

Understanding Virtual Infrastructure Upgrade Moving to the new (ESX 3.0/Virtual Center 2.0) release...

Dan Anderson
Senior Consultant



VMWORLD 2006

Agenda

- Upgrade Phases
- Before you begin
- Stepping through the "Phases"
 - Risk Mitigation
 - Licensing
 - Virtual Center
 - ESX server
 - VMFS
 - Virtual Machines

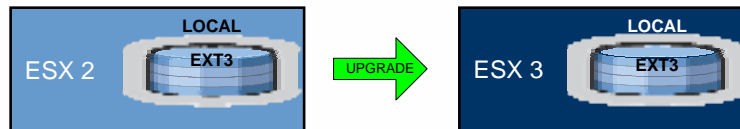
Upgrade Phases

Regardless of the specific procedures used, one factor will remain constant throughout the process, and that factor is “**Order of Precedence**”. Each “Major” component can be attributed to a *phase*, within each phase the steps may change however, the “order of precedence” for each phase will **ALWAYS** be as follows:

➤PHASE 1: *Virtual Center, the associated Database, and Virtual Center Client*



➤PHASE 2 : *ESX Server binaries, Console OS and Local File system*



➤PHASE 3: *VMFS File system (SAN and/or Local)*



➤PHASE 4: *Virtual Machine “hardware” and VMware Tools*



Before you begin

- Understand the upgrade process
 - Read the manual
 - Create an upgrade plan
 - RE-READ THE MANUAL
 - Perform upgrade based on step YOUR PLAN
 - Virtual Center
 - ESX Server
 - VMFS
 - Virtual Machines



Before you begin

- Think about “Potential” Backout Strategies (should be in your upgrade plan)
- Virtual Center
 - Re-Install original version of Virtualcenter
 - Restore Database, requires full backup of VC Database
- ESX Server
 - Re-Install original version of ESX Server
 - Restore Service Console, and files from local VMFS, Requires: Full backup Service Console, and local VMFS
- VMFS (Assume re-install of ESX 2.X and reformat to VMFS-2)
 - A) Backup VMs (OS Level w/Agent), requires recreation of VMX/VMDK
 - B) Clone / copy VM to alternate datastore (including vmx), revert to original
- VM
 - Clone VM, revert to original

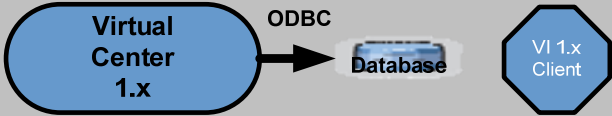



Stepping through the "Phases"

- Risk Mitigation
- License Server
- Virtual Center
- ESX server
- Bring up Virtual Center 2.0
- VMFS
- Virtual Machines

Risk Mitigation

- Protect yourselves !
- Make sure you have a backup of:
 - > VMX files
 - > VMDK files
 - > VC database
 - > Virtual switch configuration (vlan's)

Understanding upgrade dependencies

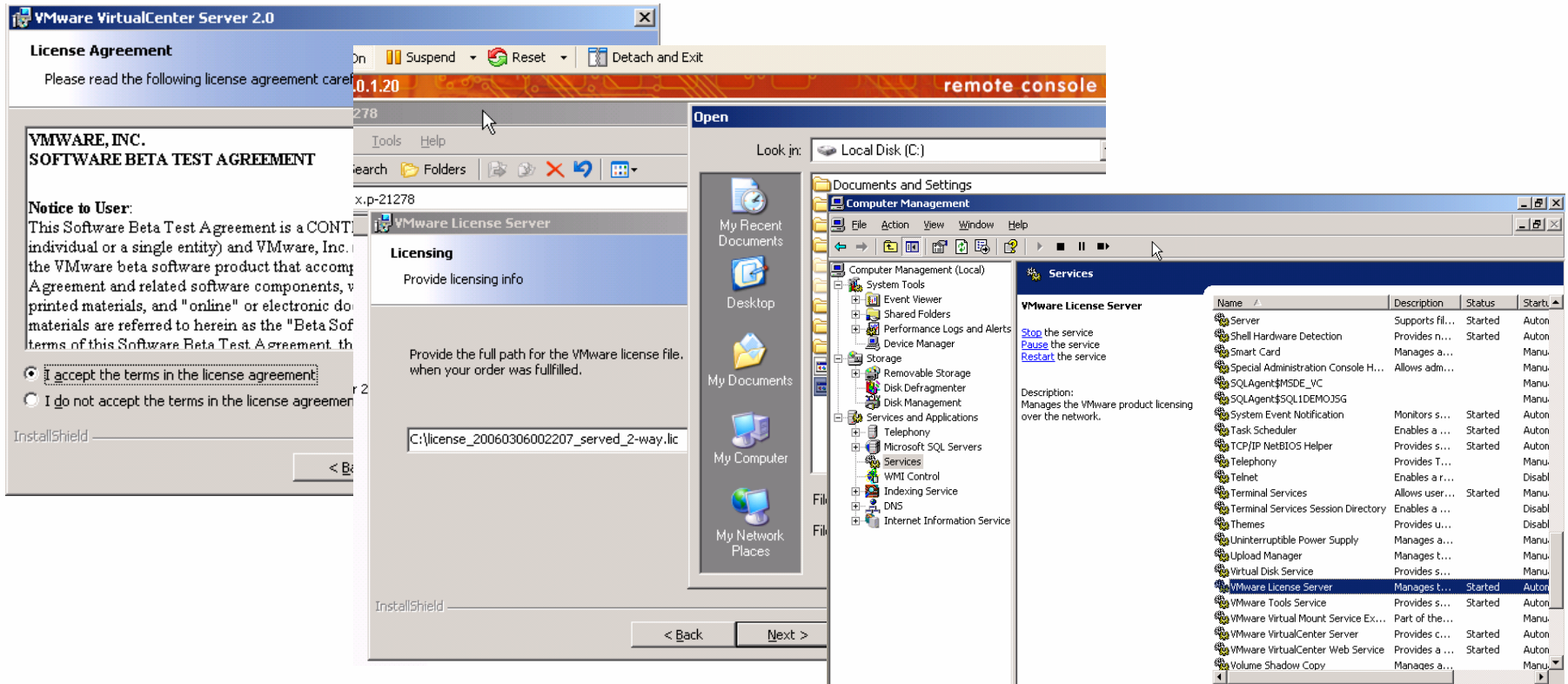
Component (Phase)	Upgrade dependencies	VM Downtime?	Caveats
Virtual Center, the associated Database, and Virtual Center Client 	Virtual Center Database Virtual Infrastructure Client	NO	During the Upgrade of Virtual Center the Virtual Machines will continue to operate however, no DATA will be collected, and centralized management of the ESX servers (and their associated Virtual Machines) will be unavailable.
ESX Server binaries, Console OS and Local File system 	Virtual Infrastructure Client	PROBABLE	All Virtual Machines associated with the ESX server will either DOWN or migrated off of the platform. Once upgraded, ESX 3.0 will have READ-ONLY access to the VMFS-2 Volumes for this reason ESX and VMFS Upgrades are "coupled" together.
VMFS File system (SAN and/or Local) 	ESX Server 3.0	YES	All Virtual Machines associated with the VMFS volume will either DOWN or migrated off of the volume (Requiring downtime). Once upgraded, ESX 2.X will be UNABLE to access the VMFS-3 Volumes, for this reason ESX and VMFS Upgrades are "coupled" together.
Virtual Machine "hardware", VMware Tools 	Virtual Center Virtual Infrastructure Client ESX Server 3.0 VMFS-3	YES	Virtual Machines must be offline to upgrade from VM2 - VM3, VMware Tools can be done at the same time (Via Script). At a minimum a Reboot of the VM will be required. <i>Note:</i> VM2 Version VMs CAN run within ESX3.0

Coupled

Stepping through the "Phases"

- Risk Mitigation
- License Server
- Virtual Center
- ESX server
- Bring up Virtual Center 2.0
- VMFS
- Virtual Machines

License server



- License server can be installed in a VM
- License server "Should" be installed on the VC server
- Served vs. Un-Served

Stepping through the "Phases"

- Risk Mitigation
- License Server
- Virtual Center
- ESX server
- Bring up Virtual Center 2.0
- VMFS
- Virtual Machines

Upgrading VC Server

Upgrade compatibility

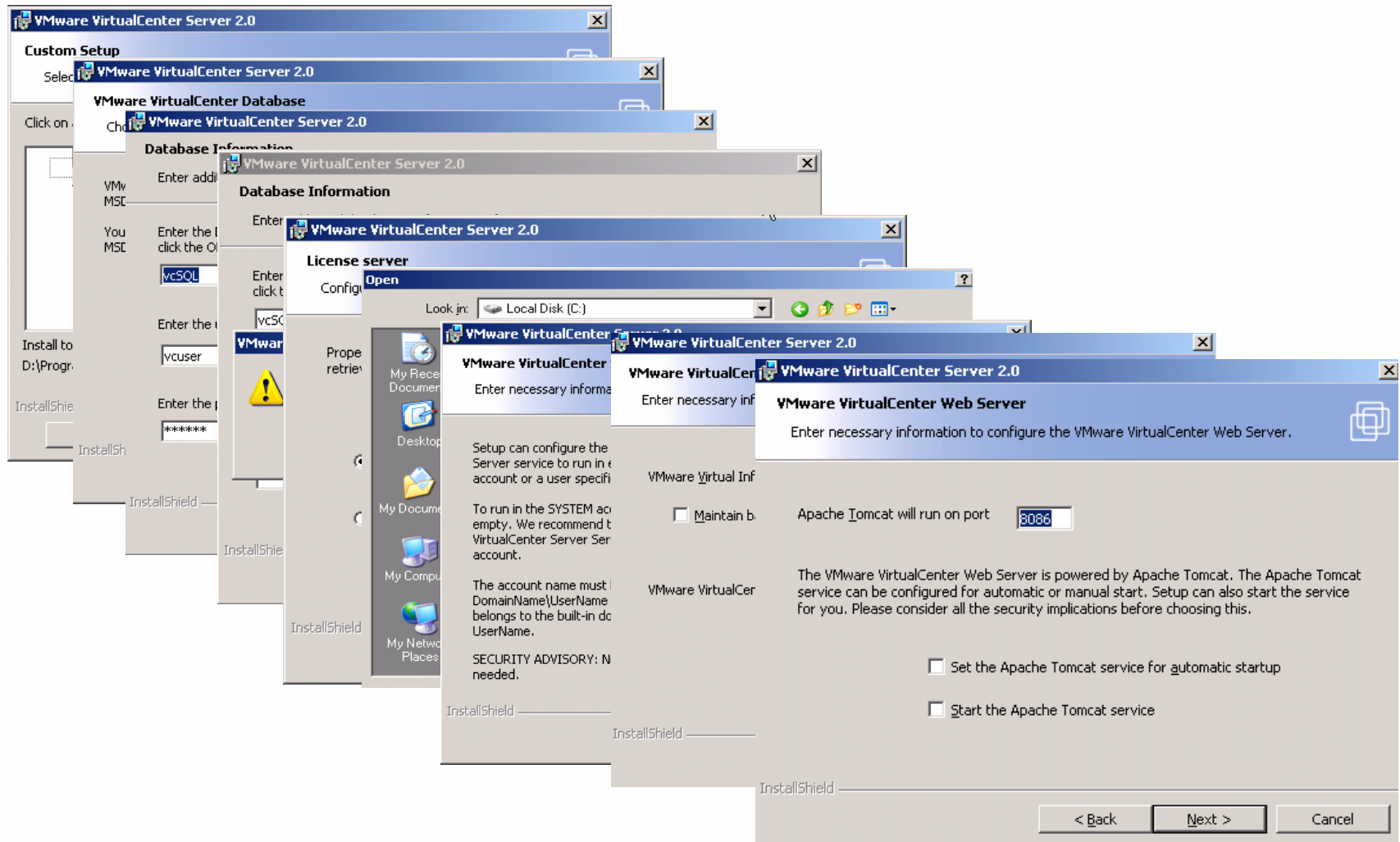
Current VC Version

Upgrade Support to VC2.0

VirtualCenter beta release (any)	No upgrade support
VirtualCenter release 1.0	Yes*
VirtualCenter release 1.1	Yes*
VirtualCenter release 1.2	Yes
VirtualCenter release 1.3	Yes
VirtualCenter release 1.4	????????????????????

**The database is not preserved unless you first upgrade to at least VirtualCenter version 1.2.*

Upgrading VC server



Stepping through the "Phases"

- Risk Mitigation
- License Server
- Virtual Center
- **ESX server**
- Bring up Virtual Center 2.0
- VMFS
- Virtual Machines

ESX server upgrade

- Upgrade compatibility

<u>ESX Server Version</u>	<u>Is the Upgrade Supported?</u>
ESX Server beta release (any)	No upgrade support
ESX Server release 1.x	No upgrade support
ESX Server version 2	No upgrade support
ESX Server version 2.1	No upgrade support
ESX Server version 2.1.1	Yes
ESX Server version 2.1.2	Yes
ESX Server version 2.1.3	Yes
ESX Server version 2.5	No upgrade support
ESX Server version 2.5.1	Yes
ESX Server version 2.5.2	Yes
ESX Server version 2.5.3	Yes
ESX Server version 2.5.3+	only support for 3.0.x products

ESX server upgrade

Insert ESX 3.0 CD and Boot (or reboot Server) ensure boot from CD-Rom is enabled:

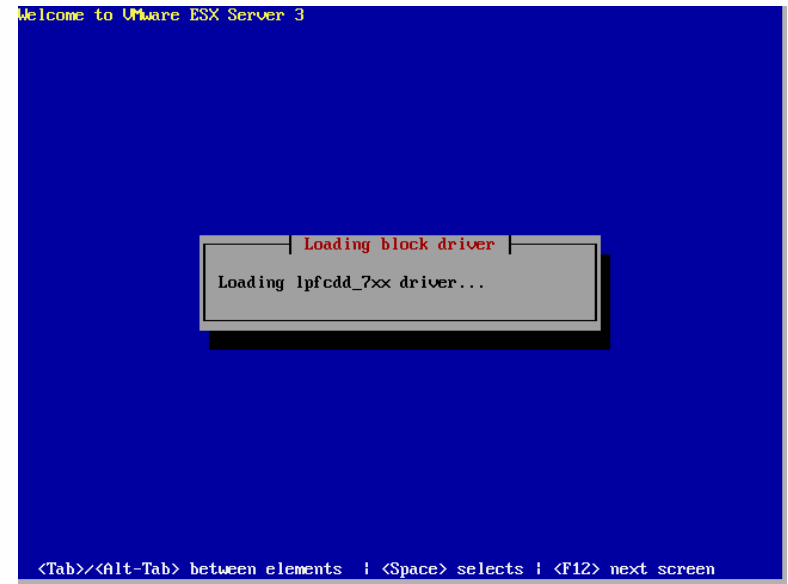


ESX server upgrade

- Installation process starts...



- Drivers are loaded...

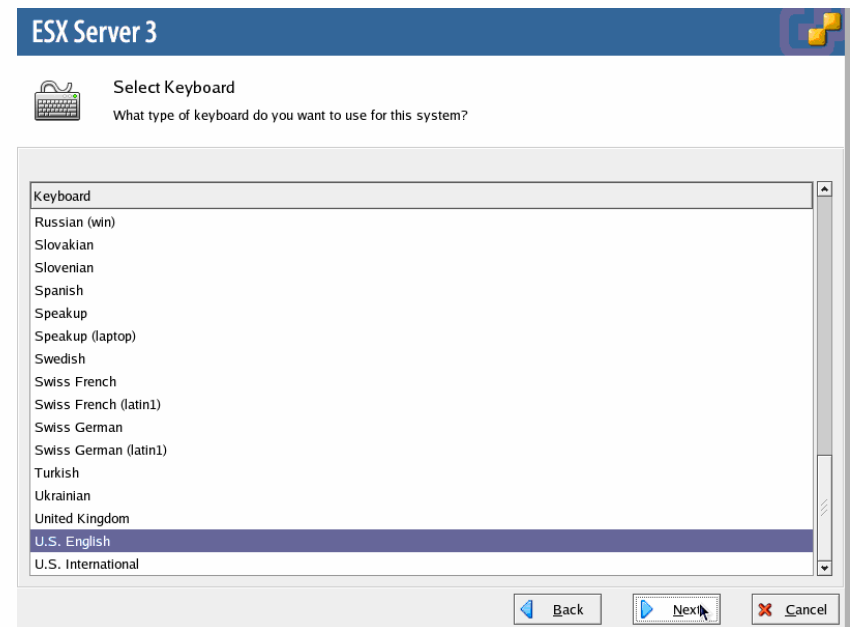


ESX server upgrade

- Graphical installer starts (Unless text mode install selected)...

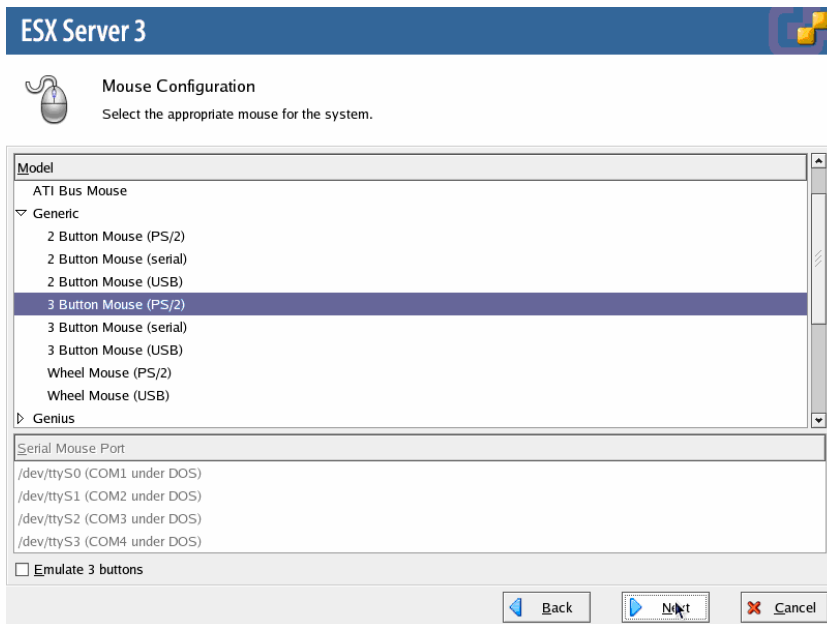


- Keyboard selection...

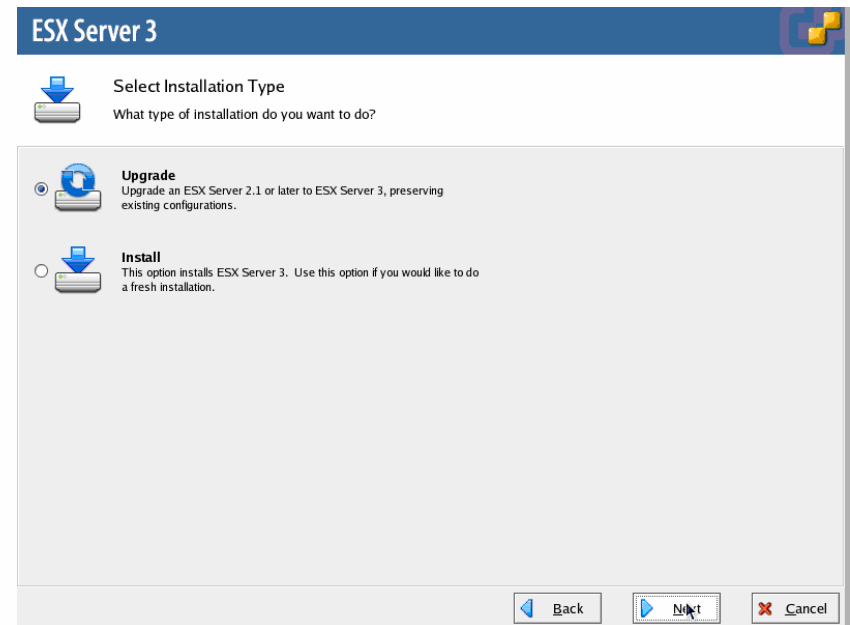


ESX server upgrade

- More next clicking...

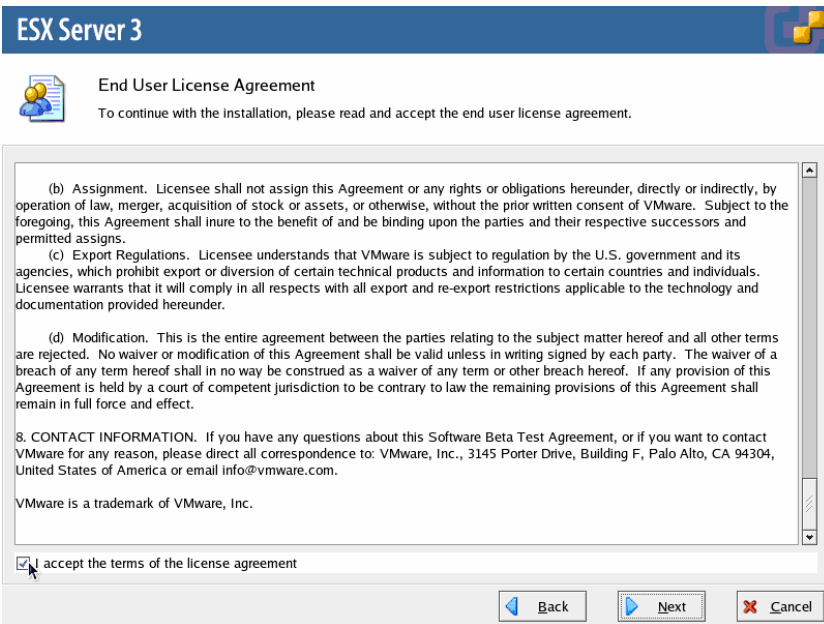


- After the installer searches for previous version, select “Upgrade” and continue...

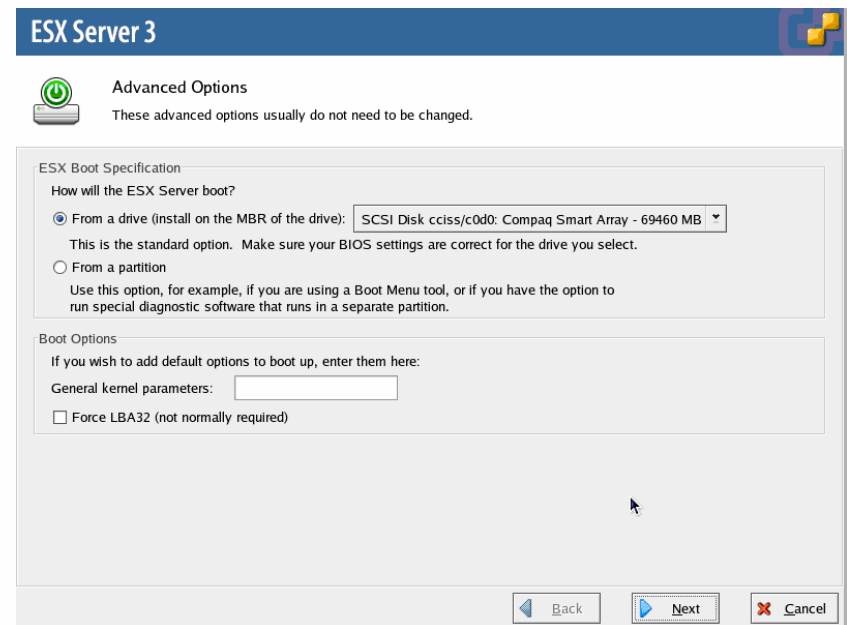


ESX server upgrade

■ Accept EULA...

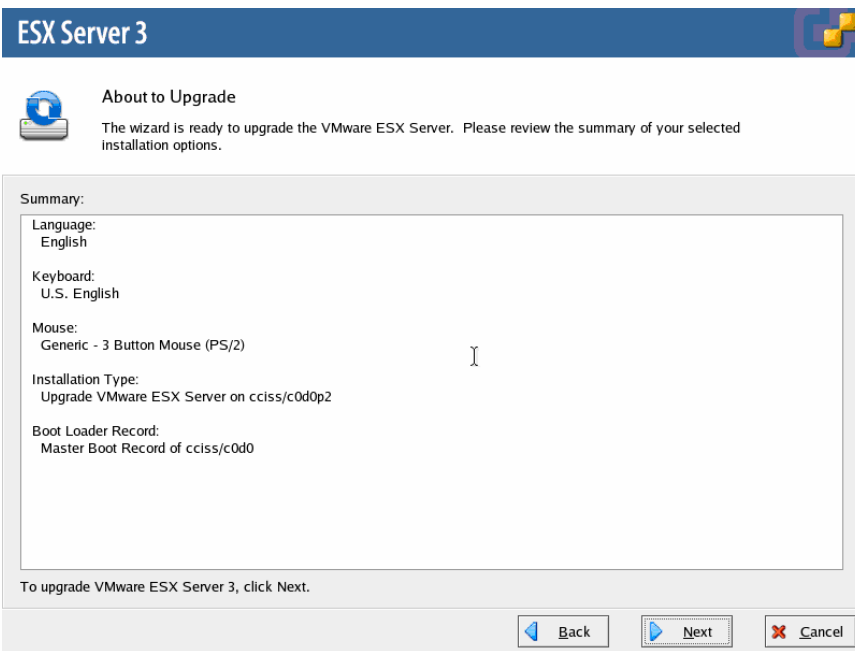


■ ENSURE the correct drive is selected for installation...

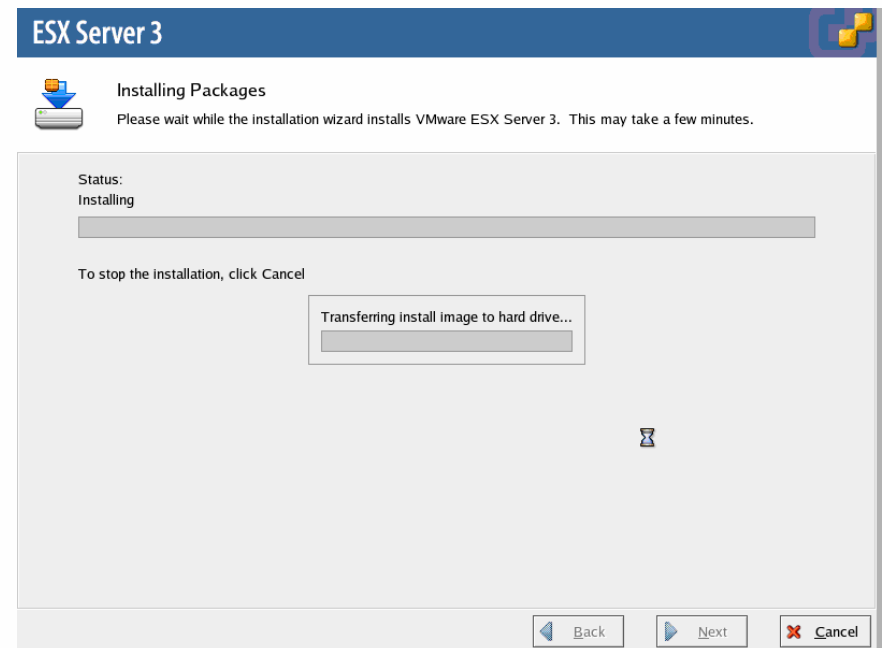


ESX server upgrade

- Settings review, confirm and continue...



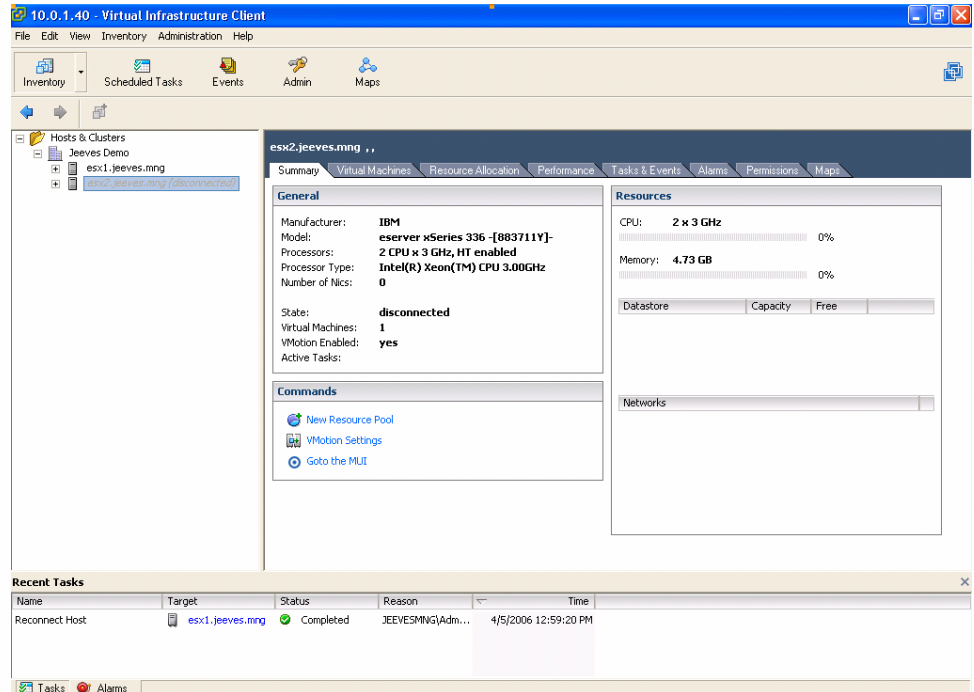
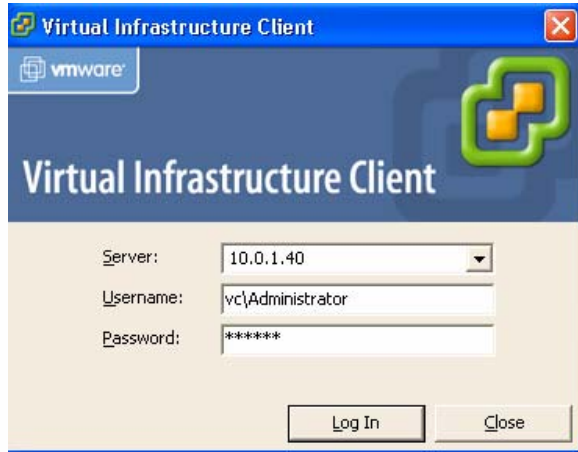
- Installation...



Stepping through the "Phases"

- Risk Mitigation
- License Server
- Virtual Center
- ESX server
- Connect to Virtual Center 2.0
- VMFS
- Virtual Machines

The VI client



- Make a connection to your fresh upgraded VC server
- Or directly to the ESX server itself. (VI client)
- You can manage ESX 2.x servers in VC 2.0

Stepping through the "Phases"

- Risk Mitigation
- License Server
- Virtual Center
- ESX server
- Bring up Virtual Center 2.0
- **VMFS**
- Virtual Machines

Stepping through the "Phases"

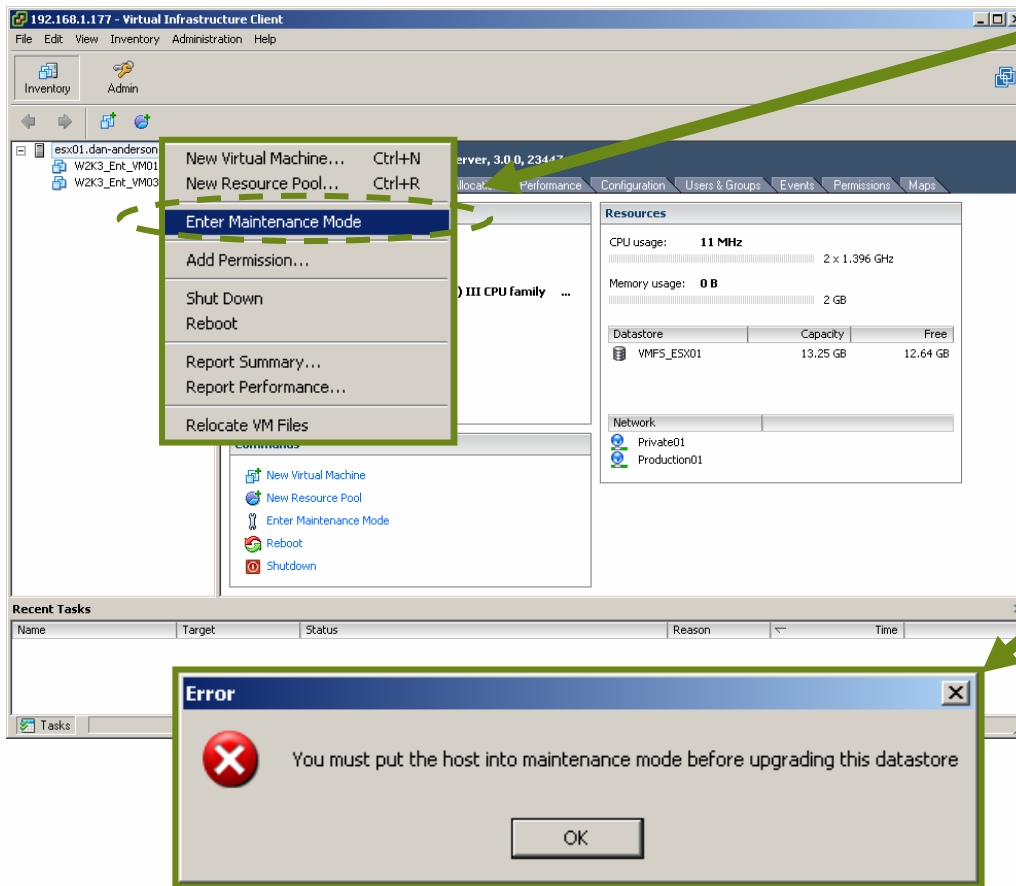
- Backup - THIS IS FILE SYSTEM UPGRADE!!
 - Backup VM's (OS Level w/Agent), will require recreation of VMX and VMDK
 - Clone VM to alternate Datastore, revert to original
- Possible "Backout" Strategy
 - See Above
 - (**REQUIRES** *re-installation of ESX 2.X and reformat to VMFS-2*)

Things to know about upgrading to VMFS-3

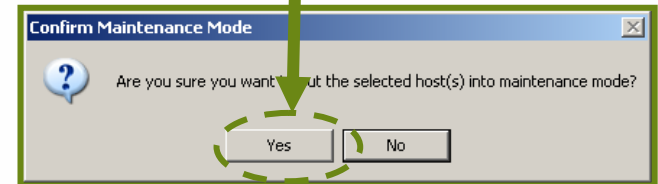
- ALL Virtual machine related files are stored within VMFS-3 on the SAN (Local VMFS-3 if no SAN is present)
- Change from global .vswp file to VM specific .vswp file.
 - In ESX 2.5.x the .vswp file is configured per ESX host, and is stored on the “Local VMFS” partition.
 - In ESX3 each VM will have its own VM specific “.vswp” file, which is based on the amount of memory assigned to that VM.
 - All files relevant to the VM are now stored on the VMFS-3 partition (SAN or Local depending on your environment), this includes the “.vswp” file.
 - “.vswp” file size is configurable, however, the default is to match the VM’s assigned physical memory.
 - When the VM is initially powered on, if there is no “.vswp” file present, ESX3 will create one based on the amount of assigned memory to that VM.
 - For example: If a VM has 512M of RAM assigned to it, ESX3 will create a 512MB VSWP file within the VM’s directory on VMFS3.
 - This could have a potential impact on available storage space within your VMFS-3 partition.
 - E.g.: 30 VM’s, each with 1Gb RAM = 30GB of VSWP !

VMFS File System Upgrade

- Attach VI Client directly to ESX Host...(VM's are assumed to be off, if not shut them down)

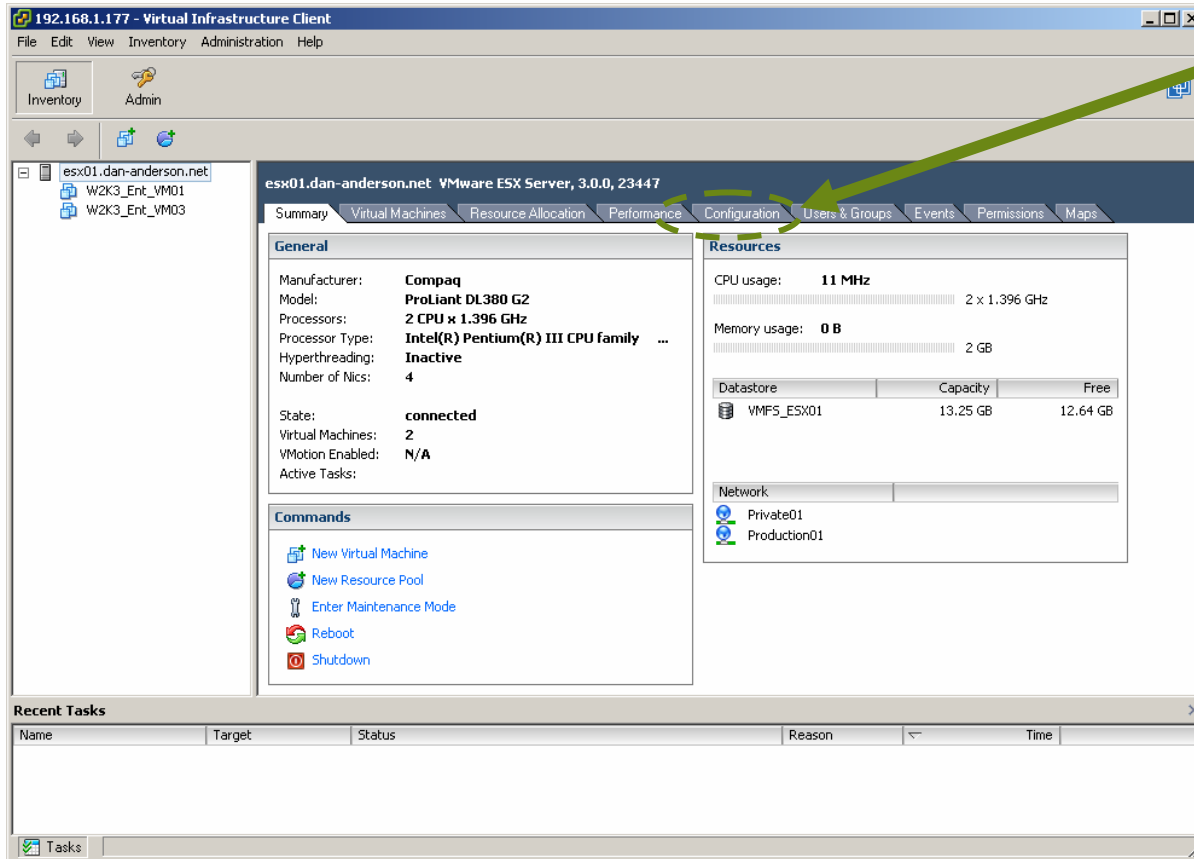


■ Right click the Hostname and put the host into maintenance mode.



■ If an attempt to upgrade VMFS is made without placing the Host in "Maintenance Mode" you will get this error...

VMFS File System Upgrade



Select Configuration tab, click on Storage (Hardware Section).

Hardware

[Processors](#)

[Memory](#)

► [Storage \(SCSI, SAN, and NFS\)](#)

[Networking](#)

[Storage Adapters](#)

[Network Adapters](#)

VMFS File System Upgrade

Hardware

- Processors
- Memory
- Storage (SCSI, SAN, and NFS)
- Networking
- Storage Adapters
- Network Adapters

Software

- Licensed Features
- DNS and Routing
- Virtual Machine Startup/Shutdown
- Security Profile
- System Resource Allocation
- Advanced Settings

Storage

Identification	Device	Capacity	Free	Type
VMFS_ESX01 (Rea...	vmhba0:0:0:6	13.42 GB	11.17 GB	vmfs2

Details

VMFS_ESX01

Location: /vmfs/volumes/e4bc05a9-d... 13.42 GB Capacity

2.25 GB Used 11.17 GB Free

Path Selection

Fixed	Volume Label:	Properties	Extents
	VMFS_ESX01		vmhba0:0:0:6 13.43 GB
	Datastore Name:	VMFS_ESX01	Total Capacity 13.43 GB

Paths

Total:	Broken:	Disabled:	File System:	Block Size:
1	0	0	VMFS 2.11	1 MB

Warning

Upgrading from VMFS-2 to VMFS-3 is a non-destructive process, but it cannot be undone. Any virtual machines using this file system must be powered off before beginning. Do you want to upgrade your file system now?

Yes No

Select datastore to be upgraded.

Click On: upgrade to VMFS-3

Are you sure? - Yes

VMFS File System Upgrade

- There is no progress bar displayed, to see activity go to the ESX Host's console and watch the VMkernel logs (ALT-F12)

Recent Tasks					
Name	Target	Status	Reason	Time	
Upgrade VMFS	esx01.dan-ande...	In Progress	Administrator	4/22/2006 2:00:54 PM	
Enter Maintenance Mode	esx01.dan-ande...	In Progress	Administrator	4/22/2006 2:00:35 PM	

Tasks 2 Alarms Showing all entries

- Complete...

Storage

[Remove](#)[Add Storage...](#)

Identification	Device	Capacity	Free	Type	
VMFS_ESX01 (Rea...	vmhba0:0:0:6	13.42 GB	11.17 GB	vmfs3	

- Upgrade time depends on : ??

Stepping through the "Phases"

- Risk Mitigation
- License Server
- Virtual Center
- ESX server
- Bring up Virtual Center 2.0
- VMFS
- Virtual Machines

Restore VMX files and reregister

- This is only needed for customers that :
 - Installed ESX server 3.x from scratch (Parallel install without Migration)
 - Do not have virtual center
 - Used a block level copy at the SAN layer
- Move your .vmx files onto the ESX 3.0 server, and use :
 - `vmware-cmd -s register <vmx-path>`

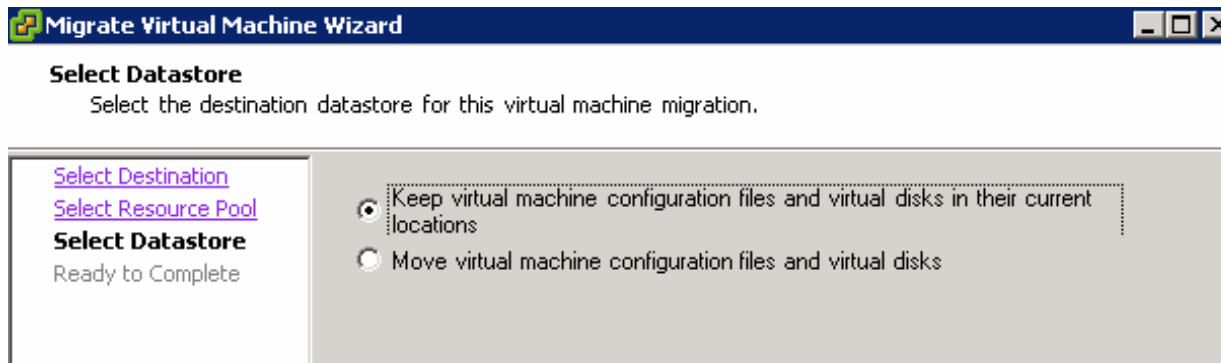
Upgrading your virtual machines

- How can we upgrade our VM's ?
 - Upgrading VMware Tools in Mass
 - From the VI client out
 - From the VC server (command line)
 - Limitations
 - Only virtual machines managed by VirtualCenter 2 can be upgraded.
 - Mass upgrades are available for only Microsoft Windows 2000 and above.
 - Windows NT is not supported.
 - The virtual disk must be on a VMFS-3 volume.
 - Virtual machines must be powered off.
 - The mass upgrade command-line tool is installed as part of the VirtualCenter version 2 installation, on Microsoft Windows.
 - No REDO log files exist
 - No suspend files exist.

Upgrading your virtual machines

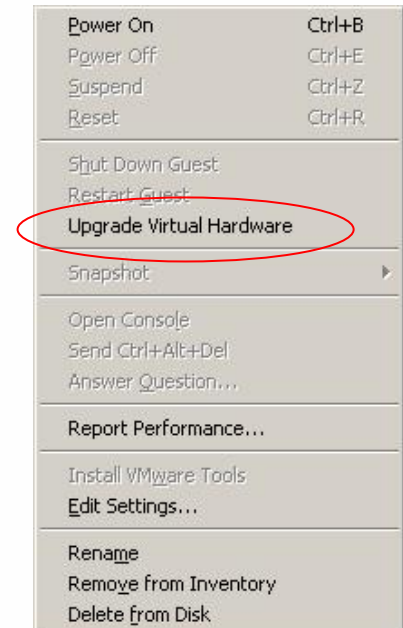
- Relocate VMs files
 - The relocation of the VMX files can be found when you right-click the VM and you choose Migrate.

- Upgrade VMs from VM-2 to VM-3













- Bulk Select – and Upgrade

Name	State	Status	% CPU	% Memory	Notes
W2K3_VMLab01	Powered off		0	0	
VMLab_XPSP2_01	Powered off		0	0	
W2K3_VMLab03	Powered off		0	0	
VMLab02	Powered off		0	0	
LabVM01	Powered off		0	0	
Windows_XPSP2_02	Powered off		0	0	
W2K3_DNS	Powered off		0	0	



Upgrading your virtual machines

■ Bulk Select – and Upgrade (Cont)

Name	Target	Status	Reason	Time
Upgrade Virtual Hardware	 W2K3_DNS	✓ Completed	root	2/7/2006 5:41:54 AM
Upgrade Virtual Hardware	 VMLab02	0% <input type="text"/>	root	2/7/2006 5:41:53 AM
Upgrade Virtual Hardware	 LabVM01	0% <input type="text"/>	root	2/7/2006 5:41:53 AM
Upgrade Virtual Hardware	 Windows_XPSP...	0% <input type="text"/>	root	2/7/2006 5:41:53 AM
Upgrade Virtual Hardware	 W2K3_VMLab01	✓ Completed	root	2/7/2006 5:41:52 AM
Upgrade Virtual Hardware	 VMLab_XPSP2_01	0% <input type="text"/>	root	2/7/2006 5:41:52 AM
Upgrade Virtual Hardware	 W2K3_VMLab03	0% <input type="text"/>	root	2/7/2006 5:41:52 AM
Search Datastore	 ha-datacenter	✓ Completed	root	2/7/2006 5:40:20 AM
Search Datastore	 ha-datacenter	✓ Completed	root	2/7/2006 5:40:11 AM
Search Datastore	 ha-datacenter	✓ Completed	root	2/7/2006 5:40:05 AM

OR

- Open the Command Prompt.
 - **Start > Programs > Accessories > Command Prompt**
- Type the command with your desired options. And use the following command syntax:
 - **vmware-vmupgrade.exe** -u user [-p password] [-n vmname] [-h host] [-m maxpowerons] [-s] [-q]

Upgrading your virtual machines

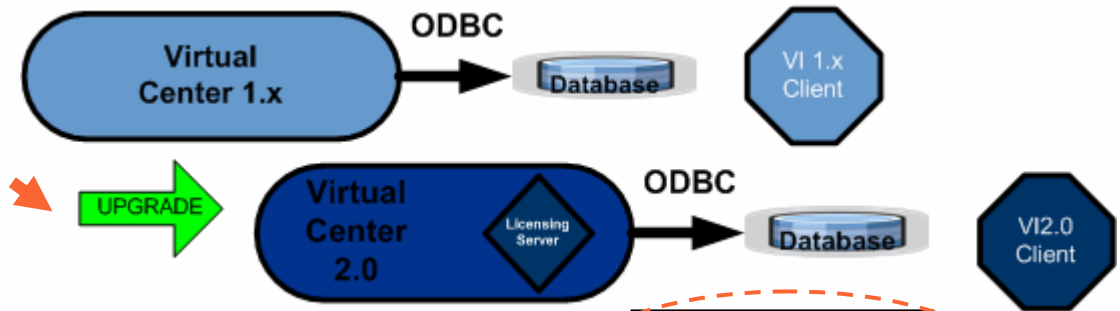
- Due to the scope and nature of upgrading **DOWNTIME of each component WILL occur.**
- How long will depend on several factors that are specific to each customer's environment, which may include but are not limited to:
 - Environment Type
 - For most customers this will ultimately be the deciding factor when making an upgrade path decision.
 - Availability of new or existing resources
 - Hardware - SAN storage, Servers
 - Personnel
 - Change Control
 - Policies, Scheduling
 - Business impact to production ESX Servers and associated VM's
 - Risk Mitigation Strategy used
 - Backups, Revert Procedures etc.

Local Disk, in-place upgrade

Upgrade path steps:

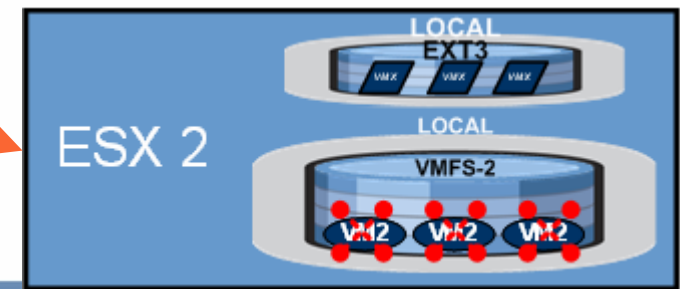
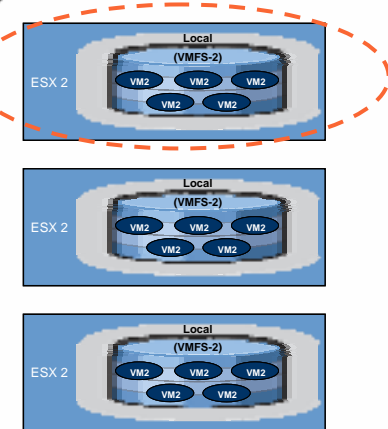
- 1) Upgrade Virtual Center and Client

(Where applicable)



- 2) Choose Host to Upgrade

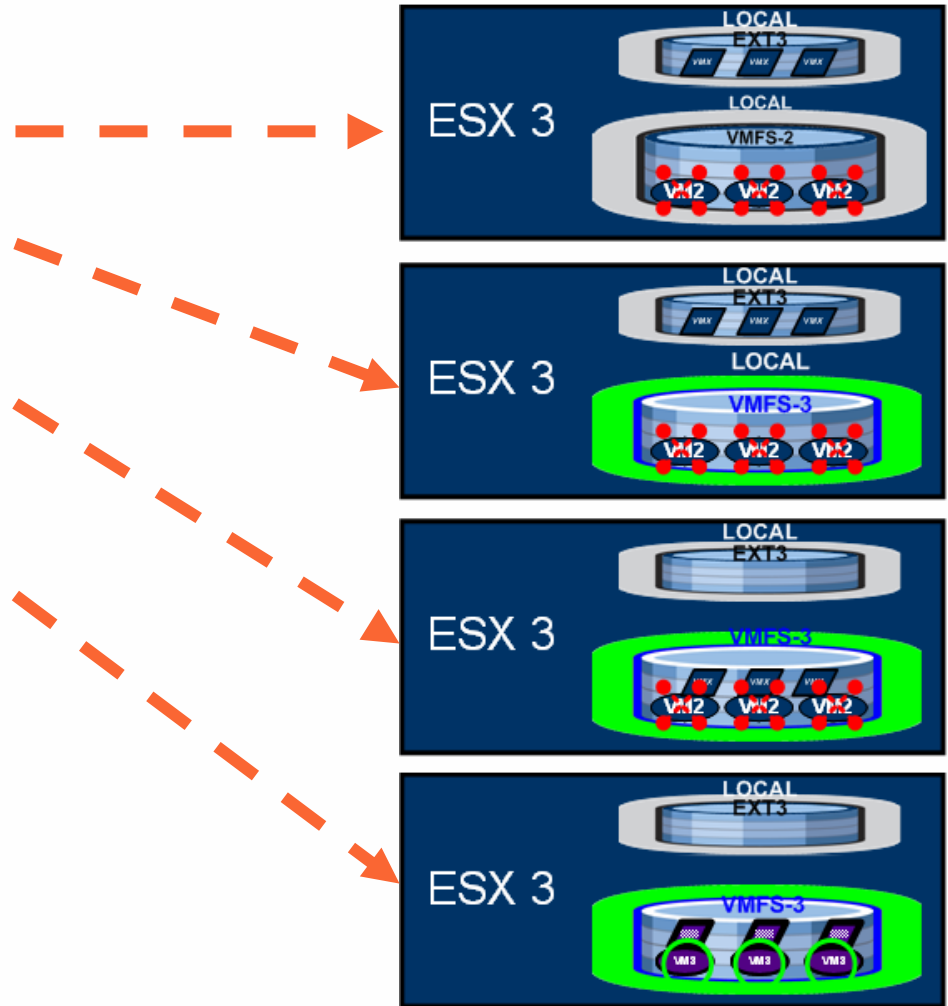
- 3) Power off all VM's



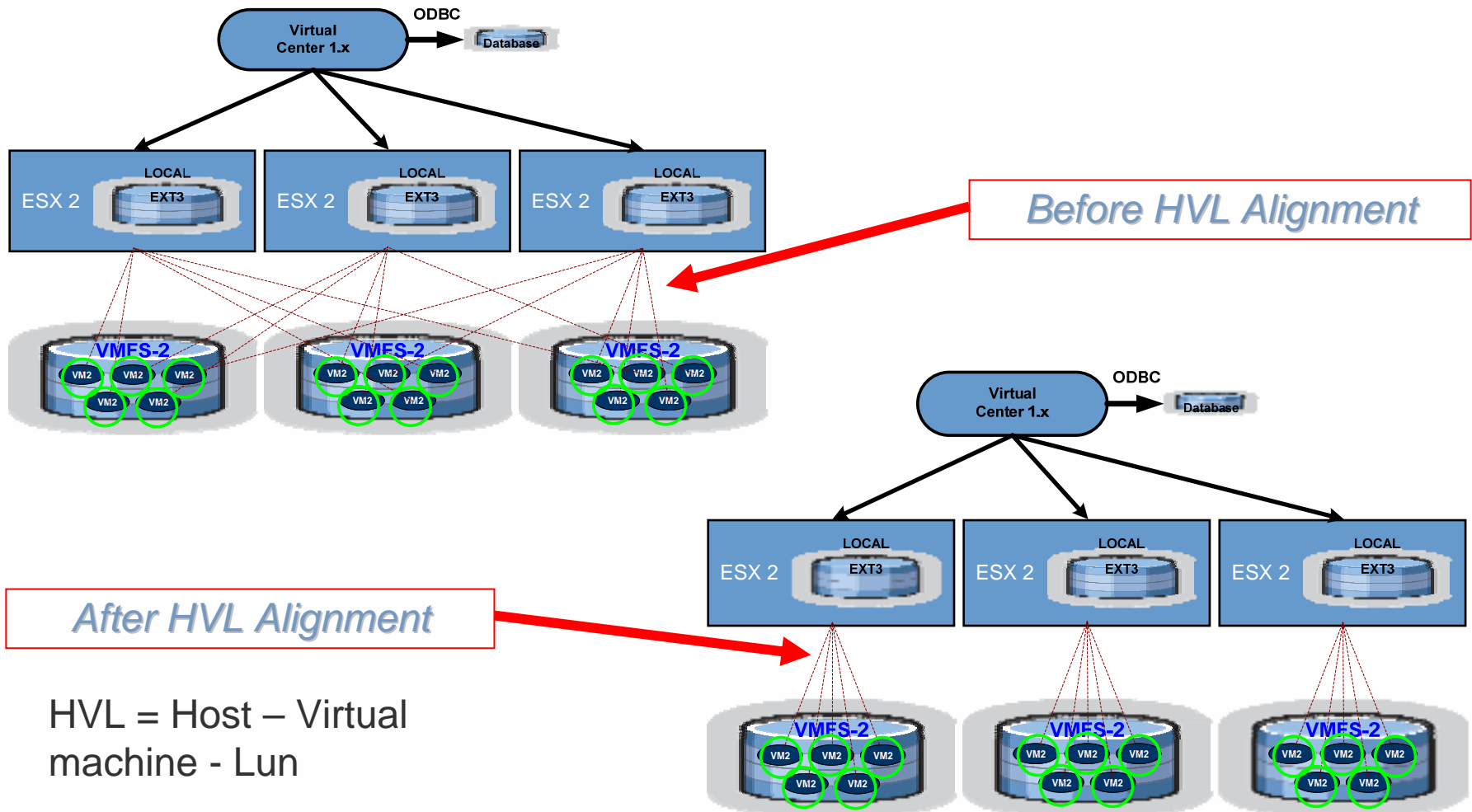
Local Disk, in-place upgrade

- 4) Upgrade ESX2 -> ESX3.
- 5) In-place upgrade of VMFS2 -> VMFS3
- 6) Relocate all VM's VMX files from ext3 datastore to VMFS datastore.
- 7) Upgrade VM2 to VM3 and tools2 to tools3.
- 8) Power-On VM's

Repeat for remaining Host(s)



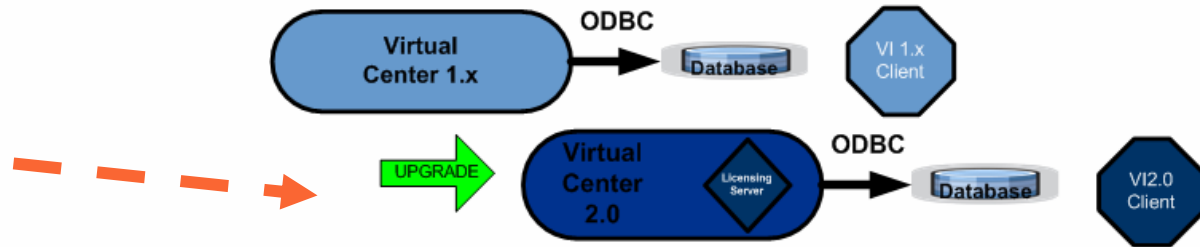
Avoiding downtime for san in place upgrades



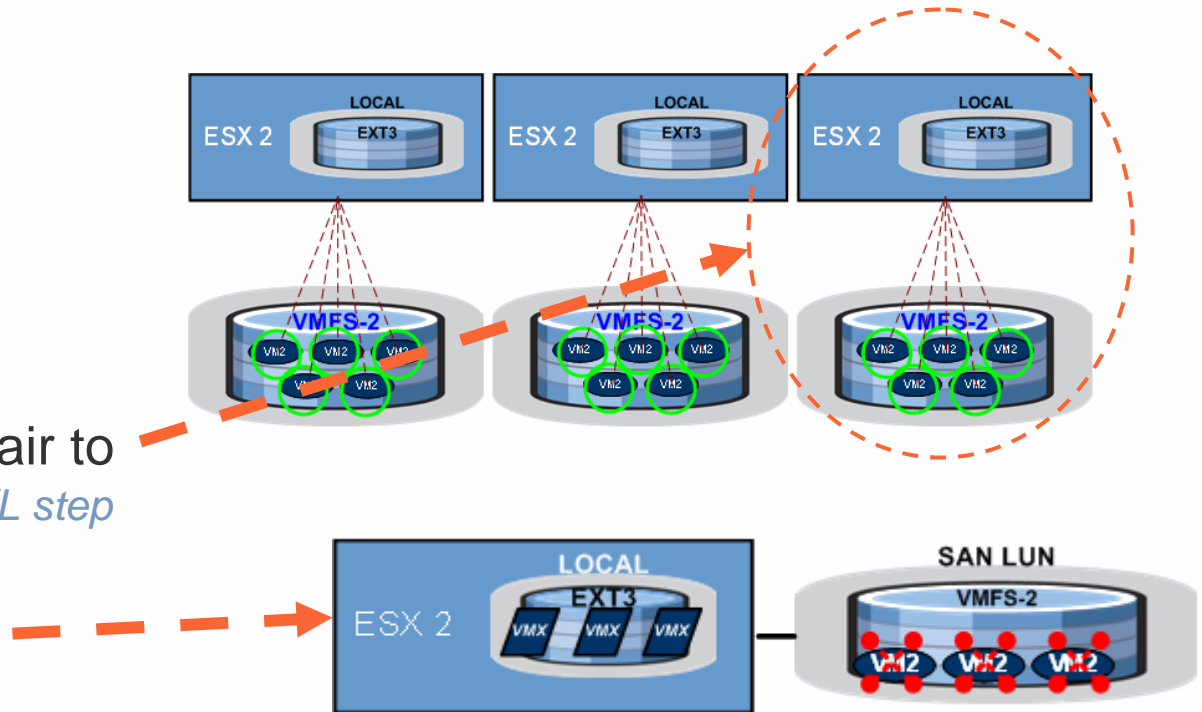
Avoiding downtime for san in place upgrades

Upgrade path steps:

- 1) Upgrade Virtual Center and Client
(Where applicable)

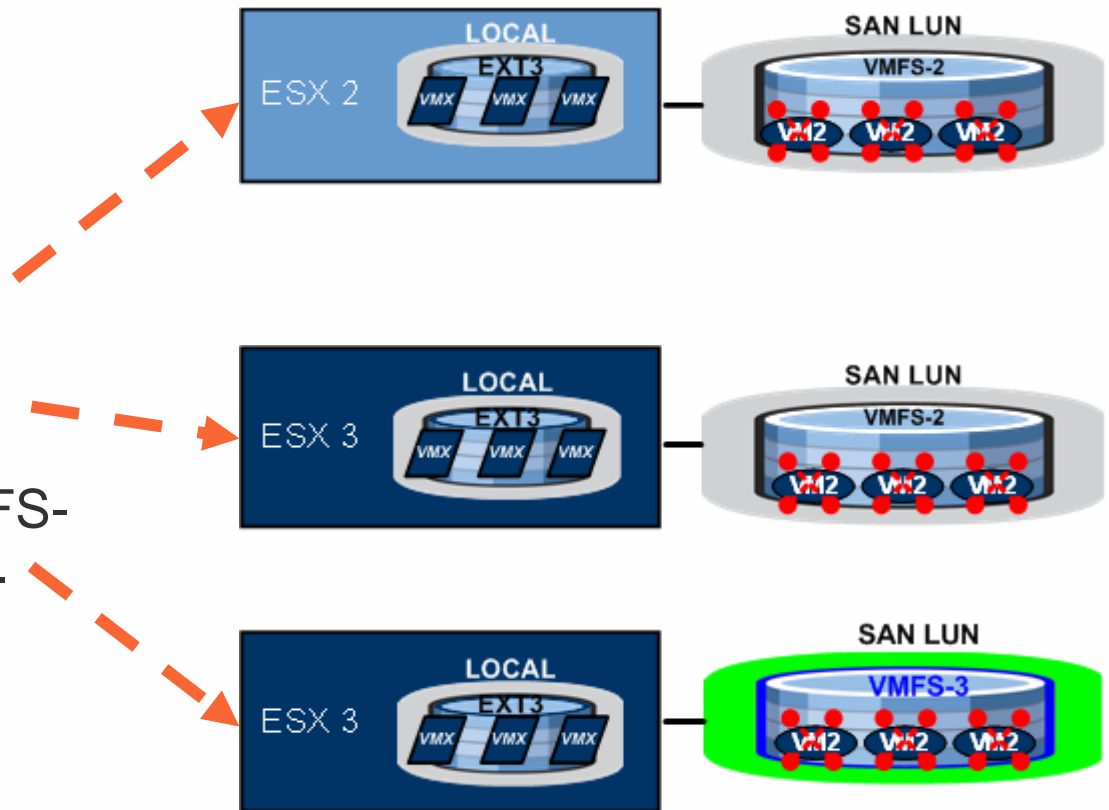


- 2) Choose Host/LUN pair to Upgrade *(assumes HVL step complete)*
- 3) Power off all VM's



Avoiding downtime for san in place upgrades

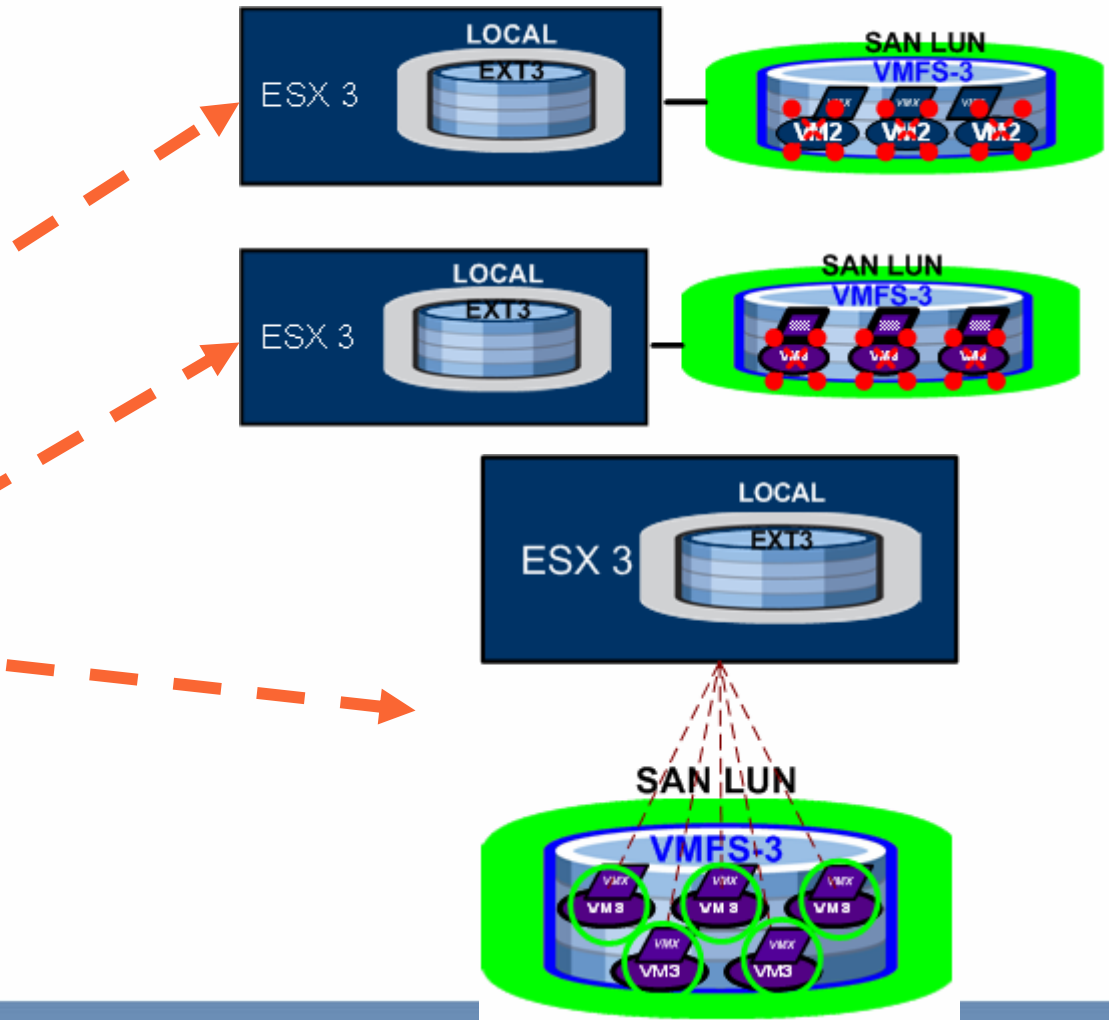
- 4) Power off all VM's
- 5) Upgrade ESX2 host to ESX3.
- 6) In-place upgrade of VMFS-2 file system to VMFS-3.



Avoiding downtime for san in place upgrades

- 4) Relocate all VM's' VMX files from ext3 datastore to VMFS3 datastore.
- 5) Upgrade VM2 to VM3 and Tools2 to Tools3
- 6) Power on VM's

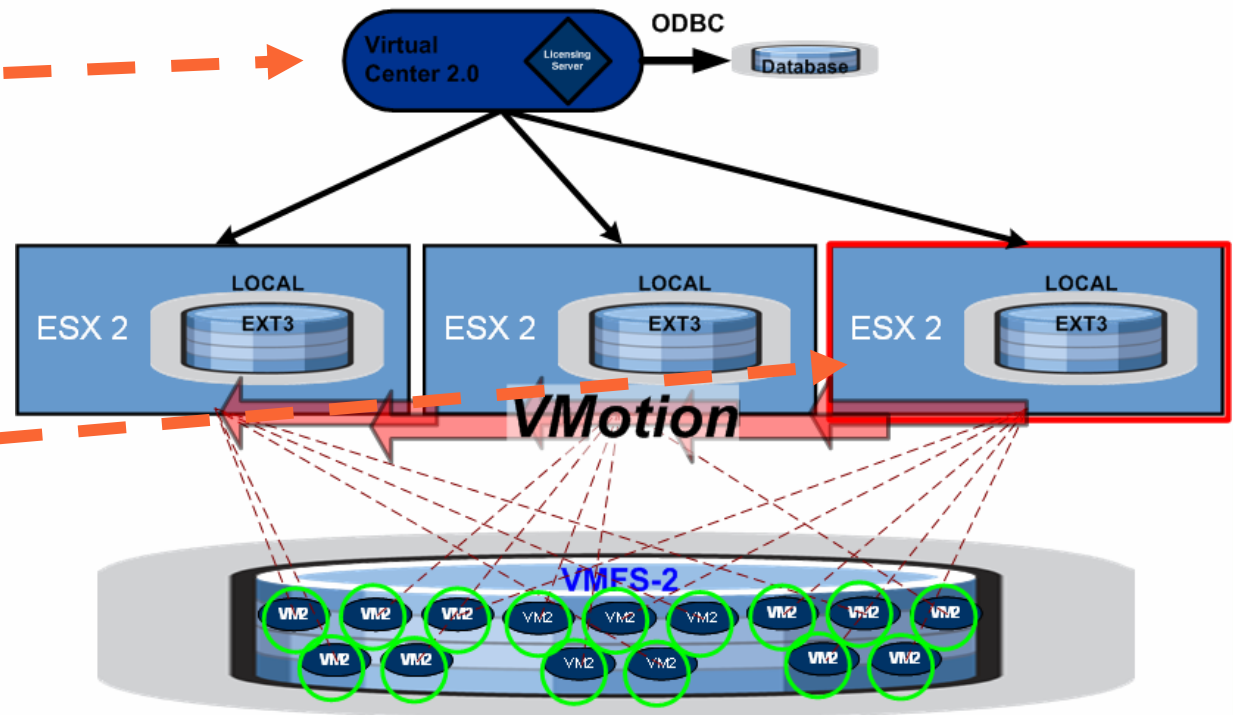
Repeat for other Host/Lun pairs.



VM by VM controlled upgrade using VMotion

Upgrade Process:

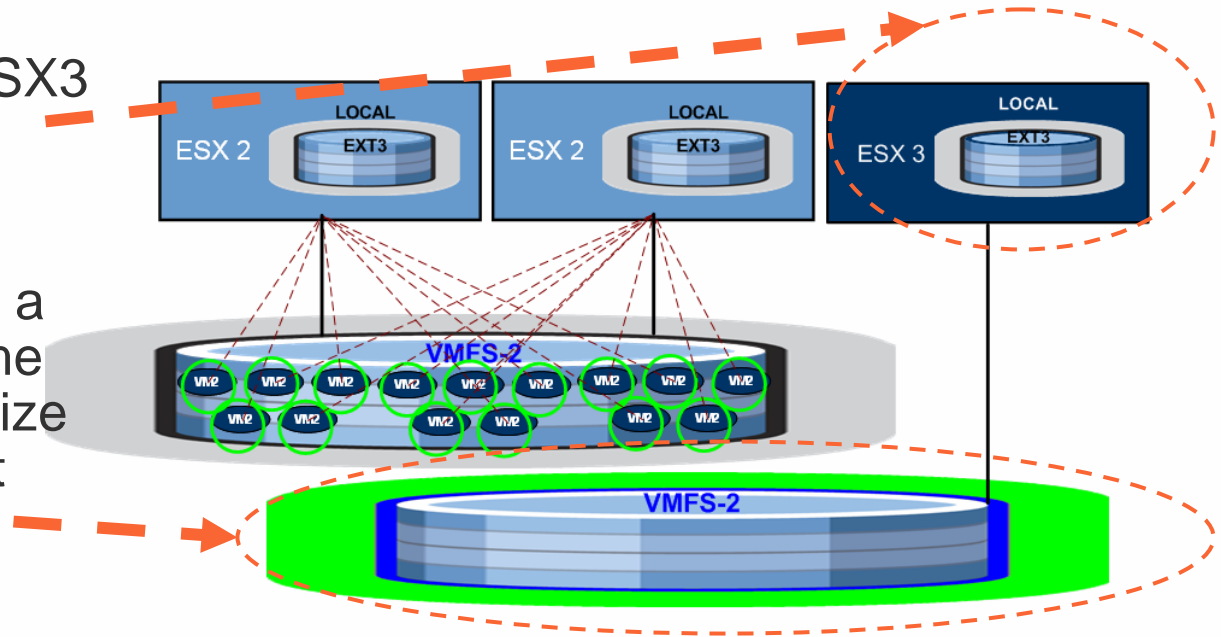
- 1) Upgrade Virtual Center
- 2) Evacuate all VM's from one ESX host to opposing ESX hosts using VMotion.



- VMotion can't move your vmdk files around
- VMotion between ESX 2.x and ESX 3.x will be supported in future versions of ESX 3.x (not in 3.0)

VM by VM controlled upgrade using VMotion

- 3) Upgrade ESX2 to ESX3 on the previously evacuated system.
- 4) Attach ESX3 host to a NEW VMFS-3 volume of equal or greater size than the volume that will be upgraded

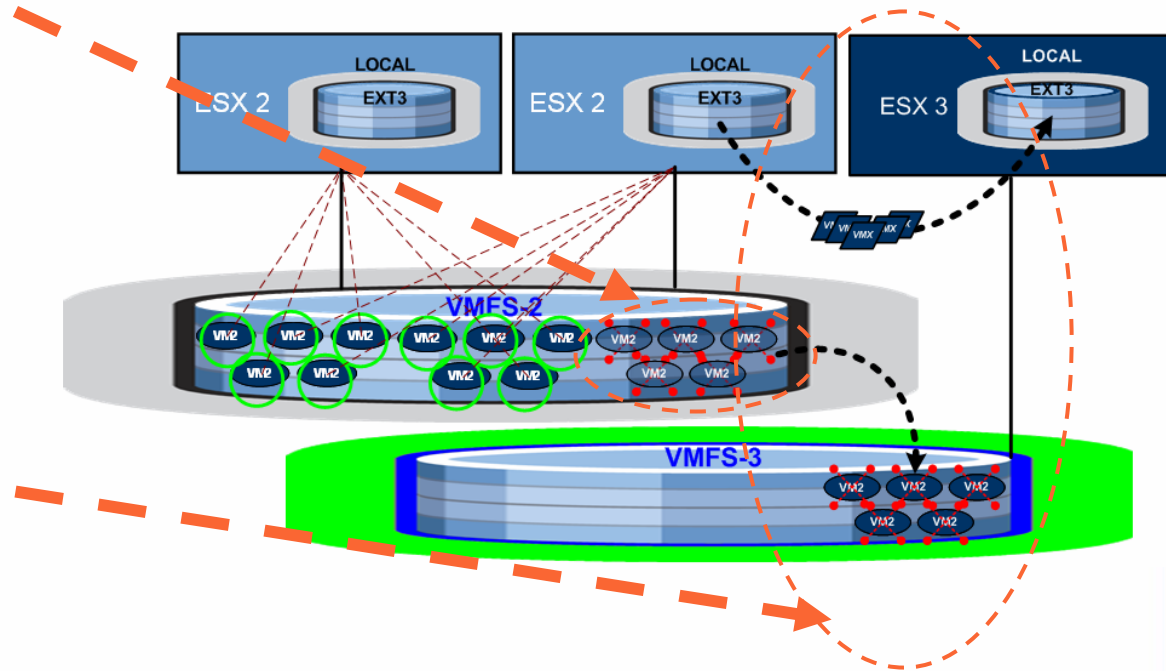


VM by VM controlled upgrade using VMotion

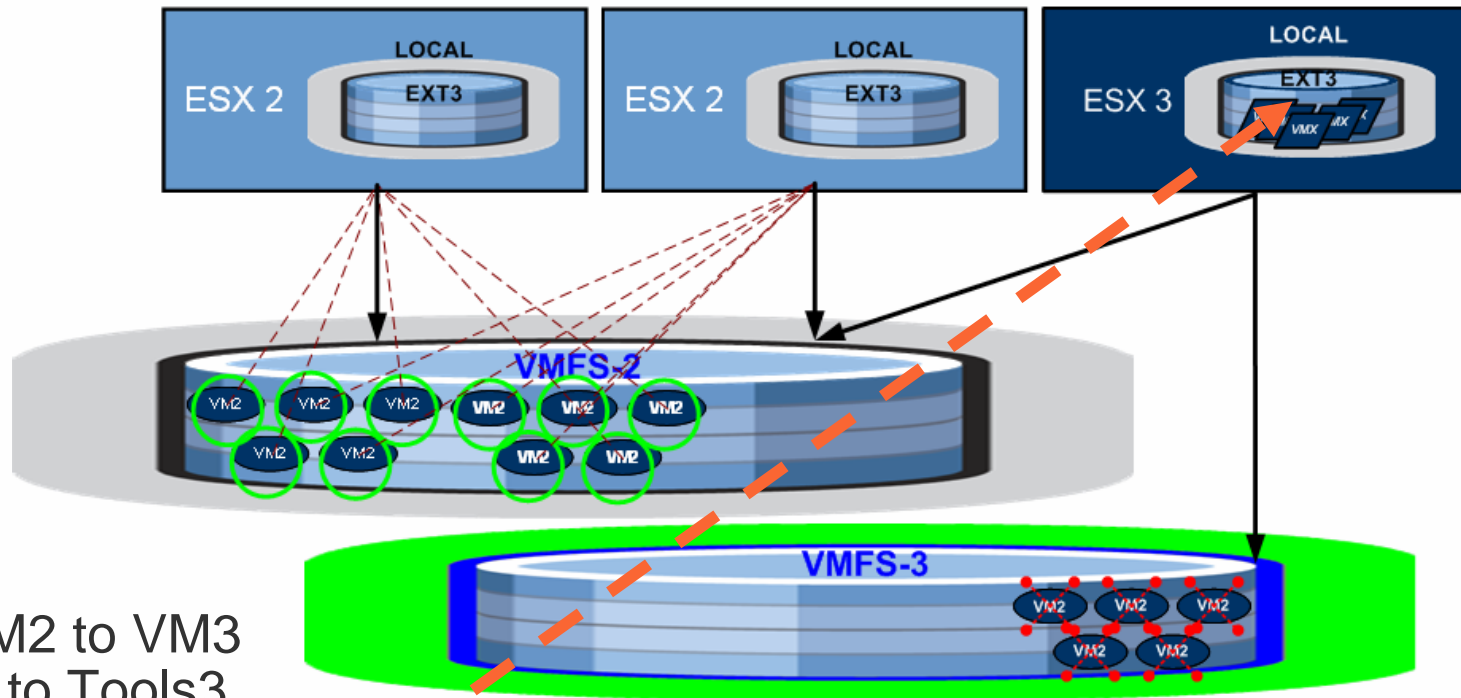
- 5) Power off VM (or VM's) in preparation for "Cold Migration"

(This can be done on a VM by VM Basis, the diagram shows multiple VMs at one time, however, to more finely control downtime of each VM, a single VM approach should be used.)

- 6) Cold Migrate (relocate) VM (or VM's) from ESX2 to ESX3 host. (VMDK file + VMX file are copied over the network)



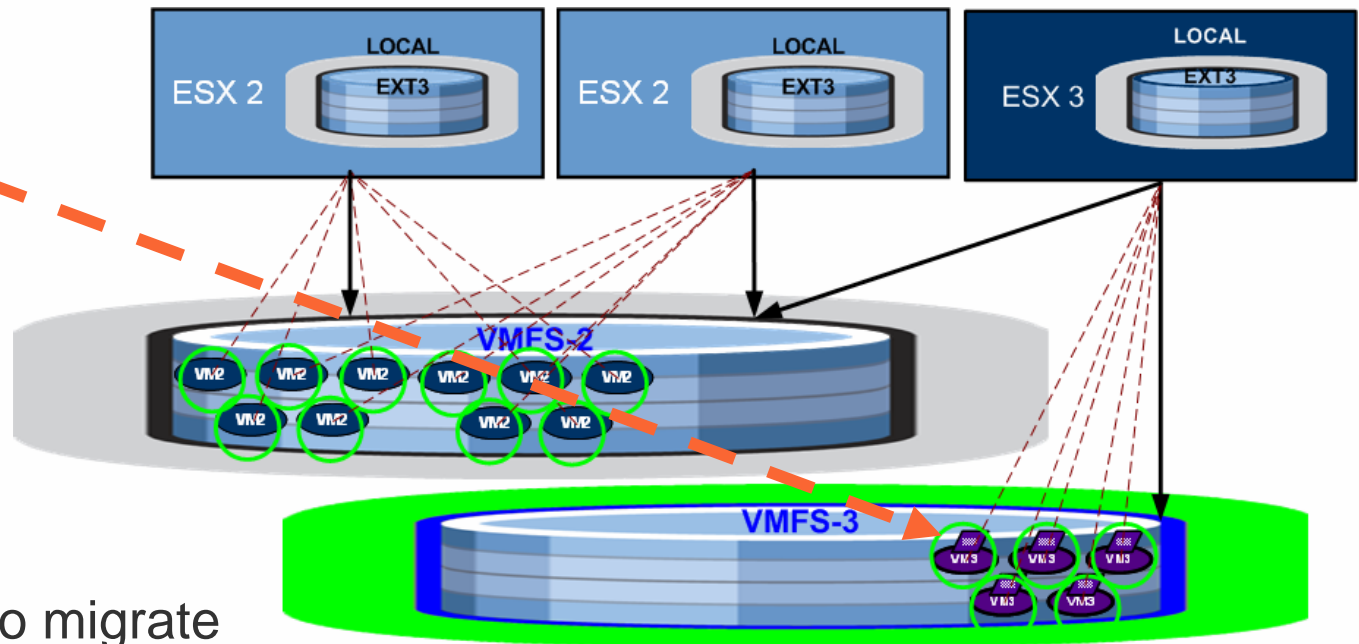
VM by VM controlled upgrade using VMotion



- 7) Upgrade VM2 to VM3 and Tools2 to Tools3.
- 8) Relocate VMX files from EXT3 to VMFS-3 volume (if not done already)

VM by VM controlled upgrade using VMotion

■ Power On

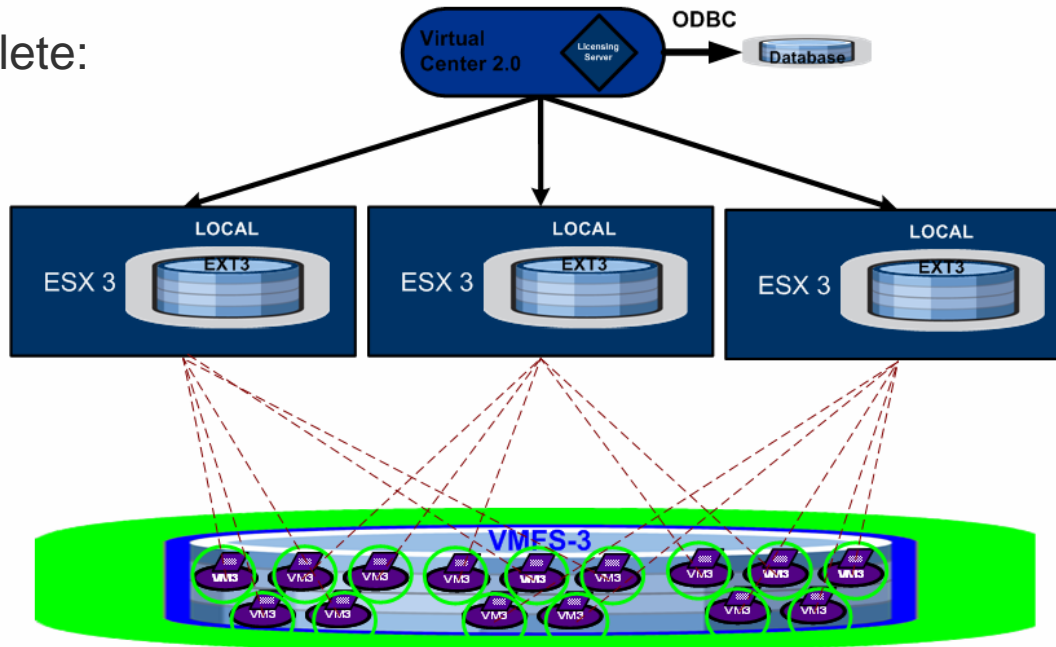


Repeat steps 5-7 to migrate additional VM's

Repeat steps 3-4 once an ESX2 Host has been cleared of running VM's

VM by VM controlled upgrade using VMotion

- When Complete:



- Downside of doing this :

- Must have necessary storage capacity (2x the base storage)
- Cold migration is slow

Thank You...



VMWORLD 2006

Presentation Download

Please remember to complete your
session evaluation form
and return it to the room monitors
as you exit the session

The presentation for this session can be downloaded at
<http://www.vmware.com/vmtn/vmworld/sessions/>

Enter the following to download (case-sensitive):

Username: cbv_rep
Password: cbvfor9v9r

Some or all of the features in this document may be representative of feature areas under development. Feature commitments must not be included in contracts, purchase orders, or sales agreements of any kind. Technical feasibility and market demand will affect final delivery.

VMWORLD 2006

