• Forged Transmits (default Accept) - won't drops outbound frames if source MAC address is different. Traffic Shaping • Status (default Disabled) Average Bandwidth (default 102400 Kbps) Peak Bandwidth (default 102400 Kbps) Burst size (default 102400 KB) - shapes out on vSS, in/out on vDS. NIC Teaming • Load Balancing (spreads outbound traffic from vNICs across VMNICs). Originating port ID (default) uses VMNIC based on where traffic entered. ip hash based on source & destination IP address of each packet (if physical switch ports are etherchannel). Source MAC hash based on source MAC address. Route based on physical NIC load only on vDS, dynamically redistributes load across all VMNICs in team. Use explicit failover order. Incoming traffic is load balanced by physical switch. • Network Failover Detection Link status only (default) detects cable pulls & switch power failures, no misconfigurations. <u>Beacon Probing</u> don't use with IP-hash load balancing. • Notify Switches - No or Yes (default) updates lookup tables. Disable for MS NLB in unicast mode. • Failback - No or Yes (default) VMNIC will return after recovering from a failure. • Failover order Active - Standby - Unused. Don't use standby uplinks with IP-hash load balancing. **VLAN** (vDS only) • <u>VLAN</u> - set ID. <u>Trunk range</u> - restrict IDs on trunked links. <u>PVLAN</u> - see below. **Miscellaneous** (vDS only) • Port blocking - selected or unselected (default) block all ports. **dvPort options**: • Port Binding Static when initially connected <u>Dynamic</u> when connected/powered-on Ephemeral no binding • Traffic shaping Ingress into vSwitch Egress out of vSwitch • Allow live port moving • Config reset at disconnect • Host can assign port if vCenter is down • Name format NIOC (Network IO Control): prioritise egress vDS traffic via shares/limits (FT,iSCSI,vMotion,Mgt,NFS,VM **PVLAN** (Private VLAN): extension to VLAN standard, adds further segmentation. Not encapsulated. Primary PVLAN - Original VLAN divided into smaller groups. Secondary PVLAN - exists only within primary, has specific VLAN ID. **Secondary types**: <u>Promiscuous</u> - connect with VMs in primary. Community-connect to themselves & VMs on promiscuous <u>Isolated</u>-connect with VMs on promiscuous **TSO** (TCP Segmentation Offload): enabled by default on VMkernel ports, allows very large frames (up to 64KB), even with smaller MTU. To enable on VMs, they need enhanced vmxnet vNIC. **Jumbo frames** up to 9kB. Must be enabled for each vSwitch. vNIC must be vmxnet2/3 or e1000. **NetQueue** enabled by default, allows certain VMNICs to spread processing across multiple CPUs. Configure networking (for vSS): (1) add vSwitch esxcfg-vswitch -a (2) add port group to vSwitch <code>esxcfg-vswitch -A</code> (3) set port group's VLAN ID <code>esxcfg-vswitch -p -v</code> (4) add VMNIC to vSwitch esxcfg-vswitch -L • VM connections: set VM's NIC to use port group. • Service Console: create interface & add it to the port group **esxcfg-vswif -a -p -i -n**, set the DG in /etc/sysconfig/network, then restart networking service network restart. • VMkernel ports: add port esxcfg-vmknic -a -i -n & set VMkernel DG esxcfg-route.

Links: http://kb.vmware.com/kb/1000258 - Configure networking from Service Console http://vmware.com/files/pdf/vsphere-vnetwork-ds-migration-configuration-wp.pdf - vDS whitepaper

vMotion enabled in vCenter if required.

Resources

Maximums (per DRS cluster): Hosts = 32 VMs (powered on) = 3000 (limit of 320 per host) **Maximums (per Resource Pool)**: Children = 1024 Tree depth = 8 **Maximums (other)**: Hosts per datacenter = 400 RPs per host = 4096RPs per cluster = 512Datacenters mark organisational & vMotion boundaries. Clusters gather host CPU & memory resources. **Resource Pools** apply policies to clusters. A DRS cluster is also implicitly a resource pool. **Resource pools:** • Shares - low, medium & high (1,2,4) • Reservations - MHz(CPU)/MB(RAM) • <u>Limits</u> - MHz/MB • Expandable reservation - yes (can draw from parent's pool) - no (can only draw from own pool). List the resource group settings: \$ sudo /usr/sbin/esxcfg-resgrp -1 Shares only apply during contention. Shares are relative to siblings. Reservations guarantee a minimum, are only checked when a VM is powered on. Limits are an upper bound, never exceeded; manage user expectations but can waste idle resources. Expandable reservations do not automatically hunt upwards, define if reservations are considered by admission control. Child pools actively reserve resources from parent even if VMs are powered off. Hierarchical resource pools require DRS enabled. DRS: priority levels 1-5 (1 the highest). DRS cluster settings: • Manual • Partial (Initial VM

placement) • Fully Automated (Initial VM placement & Dynamic balancing). Current Host Load Standard Deviation: load imbalance. Lower than Target value unless recommendations are unapplied. 'Grafted from" pools created when adding a host to a DRS cluster & keeping the host's resource pool nierarchy. **Maintenance mode** only clears VMs off host if DRS cluster is fully automated. **Affinity Rules**: VM-VM keep VMs together/apart. VM-Host keep VMs on/off specific hosts. Should rule best effort. Must rule mandatory (for licensing). Rule conflicts older wins, newer rule disabled. Anti-affinity wins over affinity. Disabled rules ignored. **Current host load standard deviation**: DRS load imbalance. Current < Target unless advice unapplied

DPM: uses IPMI, iLO or WOL (in that order). DRS & DPM thresholds are independent. Verify host's DPM Last Time Exited Standby. DPM level - Off, Manual (makes recommendations) & Automatic. Links: http://kb.vmware.com/kb/1005764 - Enhanced vMotion (EVC) FAQ http://www.yellow-bricks.com/drs-deepdive/ - DRS Deep Dive

http://kb.vmware.com/kb/1003212 - EVC CPU compatibility

Boot ESX host

VM power user

VM MSCS clustering

Storage
Maximums (per host): Volumes = 256 Paths = 1024 NAS datastores = 64 FC - HBAs = 8 (HBA ports = 16) targets per HBA = 256paths to each LUN = 32targets per HBA = 64 (62 - QLogic Static) paths to each LUN = 8 iSCSI HW - HBAs = 4iSCSI SW - NICs = 8 paths to each LUN = 8targets = 256**Maximums (per volume):** VMs = 256 Hosts = 64 (DRS limit, 2048 for linked clones) VMFS = 64TB (less 16KB) NFS =16TB File size (1/2/4/8MB blocks) = 256GB/512GB/1TB/2TB RDMs = 2TB (less 512B)Extents = 32Extent size = 2TB (less 512B) Prot (ESX port) Description FW Port Source Destination TCP (VMK) NFS Client 2049 NFS server ESX/ESXi 2049 ESX/ESXi TCP (VMK) NFS Client NFS server 3260 ESX/ESXi iSCSI server UDP (SC+VMK) iSCSI Client Common storage commands (-h switch for options, or man page for detailed description):

List all storage devices:

\$ sudo /usr/sbin/esxcfg-scsidevs -c List LUNs, paths & multipathing plugins: \$ sudo /usr/sbin/esxcfg-mpath -L List all VMware SATPs: \$ sudo /usr/sbin/esxcli nmp satp list List claim rules: \$ sudo /usr/sbin/esxcli corestorage claimrule list Lists datastores, dev names to VMFS: \$ sudo /usr/sbin/esxcfg-scsidevs -m List snapshot volumes: \$ sudo /usr/sbin/esxcfg-volume -1 Test VMkernel connectivity: \$ /usr/sbin/vmkping Manage HW iSCSI (Qlogic) settings: \$ sudo /usr/sbin/esxcfg-hwiscsi -l \$ sudo /usr/sbin/esxcfg-swiscsi -q Manage SW iSCSI settings: \$ sudo /usr/sbin/vmkiscsi-tool -L -l adapter List iSCSI LUNs: Rescan iSCSI LUNs: \$ sudo /usr/sbin/esxcfg-rescan adapter List the NFS exports from the VMkernel: \$ sudo /usr/sbin/esxcfg-nas -1 FC NAS Storage capabilities iSCSI vMotion, DRS, HA, FT, VCB, SRM & Thin VMDKs Yes Yes Yes VMFS volumes, RDMs & VMware's NMP

LUN masking: done at the SP or server. **Zoning**: at the switch. **Active-active**: access to the LUNs simultaneously through all ports, without performance degradation. **Active-passive**: one port actively providing access, other as backup. Path thrashing can occur. **NPIV** (N-Port ID Virtualization): FC HBA port assigns dedicated virtual port (WWPN) to VM (RDM) **LUN addressing** FC: Runtime Name vmhba#: *C*#: *T*#: *L*# - adapter: channel: target: LUN

Yes

Yes

Yes (HW initiator)

iSCSI: <u>IQN</u> iqn.year-mo.reversed_domain_name:string or <u>EUI</u> eui.string **iSCSI discovery methods**: Static - can manually add/remove items, only with hardware initiators. Dynamic - uses "SendTargets", target responds with list. Removed targets return after HBA rescan/reset **CHAP**: HW iSCSI 1-way CHAP, initiator level. SW iSCSI 1-way & mutual CHAP, initiator or target VMkernel Port is required to use iSCSI or NFS storage. (S.C. port not required for iSCSI anymore) **MPP** (MultiPathing Plugins): claim rules in /etc/vmware/esx.conf specify MPP to use for each path. **Claim rules**: indicate which MPP, native or 3rd party, manages a given physical path. NMP (Native MPP): • SATPs (Storage Array Type Plugins) - handles failovers. • PSPs (Path Selection Plugins) - handles load-balancing. **NMP policies**: <u>Fixed</u> - default for active/active, uses preferred path when available. MRU (Most Recently Used) - default for active/passive (& iSCSI), first working path found at boot. RR (Round Robin) - safe for all arrays, rotates through paths (not MSCS LUNs). Disk.MaxLUN: reduce number of LUNs scanned. Disk.MaskLUN: convert to claim rule instead

VMFS volumes: Large=less LUNs to create, less to manage, flexible resizing & snapshots. Small=less contention (locking), less wasted space, different RAIDs, more flexible multipathing & disk shares. **SIOC** (Storage IO Control): shares VM's disk IO across datastore's hosts. Monitors latency, adjusts VM's host queue access. Can also enforce VM IOPS limits. Enable on datastore, set shares/limit on VM **ALUA** (Asymmetric Logical Unit Access): finds/manages multiple paths for failover & load balancing. Links: http://kb.vmware.com/kb/1009553 - Lost connectivity to storage http://media.netapp.com/documents/tr-3749.pdf - Storage best practices whitepaper (NetApp)

http://media.netapp.com/documents/tr-3747.pdf - File System alignment whitepaper (NetApp)

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No

No

No

vReference.com

Version 2.3.2 for v4.1 by **Forbes Guthrie** released 13 Sep 2010

HW requirements: • 64-bit x86 CPUs • 2GB RAM minimum • see HCL (link below) **IPv6** is not supported during the install. **Installation log**: /var/log/esx_install.log **Evaluation period** (60 days) starts on first power-on even if host is licensed. Install **boot options**: F2. Install via **Media Depot**: HTTP/ HTTPS, FTP, NFS - askmedia option. **PXE Boot** install: (1) Install TFTP server software (2) Put menu.c32 file in accessible place (3) Install PXELINUX (4) Configure DHCP server (5) Copy vmlinuz & initrd.img from /isolinux on DVD (6) Create /tftpboot/pxelinux.cfg on TFTP server.

<u>Default install scripts</u>: • ks-first.cfg installs on 1St disk • ks-first-safe.cfg same but keeps VMFS. Root password is "mypassword". Interactive install creates /root/ks.cfg from choices made. **Physical partitions**: /boot, vmkcore & /vmfs. **esxconsole.vmdk**: /, swap, /var/log, & optional ones. Size of /boot, vmkcore & VMFS cannot be defined/changed during Interactive install (can if Scripted). **Mount point** Format **Default** Location

Install script can be: Default script (on DVD), FTP, HTTP/HTTPS, NFS, USB flash drive, local disk.

1100MB Primary physical partition /boot ext3 vmkcore 110MB Primary physical partition fill remaining 1st disk /vmfs Logical physical partition vmfs3 5GB (default min, may be larger) esxconsole.vmdk file (root) ext3 600MB default (max 1600MB) esxconsole.vmdk file swap optional - recommended 512MB esxconsole.vmdk file /home ext3 esxconsole.vmdk file optional - recommended 1024MB /tmp ext3 optional - no recommendation esxconsole.vmdk file /usr ext3 optional - recommended 2000MB esxconsole.vmdk file /var/log ext3 vReference recommends: /home, /opt, /tmp - min 2GB each, /var (no /var/log) - 5GB, swap - 1600MB If scripting install, consider one VMFS for COS (esxconsole.vmdk) and a separate one for VMs.

Post install tasks: • Reconnect FC connections. • Create user account & add to sudoer file (visudo - add to "user privilege specification").

• Test cables are in correct VMNICs: \$ watch -n 1 'sudo /usr/sbin/esxcfg-nics -l • Rearrange VMNICs in /etc/vmware/esx.conf if required (reboot required).

• Adjust Service Console memory to 800MB (reboot required). • Configure NTP (time) settings.

Disconnect Fibre Channel connections prior to installation.

Patch (VUM or vihostupdate/esxupdate).

• Connect vSphere Client to host (not VC) & add extra users (the sudo users) to Administrators group. • Configure vSwitches.

• Configure storage (& set DiskMaxLUN as required). • Connect vSphere Client to VC, add new host, move to required cluster.

• License host.

• Enable Web access if required.

Upgrade from ESX3: (cannot use DVD) • <u>VUM (vCenter Update Manager)</u> - upgrades ESX/ESXi. • Host Update Utility - upgrades ESX/ESXi (& updates ESXi), small environments (< 10 hosts, no VUM). Customize in %PROGRAMFILES%\VMware\Infrastructure\VIUpdate 4.0 \settings.config

• esxupgrade . sh script http://kb.vmware.com/kb/1009440 - upgrades ESX only. **Upgrade logs:** /esx3-installation/esx4-upgrade/ & /var/log/vmware/ Unsuccessful upgrades: /esx4-upgrade/ & /var/log/vmware/ **Post upgrade**: • Upgrade VMware Tools before upgrading virtual hardware • Re-install 3rd party

agents/apps • Convert LUN masking to claim rule format: esxcli corestorage claimrule **convert** • Successful upgrade: **cleanup-esx3** removes ESX3 boot options & ability to roll back Links: http://www.vmware.com/resources/compatibility/search.php - Hardware Compatibility Guide http://kb.vmware.com/kb/1009080 - Installing ESX 4.0 & vCenter 4.0 best practices

http://kb.vmware.com/kb/1009039 - Upgrading to ESX 4.0 & vCenter 4.0 best practices http://kb.vmware.com/kb/1010675 - Upgrading an ESX 3.x VM to ESX 4.0 http://kb.vmware.com/kb/1011712 - See if Intel VT or AMD-V is BIOS enabled without rebooting

Clients

SW requirements: vSphere Client: Windows with .NET 3.0 SP1 framework. Web Access: Win - 2003 SP1, XP pro SP3, XP home SP2, 2000 SP4, Linux - GTK+ 2. Browsers - IE6, 7 or ≥, Firefox 2, 3 or ≥ Protocol FW Port Destination Description Source 22 SSH client, WebAccess ESX TCP SSH access 80 ESX, VC TCP WebAccess Redirect to HTTPS 427 Clients, Web Access ESX/ESXi TCP CIM SLP client 443 ESX/ESXi, VC TCP Clients, Web Access HTTPS

902 Clients, Web Access ESX/ESXi TCP Authentication 903 ESX/ESXi TCP Clients, Web Access VM Console 5989 Clients, Web Access ESX/ESXi CIM transactions TCP **Logs**: Client Agent log /var/log/vmware/vpx/vpxa.log Client Install log %TEMP%\vmmsi.log Client Service log C:\Docs and Settings\username\Local Settings\App Data\vpx\viclient-x.log (x=0-9) Web Access to ESX or VC: https://hostname.domain.com/ui • ESXi - no WebAccess • ESX - disabled Web Access status check: \$ sudo /sbin/service vmware-webAccess status

Web Access Remote Console URLs: • Limit view to remote console - hides details like event logs • Limit view to single VM - disables inventory navigation. Permission to VMs still granted in ESX or vCenter. Alarms tab available connected to vCenter (not ESX). Web Access allows only viewing tasks. **Links:** http://www.jume.nl/articles/vmware/143-vcenter-client-shortcuts - vCenter client shortcuts

ESX Hosts

Maximums (per host): vCPUs = 512 vCPUs per physical core = 25 Logical procs (incl HT) = 128 RAM = 1TBService Console RAM = 800MB (min=272MB) VMs = 320 FW Port Destination Prot (ESX port) Description Source SSH client ESX TCP (SC) SSH server 53 (out) ESX/ESXi DNS server(s) UDP (SC) DNS requests Clients ESX/ESXi TCP (SC) HTTP access 123 (out) UDP (SC) ESX/ESXi NTP source NTP (time) client Hosts, Client ESX/ESXi UDP (SC) CIM SLP client/server 427 (out) ESX/ESXi UDP (SC) CIM SLP client/server Hosts Hosts, Clients, VC ESX/ESXi TCP (SC) **HTTPS** access 902 ESX/ESXi TCP (SC) Auth, migrate, provision Hosts, Clients, VC UDP (SC) 902 (out) ESX/ESXi Hosts, VC Auth, migrate, provision ESX/ESXi VM Console 903 Clients TCP (SC) 5900-5964 ESX/ESXi RFB for mgt tools (VNC) TCP (SC) RFB for mgt tools (VNC) 5900-5964 (out) Hosts TCP (SC) ESX/ESXi Clients TCP (SC) CIM server over HTTPS 5989 (out) ESX/ESXi TCP (SC) CIM server over HTTPS Hosts ESX/ESXi TCP (VMK) vMotion requests Hosts vMotion requests 8000 (out) ESX/ESXi Hosts TCP (VMK) Possible extras:21(FTP),22out(SSH),53(DNS),88/389/464(AD),161/162(SNMP),445(SMB),5988(CIM) **Logs**: Service Console Availability & VMkernel Messages, Alerts, Availability: /var/log/vmkernel

ESX service log: /var/log/vmware/hostd.log Syslog: /var/log/messages VMkernel warnings: /var/log/vmkwarning VMkernel events: /var/log/vmksummary VC agent: /var/log/vmware/vpx/vpxa.log Patching: /var/log/vmware/esxupdate.log **Common ESX host commands** (**-h** switch for options or man page for detailed description): \$ sudo /sbin/service --status-all List status of all services: List the service runlevels: \$ chkconfig --list

Restart a service: \$ sudo /sbin/service service_name restart (start, stop, status available)

Common services: • mgmt - vmware (hostd) • vmware - vpxa (vCenter agent) • vmware -

vmkauthd (authentication) • network (vswif changes) • vmware-webAccess (Web Access) Show build number: \$ vmware -v \$ sudo vdf -hP Check the filesystem usage: \$ sudo /usr/sbin/esxcfg-dumppart -1 List diagnostic partitions: Show description of VMkernel error: \$ vmkerrcode error_code_number Export detailed config file: \$ sudo esxcfg-info > /tmp/esxcfg-info.txt Gather debugging report: \$ sudo /usr/bin/vm-support -w /tmp \$ sudo /usr/sbin/esxcfg-auth Configure authentication settings:

\$ sudo /usr/sbin/esxcfq-module -1 Lists drivers loaded at startup: Set advanced options: \$ sudo /usr/sbin/esxcfg-advcfg option -s value (-g to get) Update bootstrap settings: \$ sudo /usr/sbin/esxcfg-boot (treat with caution) Initialization routines (resets things): \$ sudo /usr/sbin/esxcfg-init (treat with caution) **Internal firewall commands** (iptables on Service Console):

Show all firewall settings: \$ sudo /usr/sbin/esxcfg-firewall -q List the firewall named services: \$ sudo /usr/sbin/esxcfg-firewall -s Enable a service: \$ sudo /usr/sbin/esxcfg-firewall -e service_name (-d to disable) To open a port: \$ sudo /usr/sbin/esxcfg-firewall -o port, protocol, direction, name **Security Levels**: High - in/out blocked. Medium - in blocked, out open. Low - in/out open. By default all traffic blocked in & out, except 22, 123, 427, 443, 902, 5989, 5988, pings, DHCP & DNS

Set certificate location /etc/vmware/hostd/proxy.xml SSL settings /etc/vmware/hostd/config.xml **PAM** (Pluggable Authentication Modules) configuration: /etc/pam.d/vmware-authd Default authentication method is /etc/passwd. vpxuser is for vCenter Server permissions. **Passwords**: ESX uses pam_cracklib.so plug-in by default. No restrictions on root password. Defaults for non-root users: password retries = 3, minimum password length = 9, shorter passwords if Characters Classes mixed (upper, lower, digits & other) M - CC = E. pam_passwdqc.so provides more options. **User Password Aging**: enabled by default, set to never expire (max days) & change anytime (min days = 0, warning = 7) • Change host settings: **esxcfg-auth** • Change user settings: **chage**

NUMA (Non-Uniform Memory Access): controls VM memory distribution across host memory. Only

Certificate private key /etc/vmware/ssl/rui.key

use NUMA if CPU affinity is set. HT: can help better utilize idle resources. **Reclaims VM memory by:** • Balloon driver (vmmemctl) force guest to use native algorithms (guest swap) • Memory compression • .vswp file (if vmmemctl unresponsive) • Sharing memory across VMs VMware MIBs: uses embedded SNMP agent (disabled by default). Enable: vicfg-snmp syslogd: to configure • ESX - edit /etc/syslog.conf • ESXi - use Client or vicfq - syslog Links: http://kb.vmware.com/kb/653 - Collecting diagnostic information for ESX Servers http://kb.vmware.com/kb/1005184 - Decoding Machine Check Exception output after purple screen http://kb.vmware.com/kb/1012514 - Determining detailed build number information for ESX hosts

http://www.vmware.com/pdf/Perf_Best_Practices_vSphere4.0.pdf - Performance best practices

http://communities.vmware.com/docs/DOC-9279 - Interpreting esxtop Statistics

Certificate public key /etc/vmware/ssl/rui.crt

HW requirements: 64bit x86 CPUs, 2GB RAM, SATA, SAS or SCSI disks. No ESXi WebAccess. ESXi Installable starts in eval mode (60 days). If no DHCP at install, link local IP used 169.254.x.x/16. **ESXi Installable Partitions:** 4GB VFAT scratch for system swap (not required, but stores vm-support). 110MB diagnostic for core dumps, VMFS3 on free space.

Not supported: • ESXi Installable & Embedded on same host • Booting multiple servers from 1 image **DCUI** (Direct Console UI): • Configuring host defaults • Set up administrative access • Troubleshooting **Restarting Mgt agents** effects /etc/init.d processes: hostd (mgmt-vmware), ntpd (time), sfcbd (CIM broker), slpd (discover/advertise services), wsman (share mgt info via SOAP), vobd (error reporting) & AAM (HA agent) if installed. To isolate ESXi host from DRS/HA cluster disable mgt network. Management Network Test: pings DG, primary DNS nameserver, secondary DNS, resolves hostname **TSM** (Tech Support Mode): busybox console now fully supported, remote connection via SSH. **Lockdown mode**: DCUI restricted to root user, TSM disabled for all users, vSphere client and CIM monitoring only via vCenter not direct to host.

vicfg-cfgbackup • Backup host configuration: -s • Restore: -1 (-f if different build number) Repair mode on ESXi Installable CD overwrites all configuration data. VMFS is preserved if VMFS is original location on boot disk (or beyond 900MB partition), or another disk.

Maximums (per vCenter): Hosts = 1000 VMs = 15000 Running VMs = 10000 Clients = 100**Maximums** (Linked mode): vCenters = 10 VMs = 50000 Running VMs = 30000 Hosts = 3000 **Maximums (per host)**: Provisioning ops = 4 vMotions = 4 (8 for 10Gbps) Storage vMotions = 2 **Maximums (per datastore)**:Hosts = 400 Provisioning ops = 4 vMotions = 128 Storage vMotions=8 **HW requirements**: Min - 2 CPU cores, 3GB RAM • Medium (50 hosts, 500 VMs) 2 cores, 4GB RAM Large (300 hosts, 3000 VMs) 4 cores, 8GB RAM
 Extra large (1000 hosts 10000 VMs) 8 cores 16GB **SW requirements**: • Only 64bit Windows now • hostname - 15 characters or less. **Databases:** • SQL 2005 Express (up to 5 hosts & 50 VMs) • SQL 2005 (use SQL Native Client v9)

• SQL 2008 (SQL Native Client v10) • Oracle 10g & 11g • IBM DB2 9.5. Not SQL 2000 nor Oracle9i. VC needs 64bit ODBC DSN. User needs DBO rights. Default of max 10 simultaneous DB connections. MSSQL - don't use master DB.

Pre-Upgrade Checker Tool: on vCenter DVD, checks for potential issues with hosts prior to upgrade. FW Port Source Destination Protocol Description Clients TCP Redirect to HTTPS 389 VCAD DCs TCP AD lookup 443 Clients TCP VCVIC & WebAccess 443 **TCP** VCHosts vCenter agent 902 VC UDP Hosts Heartbeat 902 UDP VCHosts Heartbeat 903 VC Hosts, Clients TCP VM Console Possible extras: 22/135/137-139/445/9089(guided consolidation),25(SMTP),53(DNS),80(redirects).

88/445(AD),161/162(SNMP),389(LDAP),636(Linked VCs),1433(MSSQL),1521(Oracle), 8080/8443(webservices),8181/8182(collector service),27000/27010(license 3.x hosts). Logs: DB upgrade: %TEMP%\VCDatabaseUpgrade.log VC agent: /var/log/vmware/vpx/vpxa.log VC install: %TEMP%\ directory of user installing VC VC logs: %TEMP%\vpx\vpxd-#.log **Default roles** (System roles - permanent, cannot change privileges, ESX/ESXi & VC. Sample just vC): System - Default except users in Admin Group. Cannot view or change. No access Read only System - View state & details except console tab. System - All privileges. Default for members of the Admin Group. Administrator

Sample - Interact with, change VM settings, snapshots & schedule tasks.

Sample - Interact with, insert media & power ops. Not changeVM settings.

Resource pool admin Sample - Create, modify child pools & assign VMs, but not RP itself. Consolidated backup user Sample - Used by Consolidated Backup product, don't modify. Sample - Allows use of the datastore. Network consumer Sample - Allows network to be assigned to hosts or VMs. **Permissions**: Assigning - pair user/group with role & associate with object. Role - predefined set of privileges. Users initially granted No Access role on new objects, including datastores/networks. Logged in users removed from domain keep permissions until next validation period (default 24 hrs). Tasks - activities that don't complete immediately. All roles allow schedule tasks by default. Can schedule tasks if user has permission when tasks created. VC Local Administrators have same rights as

Administrator role by default. root & vpxuser are only users not assigned No Access role on hosts by

default. Propagation is per permission, not universal. Child permissions override those propagated. User

permissions override Group ones. Can't set vDS permissions, set on parent & propagate. ESXi Single Essential Essential+ Standard Advanced Enterprise Enterprise+ Licenses ---- Foundation & Standard editions ---vCenter ---- Essentials ----6 6 6 Cores per socket 6 12 6 12 vSMP 4-way 4-way 4-way 4-way 4-way 4-way 8-way Physical RAM 256GB 256GB 256GB 256GB 256GB 256GB no limit vpxa,Up Mgr,vStorage Yes Yes Yes Yes Yes Yes HA, vMotion Yes Yes Yes Yes Yes Data Recovery Yes Yes Yes Yes Thin Provisioning Yes Yes Yes Yes Hot Add, FT, vShield Zones, Serial Port Concentrator Yes Yes Yes Storage vMotion, DRS, DPM, VAAI Yes Yes

vDS, Host Profiles, 3rd party MMP, SIOC, NIOC Yes **Licensing**: 25-character license keys, managed in VC. vSphere (ESX/ESXi) & vCenter Licenses. Expiring licenses: <u>vCenter</u> - hosts are disconnected. <u>ESX/ESXi</u> - VMs run, but cannot power-on/reset. Statistics: CPU, memory, disk, network, system, & VM ops. Collection Intervals (time stats - archived in DB): 5mins - 1 day, 30 mins - 1 week, 2 hrs - 1 month, 1 day - 1 year. Real-time stats stored in flat file on hosts & VC memory (not in DB), collected every 20 seconds. ESX - kept for 1 hr, ESXi - kept for 30 mins. Collection level 1-4 for each interval, 4 has most counters (default is 1). Datastore metrics only available in overview charts (not advanced charts). Reports & Maps updated every 30 mins. **Alarms**: notifications of selected events, conditions & states. Composed of trigger & action. <u>Triggers</u>: condition/state triggers (monitor VMs, hosts & datastores - equal to/not equal to & above/below) & event triggers (any object, VC or license server - arguments, operators & values). Actions: responses to triggered alarms. Default alarms don't have actions associated. Can disable action without disabling alarm, but effects actions on all alarms. Disable for selected object, child continues. Reduce alarms with tolerance range & trigger frequency (default 5 mins). Disconnect hosts to suspend monitoring. **Linked mode**: joins VCs. Global data: IP & ports, certificates, licensing, user roles. Uses ADAM (AD App Mode) to store & sync data. Instances can run under different domain accounts. Installed by domain user who is admin on both machines. Requirements: DNS, 2-way trust if different domains, time sync, DNS name matches hostname. Roles are replicated, assignments of roles are not. **Server settings**: licensing (vCenter & 3.x), statistics (intervals & DB size), runtime settings (unique ID, managed IP, name), AD (timeouts, query limit, validation period), mail, SNMP receivers, http(s) ports, client timeouts, logging detail, DB connections, DB retention, SSL host verification, advanced settings.

Links: http://kb.vmware.com/kb/1011641 - Collecting diagnostic information for vCenter http://kb.vmware.com/kb/1022101 - Installing ESX 4.1 & vCenter 4.1 best practices http://kb.vmware.com/kb/1022104 - Upgrading to ESX 4.1 & vCenter 4.1 best practices http://kb.vmware.com/kb/1005593 - sysprep file locations and versions http://kb.vmware.com/kb/1010579 - Comparison of vSphere 4.0 & VI 3.x licensing

http://kb.vmware.com/kb/1010839 - Video: Licensing management http://kb.vmware.com/kb/1010550 - Setting up vCenter Server in a MSCS **Maximums (per VM)**: vCPUs = 8 RAM = 255GB(16GB - FT VMs) Swap file = 255GB (1 per VM)

Devices per SCSI adapter = 15 SCSI adapters = 4 IDE devices (disk or CD) = 4vNICs = 10USB devices = 20 Floppy drives = 2 Parallel ports = 3 Serial ports = 4 Remote consoles = 40 VMDirectPath devices = 4 VMDirectPath SCSI targets = 60 **Files**: .cfg Earlier version of .vmx file .vmem VM's memory .vmsd Snapshot metadata Earlier version of .vmdk file vMotion log file .vmsn Snapshot state file .lck-XXX Locking file on NFS datastore .vmss Suspended state file .log VM activity log .vmtd Earlier version of VC template .nvram BIOS settings .vmtm Team data Raw device e.g. tape device .vmtx VC template header .raw .rdm RDM in Virtual Compatibility mode .vmx Primary configuration file

RDM in Physical Compatibility mode | .vmxf | Extra configuration file for VMs in a team .rdmp .REDO Earlier version of –delta.vmdk file .vswp Swap file for overcommitted memory Earlier version of .vmss file .std Disk descriptor (also raw virtual disk for hosted products) .vmdk -flat.vmdk Raw virtual disks 00000#.vmdk Snapshot metadata -ctk.vmdk Changed Block Tracking file 00000#-delta.vmdk Snapshot differential file

Logs: VM log /vmfs/volumes/datastore_name/vm_name/vmware.log Commands: List all registered VMs on a host: \$ sudo /usr/bin/vmware-cmd -1 Create/modify VMDKs, RDMs, VMFS volumes & storage devices: vmkfstools (check man page) Power Off = hard power off • Shut Down = soft with VMware tools • Reset = hard • Restart = soft **VM HW**: Memory/CPU Hotplug – VMware Tools must be installed.

VMs with HW earlier than v4 have reduced performance & capabilities. Cannot add/remove devices. Manually MAC addresses: 00:50:56:x:y:z. Set in vmx: ethernet<number>.addressType="static". Disk types: zeroedthick (lazy) default, pre-allocates. eagerzeroedthick select "Support clustering features such as FT", pre-allocates & zeros, better performance, slower creation. thin allocates ondemand, monitor with "datastore usage" alarm. NFS: type determined by array. Independent disks: no snapshots. Persistent changes immediate & permanent. Nonpersistent changes lost on power-off. **RDM**: Benefits User-Friendly Persistent Names, Dynamic Name Resolution, Distributed File Locking, File Permissions, File System Ops, SAN Snapshots, vMotion, SAN mgt agents & NPIV. Limitations not for block devices, no snapshots with physical RDMs, no partition mapping, needs whole LUN. Snapshots: capture memory state, settings & disks. Can't snapshot physical RDMs or independent disks **Snapshot Manager**: <u>Delete</u> commits snapshot to parent. <u>Delete all</u> commits all snapshots before *You are here*. <u>Go to</u> reverts to that snapshot. <u>Revert to snapshot</u> back to parent's snapshot *You are here*. **vMotion**: To vMotion a suspended VM, new host must meet CPU compatibility requirements. **Storage vMotion**: can transform thick > thin or thin > thick. Limitations: VMs cannot have snapshots, only persistent VMDKs or RDMs, requires license, ESX3.5 hosts need vMotion licensed/configured. **VMI** (VM Interface) paravirtualization: standard to improve performance, only Linux 32bit guests. Uses a PCI slot. VMI VM must be off to move to an unsupported host; can reduce performance. **VMDirectPath**: I/O allows guest OS to access physical PCI/PCIe devices. Intel Nehalem platforms.

Restrictions: vMotion, Hot add/remove, suspend, record/replay, FT, HA, DRS (but allowed in cluster). **SCSI controllers: •** BusLogic Parallel • LSI Logic SAS • LSI Logic Parallel • PVSCSI **PVSCSI** (Paravirtual SCSI): high-performance storage adapter. Not recommended for DAS. <u>Guests</u>: Win 2003, 2008, RHEL5. Not supported: Record/Replay, FT, MSCS, (2003/8 boot disks OK since U1) **NPIV** (N-port ID virtualization): share FC HBA port as multiple virtual ports, each with unique IDs. VMs assigned 4 WWNs. Limitations: NPIV enabled FC switch, only RDMs, HBAs need access to LUN using its WWNs, NPIV capable HBAs, no Storage vMotion, VM can't power on if WWNs in use vNICs: • Flexible - 32-bit guests, vlance without VMware Tools or vmxnet with VMware Tools • e1000 - Emulates E1000 NIC, default for 64-bit guests • Enhanced vmxnet - vmxnet with enhanced performance, requires VMware Tools • vmxnet3 - vmxnet with enhanced performance & networking features, requires VMware Tools & HW v7.

TSO (TCP Segmentation Offload): enabled in VMkernel by default, must be enabled at VM level. Needs enhanced vmxnet, might change the MAC. **Jumbo frame** requires vmxnet2/3 or e1000. **OVF**: templates can be deployed from a local file system via the Client, or from a web server. OVF files are compressed. Client validates the OVF file before importing it. **vApp**: container containing one or more VMs, can power on & off, & be cloned. Metadata in VC's DB. IP pool - network configuration assigned to network used by vApp. VC then provides IPs to its VMs.

Links: http://kb.vmware.com/kb/1010048 - Set all VMs to upgrade tools at next power on http://kb.vmware.com/kb/1002511 - Recreate missing virtual disk (VMDK) header/description file http://kb.vmware.com/kb/1002310 - Committing snapshots if no snapshot entries in snapshot manager http://kb.vmware.com/kb/1007849 - Consolidating snapshots



Availability (HA)

Maximums (per HA cluster): Hosts = 32 VMs = 3000

Logs: HA logs: /var/log/vmware/aam/

Failover hosts = 4 (only 5 primaries), or 50% of hosts if less than 8 Prot (ESX port) Description Source FW Port Destination 2050-2250 Hosts ESX/ESXi UDP (SC) 2050-2250 (out) ESX/ESXi TCP/UDP(SC) HA Hosts UDP (SC) HA8042-8045 Hosts ESX/ESXi 8042-8045 (out) ESX/ESXi TCP/UDP(SC) HA Hosts

HA primary hosts (first 5): maintain & replicate cluster state and initiate failover actions.

Active primary host: decides where to restart VMs, tracks & effects failed restart attempts. **List primary hosts**: \$ cat /var/log/vmware/aam/aam_config_util_listnodes.log **Seconday host** promoted if primary is: • maint mode • disconnected • removed. Not on failure. **Host isolated**: no heartbeat for 12 seconds, then cannot ping isolation addresses. **Isolation response**: • power off • leave powered on • shut down (default). However **Host Failure** is only after 15 seconds. **Admission Control types**: • Host • Resource Pool • HA (only HA admission control can be disabled) **HA Admission Control**: rules if VMs can power on when they violate availability constraints at HA failover. Actions that change a reservation must satisfy admission control. <u>Control policies</u> • Host Failures Cluster Tolerates (1-4 hosts) - adds Advanced Runtime Info box showing slot size, total, used, available slots, total VMs on, hosts, good hosts • % of Cluster Resources (up to 50%) • Specify a Failover Host. Policy Factors • resource fragmentation • flexibility • VM diversity. **Slot size**: represents VM CPU & memory resources needed for any powered on VM. Distorted by large VM reservations. Avoided with advanced attributes das.slotCpuInMHz or das.slotMemInMB

Links: http://www.yellow-bricks.com/vmware-high-availability-deepdiv - HA deep dive