtual switch & when failover event cause a virtual NIC traffic to be re-routed to a diff physical NIC.

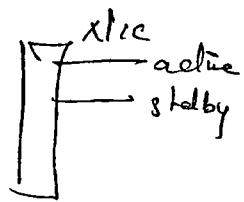
- adding NIC
- Tuning on VM
- When an NIC card fails it will notify & re route it (failover)

Notify switch yes & no if

Microsoft load bal or uncast switch  
(MSNLB) for load balancing.)

### \* fail back

Yes: failed physical adaptor is active whenever its up



No: failed adaptor is inactive even after its up

→ These are policies. how do they effect your VM infrastructure :—

- failures
- load bal
- security
- redundancy

how is vSphere operation ?

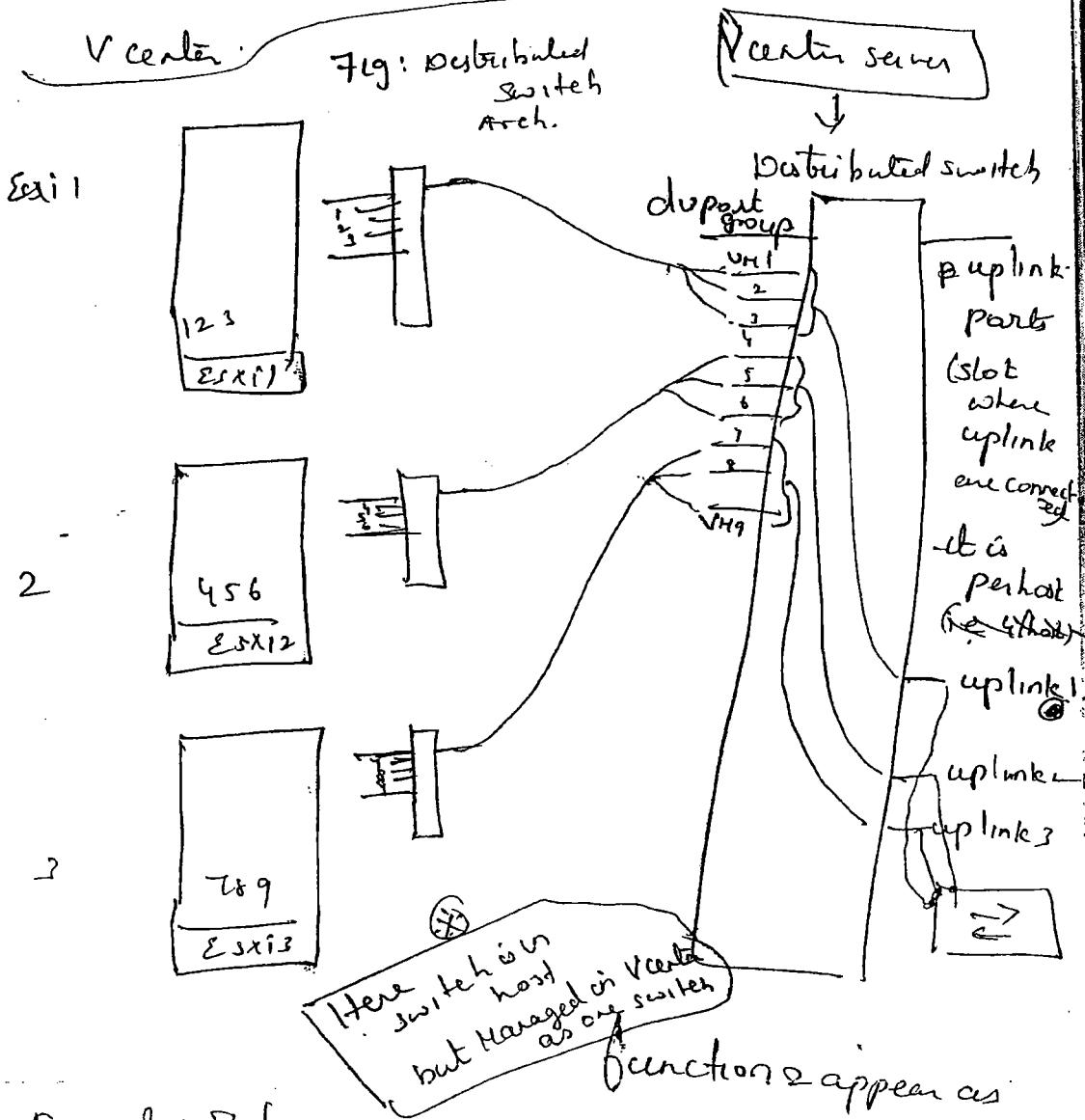
If any Host Machine is setting with another Machine "Migration"  
If "A" is not possible

Make sure all have same settings.

## \* Vsphere Distributed switch

- Virtual switch
- layer 2 switch
- you can create if you have Vsphere enterprise plus licence

- cannot create & manage without



Consider: I have

4 uplink ports.

⇒ in each Machine we can connect 4 replink or NIC in these uplink ports

single switch. But distributed & associated with multiple ESXi host

I can migrate all VM to  
distributed switch  
↳ refer previous page

Uplink 1 is connected

do all VM can able to  
communicate Uplink 1

Uplink should be connected  
for each ESXi's. Else no communication

We have std switch!!!

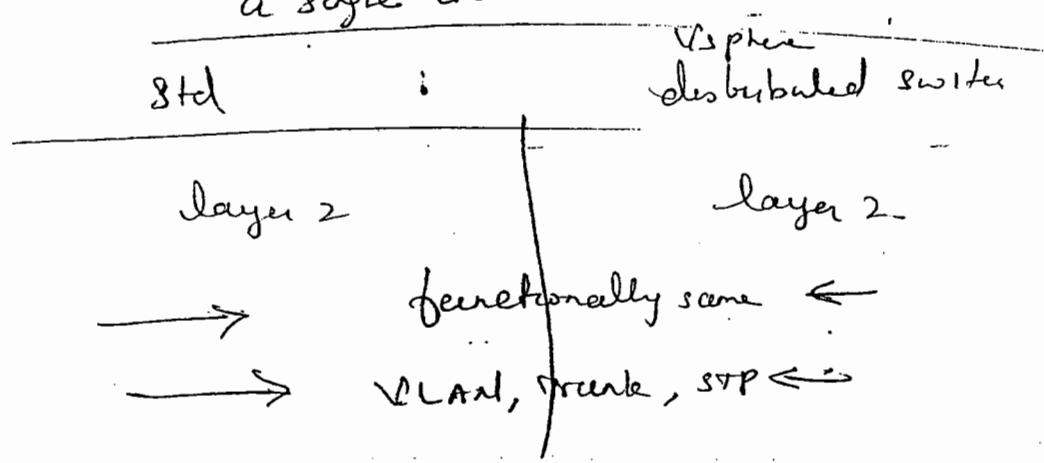
⇒ Why we need Vsphere distributed switch?

- It is for ease of Management.
- centrally can manage all

Virtual networking

- every process can be done here
- centralized administration
- entire n/w can manage in

a single instance



Not possible

Private VLAN possible  
(Vlan is VLAN)

port bonding, port mirroring,  
net flow.

centralized network

- if no VLAN<sup>if</sup> the dv port receive only native VLAN. Then port should be access
- if VLAN type set to VLAN<sup>mention</sup> id & dv port will tag VLAN id & <sup>uplink</sup> port should be trunk
- with VLAN type to trunking you need to specify range. ~~The dv port will group~~
- private VLAN entry

\* private VLANs configured in primary & secondary  
downstream - incoming  
upstream - outgoing

### LAB:

- Home → networking
- created on datacenter R.C datacenter → new distributed switch
- > choose a version <sup>(5.1)</sup> → next → dv switch & uplink → next

→ select add later → ok.

click dv switch → configuration tab

~~choose~~ choose add host → [click a  
uplink which is not accessed (adding 2  
machines) → ~~use~~ used & unclaimed portgroup] →  
next → next → next → finish.

Re-Migrate vnic source port group → next → select  
the VM connected to std switch → next  
→ finish.

do it again choose some other and  
add.

⇒ in vcenter we can see all  
ports and VM & links.

but from esxi it will show  
its VM ports connected (it shows only  
its VM & its uplink)  
⇒ it is single switch but distributed  
to all.

in Vcenter view we cannot  
VM kernel port - from esxi view  
we can create



Manage virtual adapter → add

→ new VM kernel → next → VM kernel → next →  
→ dv portgroup → choose one → IP → ~~new & scaled up~~

Distributed switch  
used in large org. mandatory in building  
a cloud. without it you can but no such performace  
done!

5/2/15 ESXi architecture :-

ESXi is functionally equivalent to ESX3.

Many had misconception that ESX is Linux.

Because of cos. (RHEL) they thought so.

ESX is a <sup>POSIX</sup> standard. and.  
Red Hat, Solaris and Irix are similar.

Basic commands of unix works here.

lot ~~of~~ hypervisor bo is there but y  
VMware vSphere is ~~most~~ famous.

because of its "footprint."

foot print is less than 32 MB of memory.

There is 3 core fn.

- take care of device drivers
- does resource schedule
- take care of input/output stack.

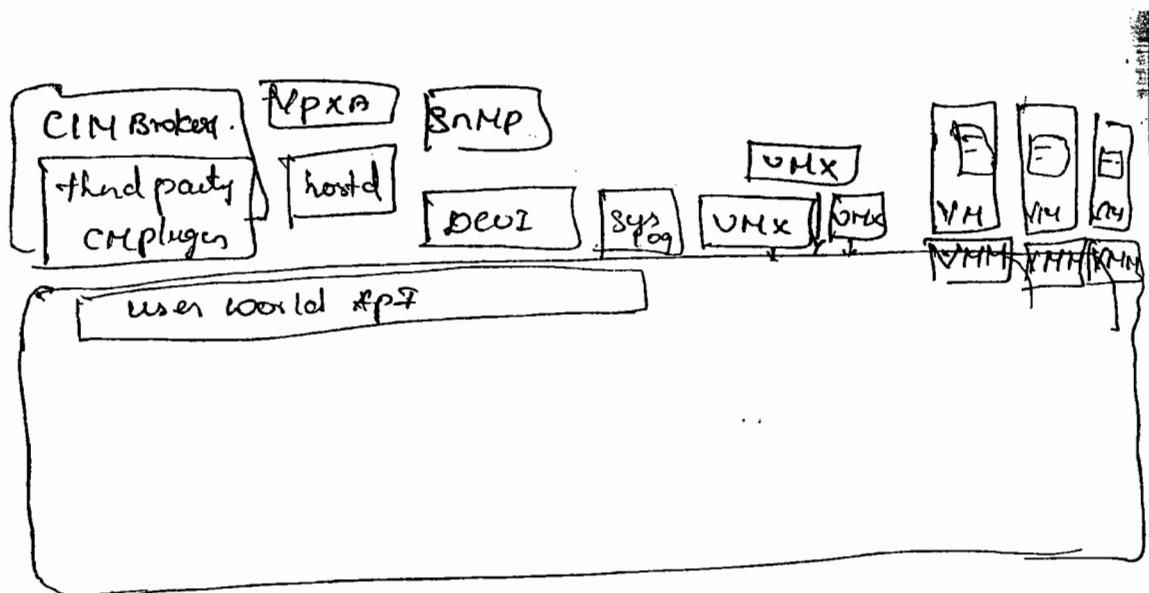
Other hypervisors don't do all these  
Some they do. but ESXi, it do all.

Apart from this OS runs certain process and  
ESXi also runs such process. But ESXi runs very  
few process. They are called "user world API"

Syslog: log files.

CDC Broker:

VMM - Virtual Machine Monitor.



- ESXi can NFS it also use a temporary file system
- simple in memory file system. It is used to hold ESXi config files.  
It uses when host.

Linux also use but after they load permanent

/etc/vmware, log files /var/log/vmware, and  
Staged patches in /tmp

#### \* Component / process:

hostd: programmatic interface of VM kernel used by vSphere client.

A credential - hostd is responsible for authenticating and authorizing local user.

#### VMOMI:

- Virtual Machine Monitor

process provide executional environment for a VM. (hardware environment)

"It provide hw to a VM"

VMX provide the information of configuration  
to it

Each machine will have VMX & VNX

\* HA Agent:

Adding host or installing HA. HA agent will  
get installed

\* syslog as a daemon stores log files & feed to  
remote storage.

exp: ESXi require only 750MB - so it consume  
small space. So it won't get persistent log. because  
of small log in only 200 line can written  
if written 201 the first line is washed out.

If you need logs store on a remote  
storage.

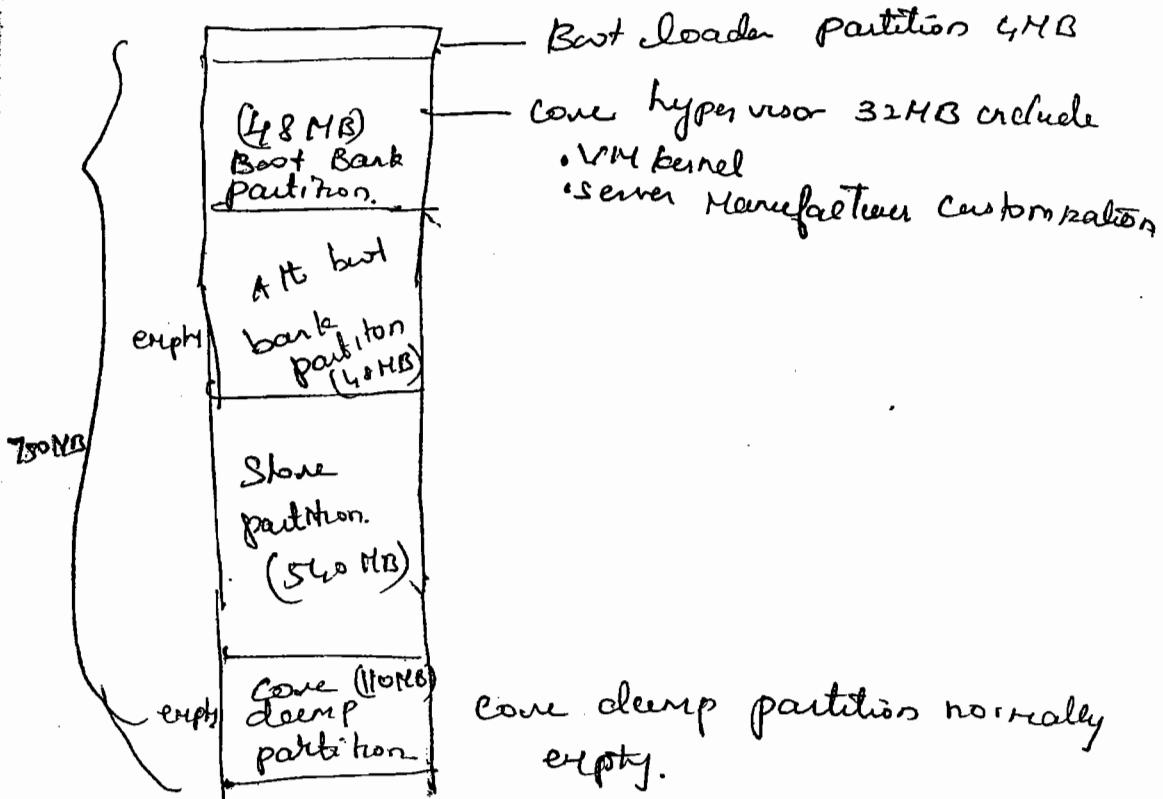
- A process that handle critical issue target  
decency.
- process that enable NTP
- enable SNMP (monitoring tool)
- CIM (Common information model.)

When you click summary. It gives info  
of HW. How it gets. We have sensor that  
Monitor temp, fan, processor etc...

CIM will integrate with plugin that  
do their activities.

user & group def. are stored in these filesystems.  
/etc/passwd, /etc/shadow, /etc/group

\* Types of partition & what does.



Alternate Boot partition:-

This is alternate booting location.

When used?

while upgrading from lower to higher version of esxi. old version will be in boot bank and new boot will be in alternate boot image.

When booting for first time it will boot from alternate boot partition if concept in os. it will appear overwriting the boot bank partition & loading old version.

This is why we have alternate boot bank partition.

core dump partitions:

A file will get created when system crashes.

Eg: blue screen error (blue screen)

BSoD (Bluescreen error of death)

ESXi also crashes.

Purple screen errors.

(PSOD - purple screen error of death)

When ESXi crash it will create file on that. Still that time the partition is empty. It is empty by default

1. SSH (putty) → ESXi shell → ~~stolen shell~~  
2 set of commands  
Most widely used creds.  
} - ESXi cfg - xxx xxx component (19)  
} - ESXi CLI commands  
(9 components can be managed)

2. VCLI
  - Application
  - SDK
  - installed on local system (xp or desktop)
  - available for windows / linux
  - commands are in bin directory of VCLI  
it's in bin.

You need not to be in that directory to execute them

3 set of cmd.

execfg - xxxxx (19 commands)

vifcfg - xxxxx (+ extra)

Only through  
VCLI it is  
possible

Exectl (q)

Even through ssh.

using putty & VCLI is different

it create secure sessions between host & Client Machine

there is no session. You enter in local machine & Executed remotely on host & op is -local Machine  
then session loss (Most secure)

VCLI commands:-

3 sections:-

⇒ Command

vifcfg - vswitch  
(to manage vswitch)

⇒ Connection options.

(Pls execute in sudo host detailed

info)

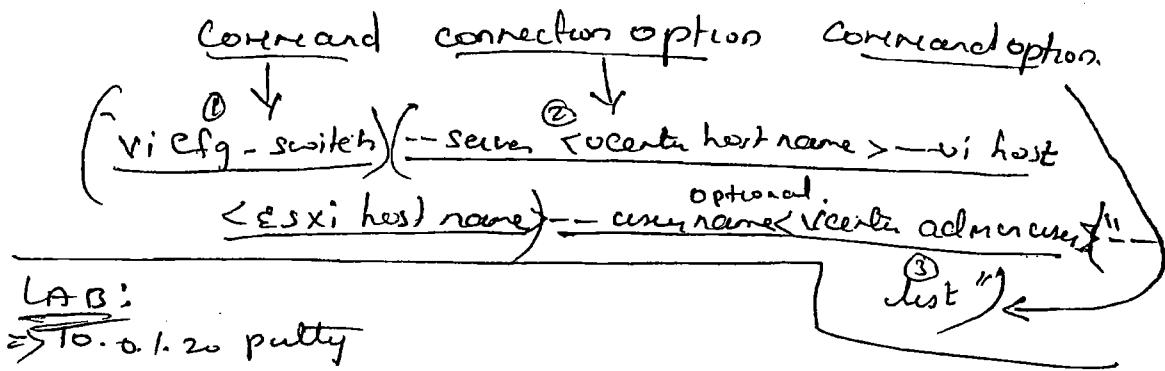
e.g. - Server < where > < ip >

- Server < Vcenter host name > < ip of host >

- Server < exit > < ip of host >

(username & password is option (skip it))

$\Rightarrow$  command option.



# col skin (ence)

\* By you can do these command in other directores too.

YELI :  
Install on Machine.

Start → program ⇒

• Cmd are in vcl  
Windows

# DIR

# CD bin

# DIR ~~B~~ (last file created)

## Scenarios:

(1.) VM hang:

(where not possible through client this can CLI)

Techie: Process hang - so kill the process.

\* Esx CLI ↴

### Components listed

205

# ESXCLI VM ↴ ↴ to get help option

# ESXCLI VM process ↴

# ESXCLI VM process list

lists the VM. identify with name.

"Would id is must and it is unique"

note world id

e.g.: 165889

# ESXCLI VM process kill ↴

options

-t (type)

-w (world id)

3 types of kill { soft shutdown  
force  
hard  
force

You should not use if you can restart with client. This is killing will effect the files & os.

try soft # if no hard if not is hard try force. dont try in Production environment.

soft will try to kill softly

# ESXCLI VM process kill -t soft -w 165889

## ② VM orphaned:-

host is parent. if no host i.e. no more owned by a host

How to find if it is orphan?

exists --- Orphan ) → name.

R.c Orphan VM → click migrate

(Check survey ↓ and Migrate to another  
on which host it is  
Machine)

After Migration it will be available.

Rehie: i.e. VM got unregistered with  
any host if migrated it will get register  
When this happens? :

Something goes wrong in registration  
during Migration, but it shows a host.  
because it was there prior.

If deleted a VM also this may  
happen but can't Migrate as deleted.

③

VM can be removed from inventory (unregistered  
with host) but it is in datastore :-

(or)

Adding VM to your inventory from a  
data store.

R.c VM → remove from inventory  
(now unregistered)

Bring back :-

Browse the datastore & find the

name → R.c in folder you will find  
add to inventory → select a location

and store it.

(it is good for orphaned also)

④ VM inaccessible :-

(unable to process in a VM, not reachable from data store or unable to access datastore)

It will be grey'd out (inaccessible)

e.g. ESXi... (inaccessible)

It will get stored through  
Storage adaptor.

Config → storage adaptor → R-adapter

it will try to reestablish.

If established you will get

If not established prob with SAN.

Plug & check

else ask @ storage admin

and rescan again

⑤ Cannot power on (with msg VM disk  
require consolidation

or

When scanning a message

"VM \* disk require consolidation"

- issue related to snapshot

If you associate OS with snapshot  
for long time this occur

R.C. VM  
REVERT → snapshot → consolidate

disk will consolidated & power on

If again same prob. delete the snapshot

on production don't use annotated  
with snapshot

⑥ Working with a VM, suddenly a msg pops.

"unable to continue with present task"

2 options  or

It will be a summary of VM.

If click cancel the task cancelled  
retry it will try again

(rare it occurs) related to  
nospace or lack of space in datastore  
(or)

VM configured with this provision

Soln:

either Migrate VM to some other  
host (or) increase the size of datastore

"normally won't occur because vcenter will  
give warning"

⑦ Mks issue :-

try to open console → a black  
screen opens.

But a msg pops like issues

"Mks - Mouse keyboard screen issue"

95-99% come when opening through

Vcenter.

1-5% when open directly from host also  
it occurs.

⇒ If in vcenter several steps to confirm

- check one by one
- check local firewall on local sys. (else)
  - check the firewall on vcenter system (else)
  - check DNS configuration (else)
  - restart Vcenter services (else)
  - restart vpxa (try)
  - go for different solution  
do with 8th soln.

⑧ vsphere client to <sup>connect</sup> ESXi. can't connect but  
ping possible

"could not connect"-error

through putty you are getting connected

What is the issue :-

hosted process problem.

⇒ the host d not responding

soln:- so restart the hosted process

for long time.

~~cmd~~ To restart VMs are host together  
cmd:

service.sh restart. → through putty  
back VM will be running but  
it won't effect. Service will just restart

### ⑨ lost esxi password?

Reinstall esxi (official info)

(or)  
Go with repair (an official)

how:- Boot esxi <sup>with cd</sup> choose repair it will  
remove password & set to null. Then log in  
and preconfigure.

### ⑩ hd crash & lost esxi : (backup your configuration) reinstall

because all data is VM & OM in  
data store.

but configuration is in esxi !!  
It will lose all configurations.  
∴ better timely take backup your  
configuration

Done through vCLI

or Cmd:-

Cmd:

VICfg -cfg backup.pl. (only through  
vCLI)

VICfg -cfg backup.pl -s --server 10.0.1.20  
Save. ↓  
IP of host

esxi1-02-05-2015backup.bak

↓  
DirName      name      |  
                |      extension

Same command  
↓  
enter user name of host & password  
Save config file on your local system  
cmd: To save

VICfg-cfgbackup.pl -s --server 10.0.1.20 esxi1-02-05-2015 backup.bak

while uploading it will take default  
To Local

VICfg-cfgbackup.pl -l --server 10.0.1.20 esxi1-02-05-2015 backup.bak

Search for location

Save on default location & Local  
automatically from it

(1) PSOD

Purple screen error of death.

Soln: reboot  
(Temp soln)

→ how it appears?

purple color

→ how to extract log file from dump?

esxcfg-dumppath -L /var/core  
use tab key

VM kernel -> dump1 . . . .

the latest error is the highest no. choose  
and extract

vmkernel.log - filename.

it will be in /

use vi editor & open

apply patch

Job done.

else

Contact support team.

apart from this support team may ask  
to send vcenter log bundle

⇒ how to create log bundle & send

it is created from vcenter server system  
2008 - Programs it will be there

In 2012 - Click generate vcenter server log bundle.

or

vcenter log bundle extended choose it

it will create in desktop & send it.

\* In vcenter we have alarms:

it monitor host (host, VM, etc..)  
& prob alarm trigger)

vcenter → alarm tab (creates some prob)  
alarm

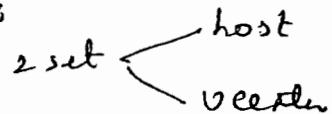
RC → acknowledge (Your name will be there) R.C. close  
One way object alarm will be there check out  
tab

double click alarm (eg. if cpu usage high for  
10 min alarm will be generated)  
core service of vcenter

⇒ customizing alarms:

RC in def see of alarm → new alarm → name (memory)  
→ choose trigger & choose memory usage → make alert  
choose action → send email & lot and mention email id →  
→ ok "Vcenter sends email"

⇒ logs:



home → system logs. (esxi)

home → & vcenter logs (vcenter)

⇒ Maps:-

using map check architecture

⇒ Configuring email setting in Vcenter

home → vcenter server settings → mail (smtp domain

name & vcenter account → snmp config &

⇒ Creating tasks:

home → right schedule task → new → choose a task

\* upgrading esxi from low to high version.

3 important component

- host ③
- vcenter ②
- vsphere client ①

first upgrade client then upgrade  
vcenter then upgrade host.

better fresh install (best)

(official)

↓  
upgrade (not so best)

~~shortest~~ in upgrade of low from high you

will have 3 option

(upgrade only)

upgrade esxi: preserve vms (vms not deleted)

new (old will go install esxi) preserve vms (vms not deleted)

(switch to install esxi: do not preserve vms  
fresh install)

⇒ Diff between 5.1 & 5.5

function & arch both same

5.1

- 2 GB RAM  
- Max 2 TB

- VM virtual hd can  
be upto 2 TB

5.5

4 GB RAM  
Max 4 TB

- significant change:  
VM virtual hd can  
be upto 64 TB

- VSAN (Step towards  
SAN before storage)

VSAI:

use local hd & create pool of NFS volume no  
need of shared storage but 3 server with high  
storage. Good for small org.

6/2/15 VShield:

- Name given to family of products
- Security products developed for cloud
- (VNS) - ~~the~~ Virtual Networking & security products  
is now native in old we called as  
VShield.

## ↳ & VCA Family

- 3 products

Used in cloud.  
• Vshield edge  
• Vshield App with data security  
• Vshield end point

### Vshield edge:

- firewall
- protect the perimeter of data center
- NAT, DHCP, Routing are some other features.
- it act as virtual route

### Vshield App with data security

- forward firewall
- hypervisor based
- application aware firewall  
for virtual data center

### Vshield end point:-

↳ basically a service

- offloads antivirus & <sup>anti</sup>malware agent processing to a dedicated Secured VM delivered by VM Partners

End points integrated with S/I

These 3 are managed by

Vshield Manager now, VCA Manager

VCA's Mgr:-

- Virtual appliances
- Pre configured VM.

\* Usable end point:

Service help in installing antivirus

Symantec end point

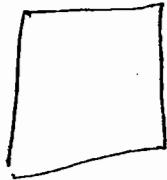
Kaspersky endpoints

McAfee end point

are some which can be installed directly

But there is prob.

system



Scanning require lot of resource

In physical machine it is scanning one process so lot of resource will be there

but here it shares Memory

& storage. If ~~so~~ run out of space they ask ESXi and it can't provide and it hangs

better remove A.V agents from VM.  
 Make a dedicated server for  
 Antivirus on ESXi  
 like Kaspersky  
 "Trend Micro solution" provide  
 security for "VMware".  
 Here Vshield is service in ESXi:  
 "it offloading end point agent process from  
 VM to a dedicated Secure Virtual  
 appliance" "DSVA" from "Trend Microsolution"  
 So all other machine &  
 will get solution from this dedicated  
 machine.

\* High level overview:-  
 first → VCSA Manager (Deploy it)



1. Deploy VCSA Manager OR VSM.  
 power on configure & integrate
2. using this install Vshield endpoint  
 on ESXi host.

then "Trend Micro system product "DSVA"

"Deep secure virtual appliance"

~~install & deploy it~~

③ "Deep Security Manager" it is similar to System Center Operation Manager.. it is an application used to deploy & monitor antivirus solutions from "Trend Microsys". It will get installed on unix/linux but mostly in win.

Once installed it will integrate with Vcenter & vSM.

④ after that we install DSVA on ESXi host

### CABS

Vcenter:-

File → Deploy OVF template

Browse & choose it

Accept → give name → and select a data center → select cluster → next → next → Then provision → next → next → finish

Power on Kshield VM → open the console.

One  
Kshield VM  
for a Vcenter  
server

login credentials :-

username : admin

passwd. : default

> enable

: default (passwd)

# setup

ip add: 10.99.99.10

mask : 255.0.0.0

gate: 10.0.1.20

DNS : 10.0.1.20

Domain : x.com .com



Yes to save config.

log out &

login after 2 min

u: admin

p: default

> exit

ping & check to the IP

Open a browser & enter IP

<https://10.99.99.10/>

login with credentials

admin

default

- integrate this with Vcenter
  - it is single signon. (similar)
- ~~similar to single signon, but single signon.~~
- Provide single signon IP & username.
  - after that it will integrate with vcenter
- Vcenter IP & username.
  - it will integrate with Vcenter
- You will get all host & VMs.
  - Select VMs and install Vshield service.

### Veeam:

- application
- can install on host machine.
- 3<sup>rd</sup> Party, lightweight app
- robust, light and it take backups of Virtual Machine & hyper v.
- Mostly used
- replication of data also possible

## Configuration:

- Deploy on a Win Machine
- Mount the iso image  
edit settings → cd → choose image.
- my computer & choose & double click  
& click on setup → install.

require - .net 4.0

- db.

~~accept~~ follow instructions &  
free editions not possible.

provide db passed during  
installation. (install. veeam)

VIM backup replication → launch it.

add vcenter

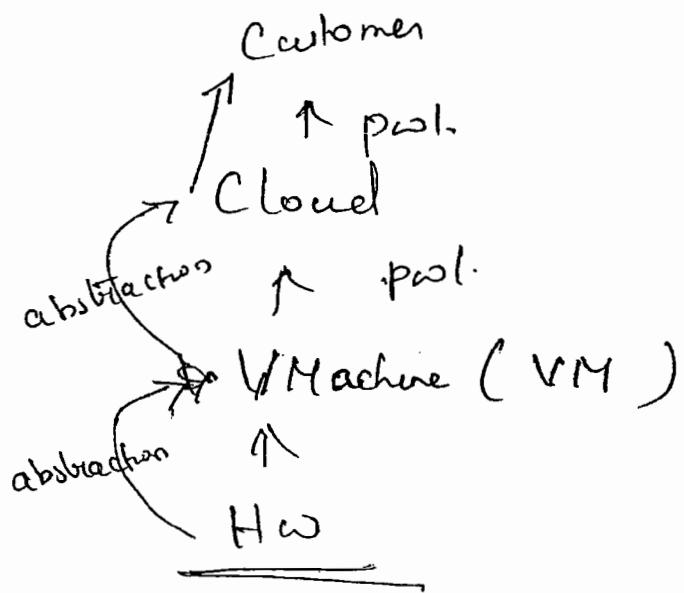
Add server → enter ip → next  
provider credential and ~~select~~ add it

Select a VM → click veeam zip &  
store in a loc. → it will start backup

You integrate SAN but hp only.  
Select a dest. it will do backup

Quick migration is migration of VMs.

## General abstraction layer.



In future.....

"cloud... !!!"

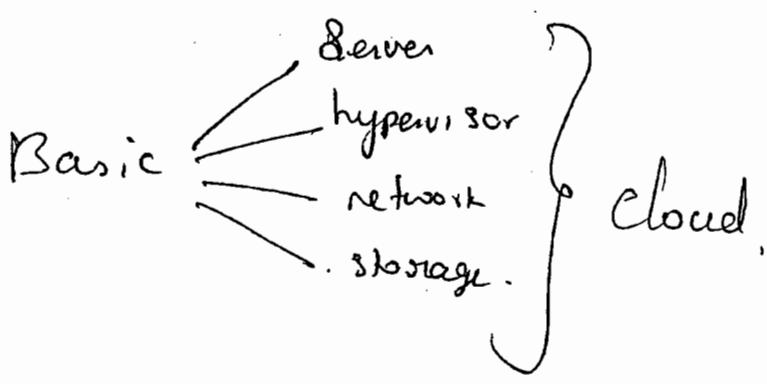
cloud or data center

laptops, ipads, smartphone  
will be used to manage all

prob for small org.

Virtualization & cloud will be base,

by.



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