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# Lessons Learned While Deploying Citrix Presentation Server (XenApp) 4.5 in a Virtual Datacenter

**Breakout Session # VD2591**

**Orestes Melgarejo**

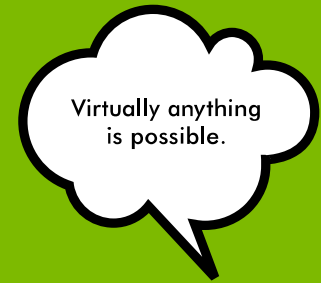
Director, Product Management  
Application Virtualization Group

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Quebecor World, Inc.

Date: September 17, 2008

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# Citrix XenApp in a Virtual Environment

Orestes Melgarejo

Director, Product Management,  
Application Virtualization Group

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**vmworld® 2008**

## **Disclaimer**

**This session may contain product features that are currently under development.**

**This session/overview of the new technology represents no commitment from VMware to deliver these features in any generally available product.**

**Features are subject to change, and must not be included in contracts, purchase orders, or sales agreements of any kind.**

**Technical feasibility and market demand will affect final delivery.**

**Pricing and packaging for any new technologies or features discussed or presented have not been determined.**

**“These features are representative of feature areas under development. Feature commitments are subject to change, and must not be included in contracts, purchase orders, or sales agreements of any kind. Technical feasibility and market demand will affect final delivery.”**

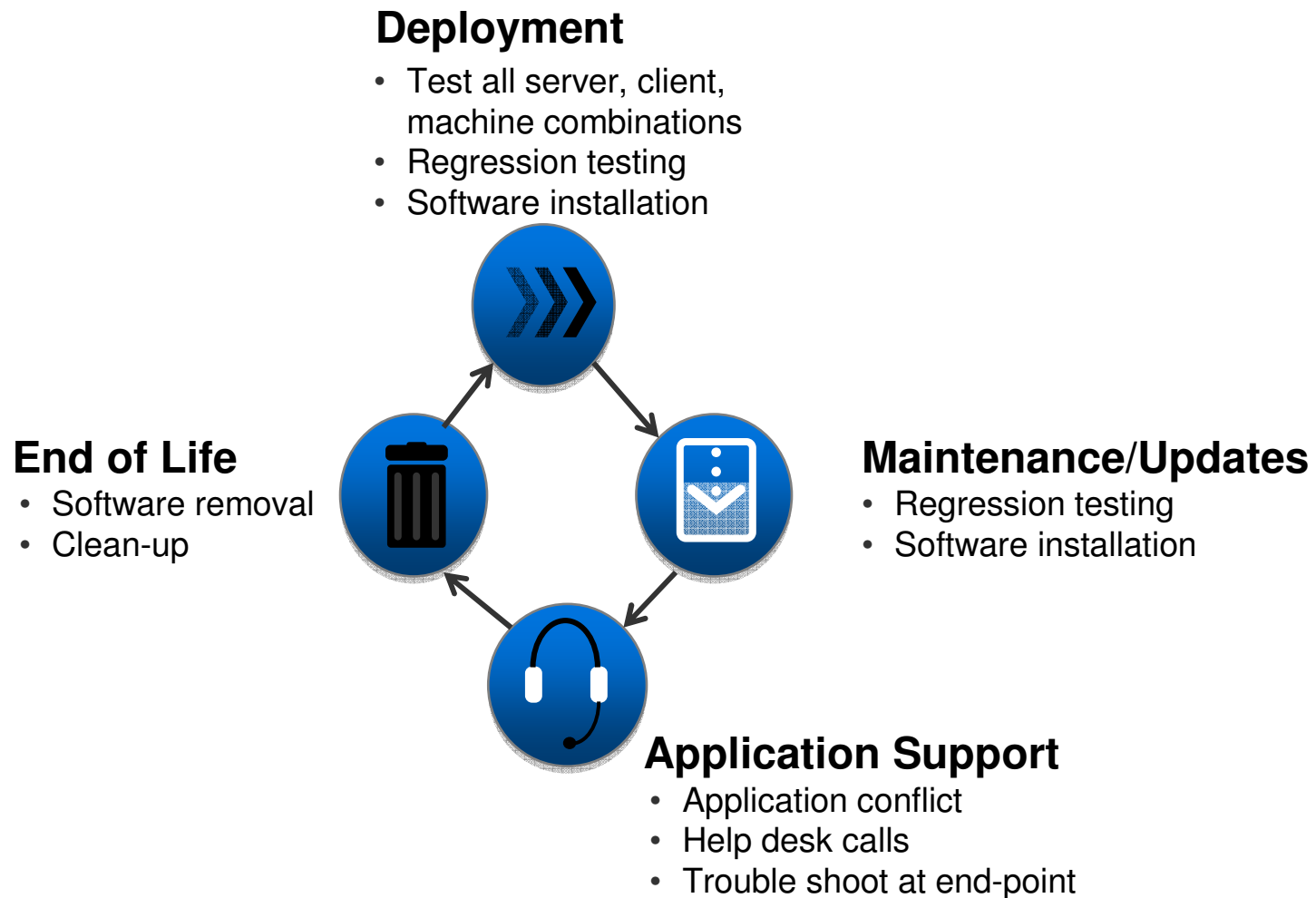
## **Current Application Management Is Not Agile**

- Applications are hard-coded to devices
- Users are tied to specific devices
- IT tries to minimize devices and lock down
- Device proliferation and increasing user pressure from users for flexibility makes current approach costly to support

## Issues With Current Approach

- Applications are costly to maintain
- Application environments are inflexible and cannot easily respond to business needs
- Intellectual property is not secure
- The user experience is poor

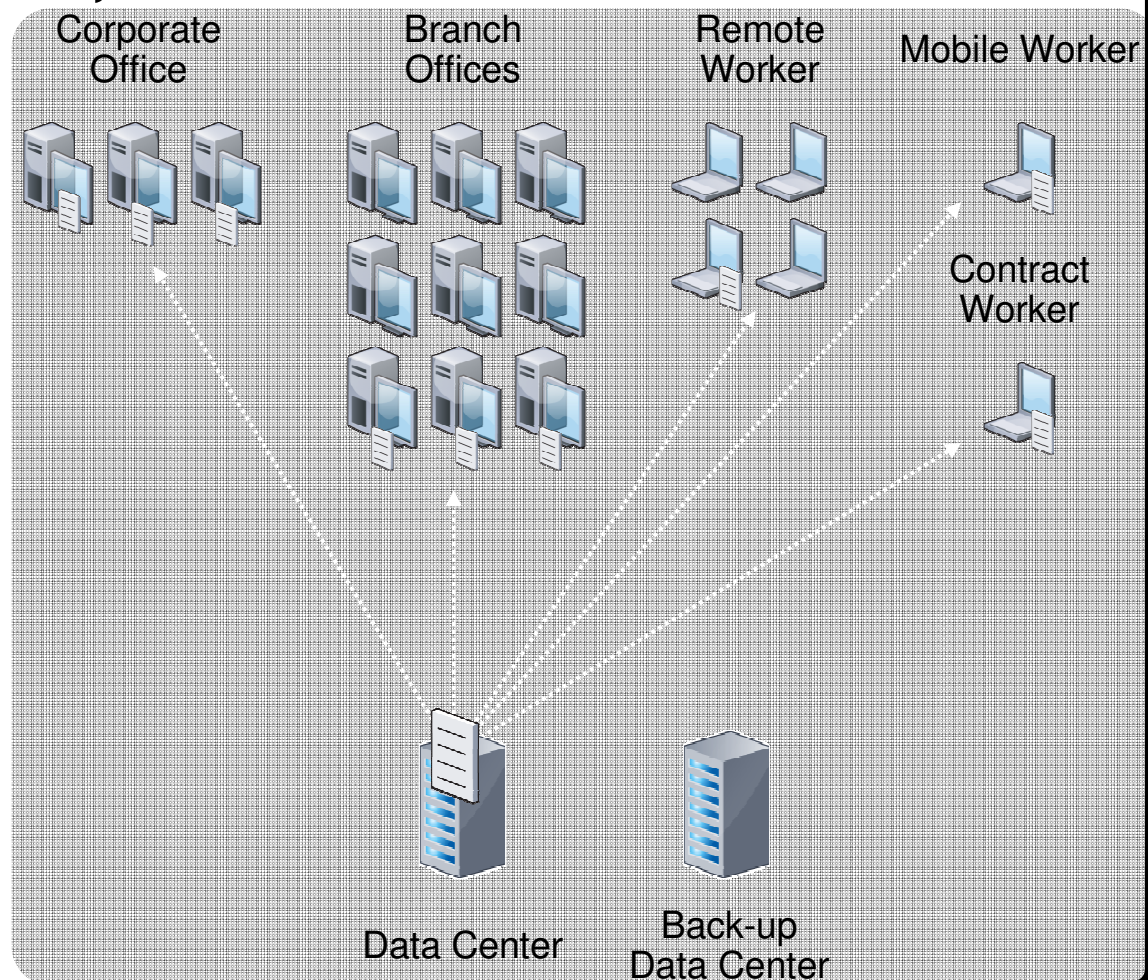
# Typical Application Lifecycle Management

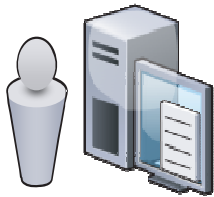


## A Better Approach: Centralize, Virtualize, Deliver On Demand

### Separate applications and operating environments

- Move applications and data from individual machines to the data center
- Maintain and test in one secure place
- Deliver instantly and on-demand to any pristine device, anywhere





Separate the App, User  
and machine

XenApp  
Server

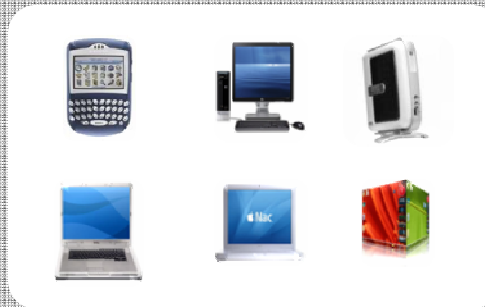


### Virtualize

1. Eliminate app conflicts
2. Eliminate regression testing

### Centralize

1. Install once
2. Secure app and data



- Virtual App – Hosted
  - Any device, any network



- Virtual App – Local
  - Offline use
  - Use local resources



# **Deliver ALL Windows Applications**

## **Virtual Apps – Streamed to Local**

- Centrally manage applications that must run offline
- Centrally manage applications that require local resources (e.g. CPU, Memory, Graphics)

## **Virtual Apps – Hosted**

- Supports the broadest range of devices
- Apps fully separated from device
  - Applications follow the user
- Data and intellectual property are contained and secure in the datacenter

# Deliver, Don't Deploy

## Traditional Deployment

- Package for each application
- Test for different use cases and platforms
- Extensive compatibility testing
- Install on all devices
- Distributed management
- Distributed data (insecure)
- Extensive regression testing
- Applications dependent on device OS
- Network over provisioning for branch/remote
- Application re-install

## Application Delivery

- Package once
- Test once
- Minimal compatibility testing
- No install – Deliver instantly
- Centralized management
- Centralized data (secure)
- Minimal regression testing
- Any application can be accessed from any device or OS
- Optimal performance over any network
- Application “reset”

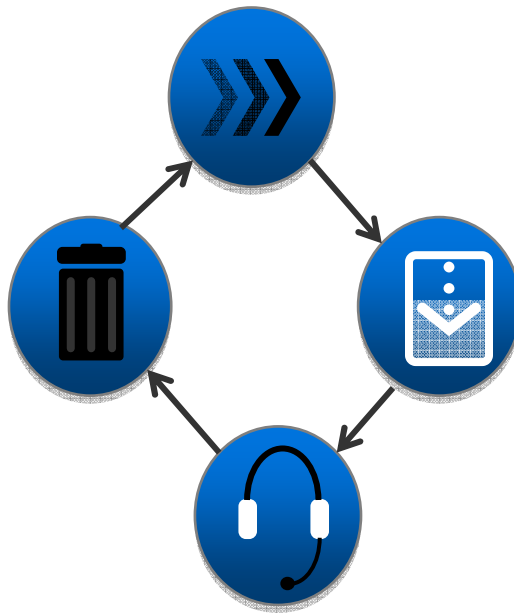
# Application Lifecycle Savings with Virtualization

## On Demand Software Delivery

- No Regression testing
- No Software installation

## End of life

- No Software Un-install
- No Post-removal cleanup
- Re-use existing HW



## Maintenance/Updates

- No Regression testing
- No Software installation

## Application Support

- No Application conflict
- Application Re-set
- Reduced Help desk calls

# Benefits of Application Virtualization

## For the user

- Applications on demand
  - anywhere, any device
- No operating environment “bloat”, conflict or corruption
- Improved performance by offloading to central servers
- Instant app access
- No hassle app updates

## For IT

- Reduce application costs
  - Install, test and patch once
  - No regression and app compatibility testing
  - Manage a single application instance for all servers and desktops
- Eliminate data loss by centralizing applications and data
- Instantly deliver applications for business agility
- Ultimate user mobility, productivity and satisfaction
- Leverages existing infrastructure

## For the business

- Data security
- Business Agility
- Business Continuity

# Why Virtualize XenApp?

## Consolidation

- Achieve server and silo consolidation
- Reduce hardware footprint in datacenter
- Accelerate 32- to 64-bit server transition

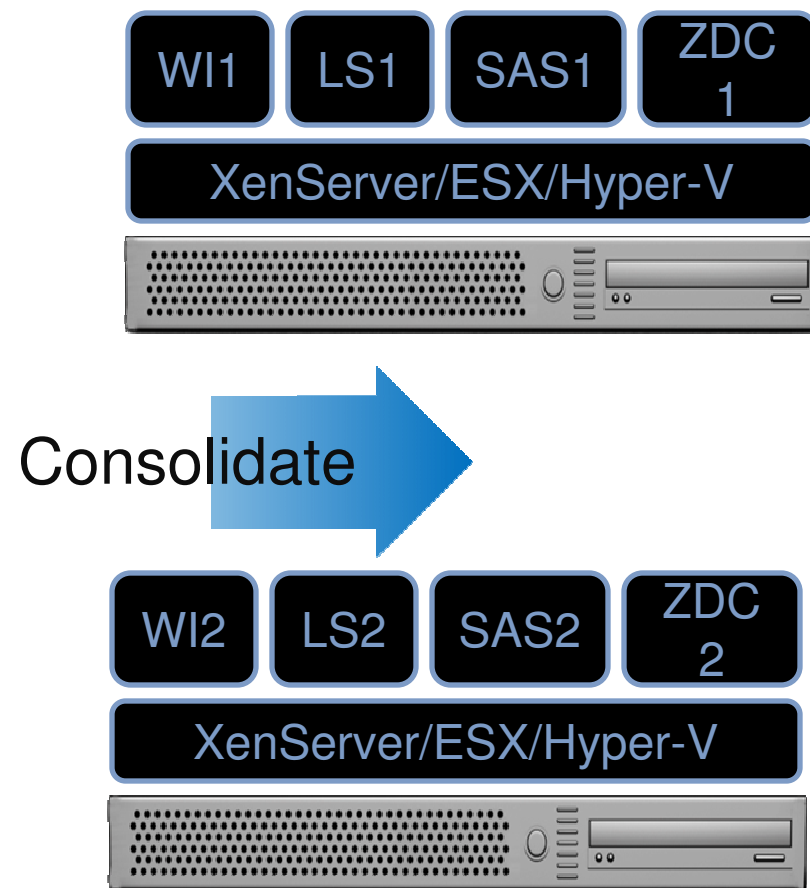
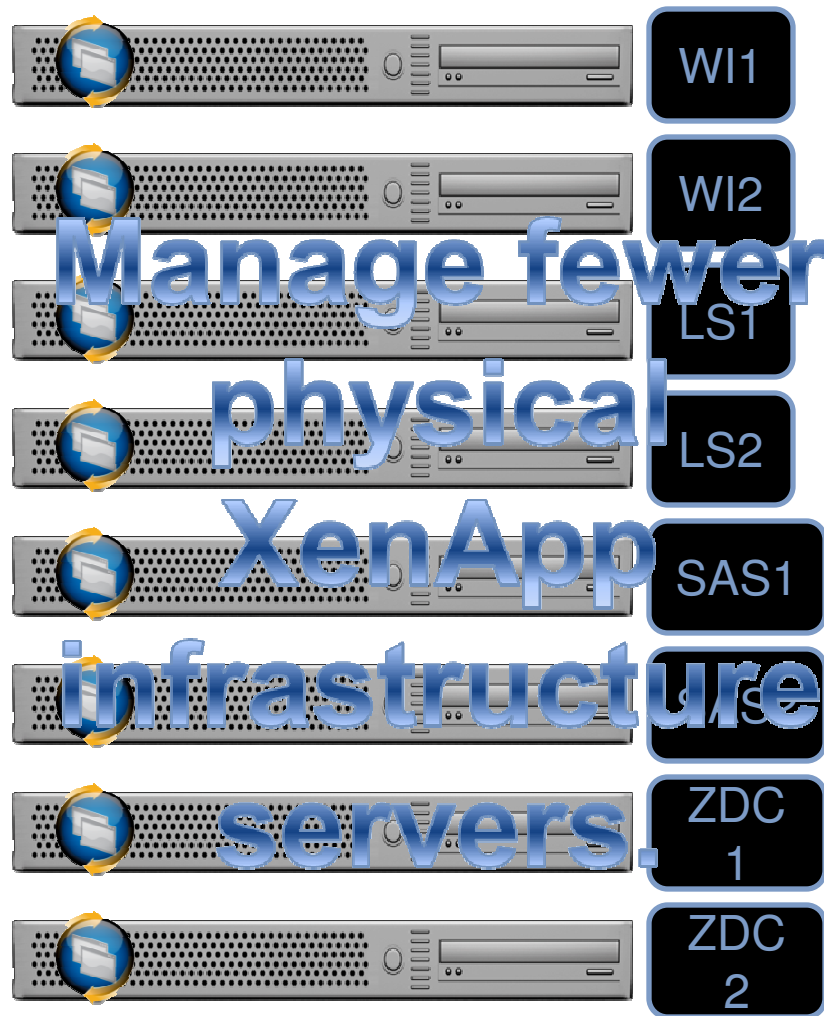
## Simplified Management

- Simplify server provisioning
- Manage one image for physical *and* virtual servers
- Address test and dev scenarios

## Improved Availability

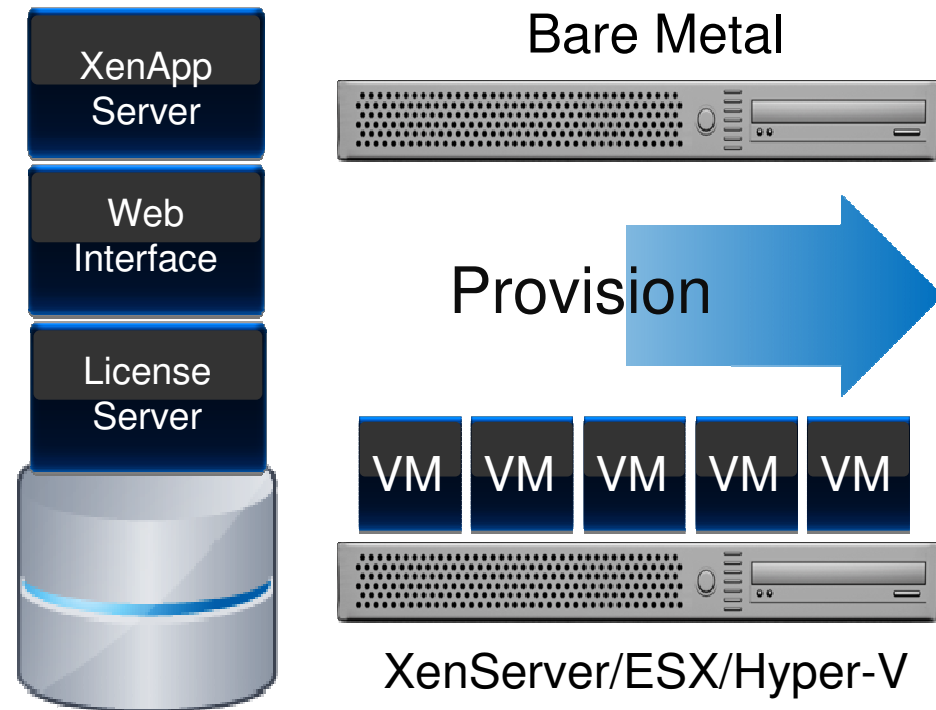
- Reduce application downtime
- Add high availability and fault tolerance
- Simplify disaster recovery

## Infrastructure Consolidation



## Simplified Management Scenarios

**Accelerate  
provisioning  
to physical or  
virtual  
XenApp  
servers.**



# Application Delivery – More Than Just Virtualization

## Superior user experience

- Any user – task, knowledge, mobile
- any location, any network
- Application follows the user
  - Device to Device
  - Offline

## Scalability and flexibility

- Instantly deliver apps anywhere

## Highly available

- Achieve 5 9's of application availability

## Superior application management

- Provision – install once, test once, deliver instantly to everyone
- User experience monitoring – end to end visibility of user experience
- Support
  - Application availability and service level alerting
  - User centric troubleshooting for fast problem resolution
- Security, control and compliance
  - Policy base application access
  - Secure login
  - Application recording
  - Centralized data and IP
  - Configuration and change reporting



# XenApp – End-to-end Application Delivery System



## Why Should IT Act Now?

- Best way to address business climate / economic conditions
  - Virtual Workplace
  - Green IT
  - Work from Home
  - Business continuity
- Flexibility and agility to respond to business needs.
- Reduce application management costs by up to 50%
- Most secure way to deliver all Windows applications
- Ability to support the broadest range of users and devices while maintaining control

# What's New in XenApp 5

## Deliver ALL Windows Applications

- Next generation application virtualization with inter-isolation communication
- Compatibility with Microsoft Application Virtualization gives IT choice for packaging and delivering apps
- Flexible delivery options – HTTP(S) and existing infrastructure (e.g. SMS/SCCM)

## User Experience 2.0

- Visually compelling and intuitive user interface
- Integrated application experience
- Consistent throughout the Citrix Delivery Center
- User and app prioritization via Preferential Load Balancing

# **What's New in XenApp 5**

## **Application Performance Monitoring**

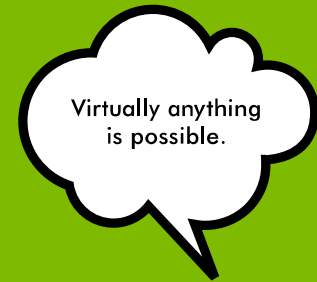
- True Service Level monitoring and alerting
- Expanded real-time monitoring and metrics
- Improved user interface

## **Application support**

- New Resource Manager (built on EdgeSight technology)

## **Dual Platform support**

- Supports Windows Server 2008 and Windows Server 2003
- Mixed farm support provides smooth transition to Windows Server 2008



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# Lessons Learned While Deploying Citrix Presentation Server (XenApp) 4.5 in a Virtual Datacenter

**Brandon Meyer**

**Senior Enterprise Windows Systems  
Administrator, Quebecor World, Inc.**

**Date: September 15, 2008**

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## Outline

- Introduction
- Initial Setup and Configuration
- Citrix Server Configuration
- Citrix Server Templates\Cloning
- Simple Performance Metrics
- Conclusion

## Quebecor World Data Center Overview

- 60 VMware VI 3.5 ESX hosts
- Over 400 Virtual Machines
- Over 100 TB of FC SAN storage
- All ESX Servers running on HP BL460c blades
  - 2 – Dual Core Intel Pentium Xeon Processors
  - 16GB of RAM
  - 2 – Physical Gig NICS
    - 1 NIC dedicated for VM traffic, 1 NIC dedicated for VMkernel and Service Console
    - WITH FAILOVER REDUNDANCY
  - 2 – 72GB SAS internal hard drives
  - 2 – 4G FC Qlogic HBAs
  - HP EVA 8100\8000\6000 as backend storage for VMDKs
  - VMware gave us the ability to migrate 130 Servers from Montreal to our main Data Center in Illinois within 30 days with minimal downtime

# Vmware Virtual Environment

## 1 Virtual Center Server

### 5 Distinct Clusters with HA and DRS enabled

- Citrix 1
- Citrix 2
- Production
- Test
- Lotus
  - 2 Citrix clusters is for 2 reasons.
    1. 16 Server limit within DRS Clusters
    2. Allowed us to separate the load for our Citrix 4.0 and 4.5 farms



# Initial ESX Setup and Configuration

- DRS
- HA
- Networking
- Storage
- Memory
- Snapshots

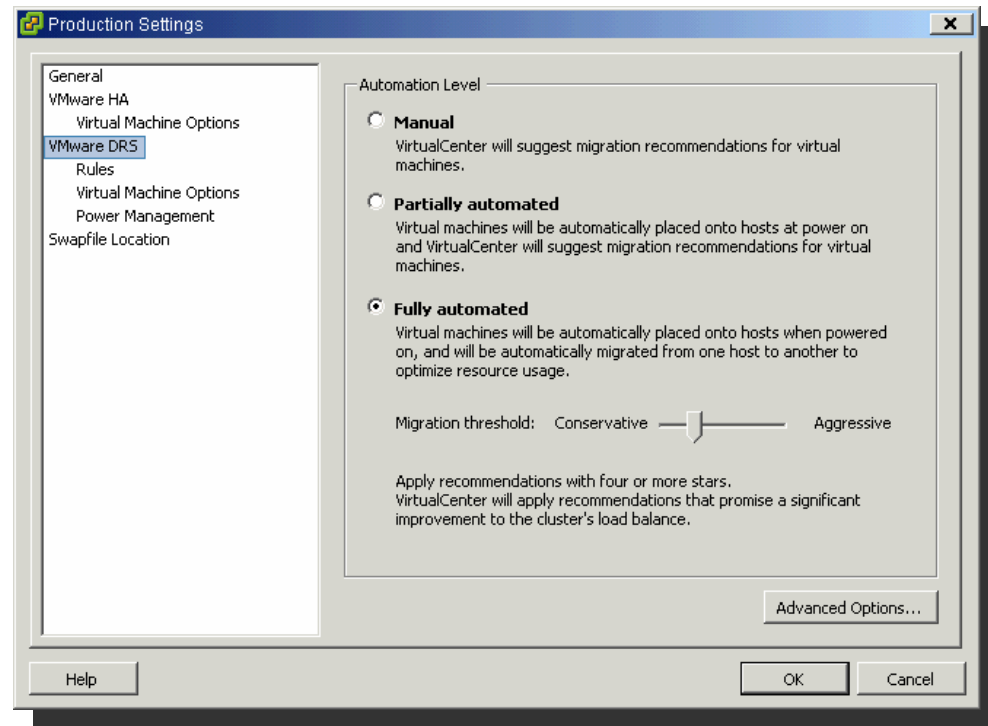
# DRS (Distributed Resource Scheduling) Migration Threshold

Can be your friend or your worst enemy

Configure conservatively

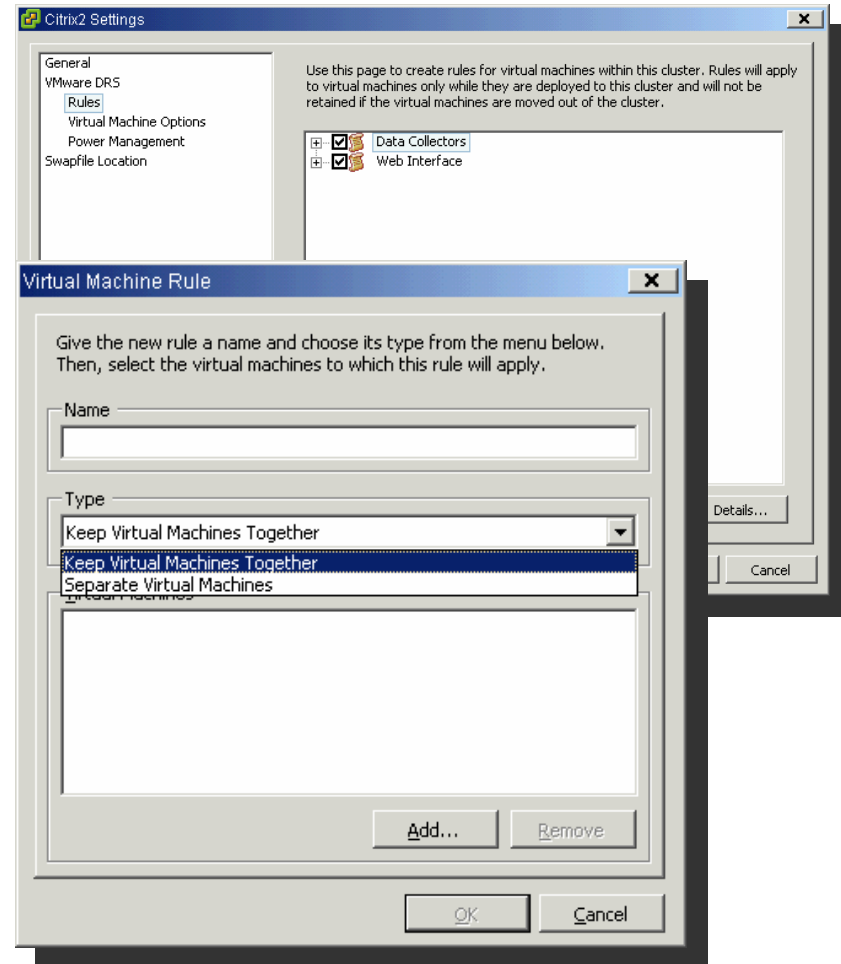
- Too many VMotions will result in poor VM performance and extra network usage

Maximum 16 hosts in  
DRS Clusters



# DRS (Distributed Resource Scheduling) Rules

- Utilize the rules options
- Allows you to guarantee that specific servers will not be on the same blade at the same time
- Allows you to guarantee that two servers will be on the same blade at the same time, to save on physical network usage.



## **HA (High Availability)**

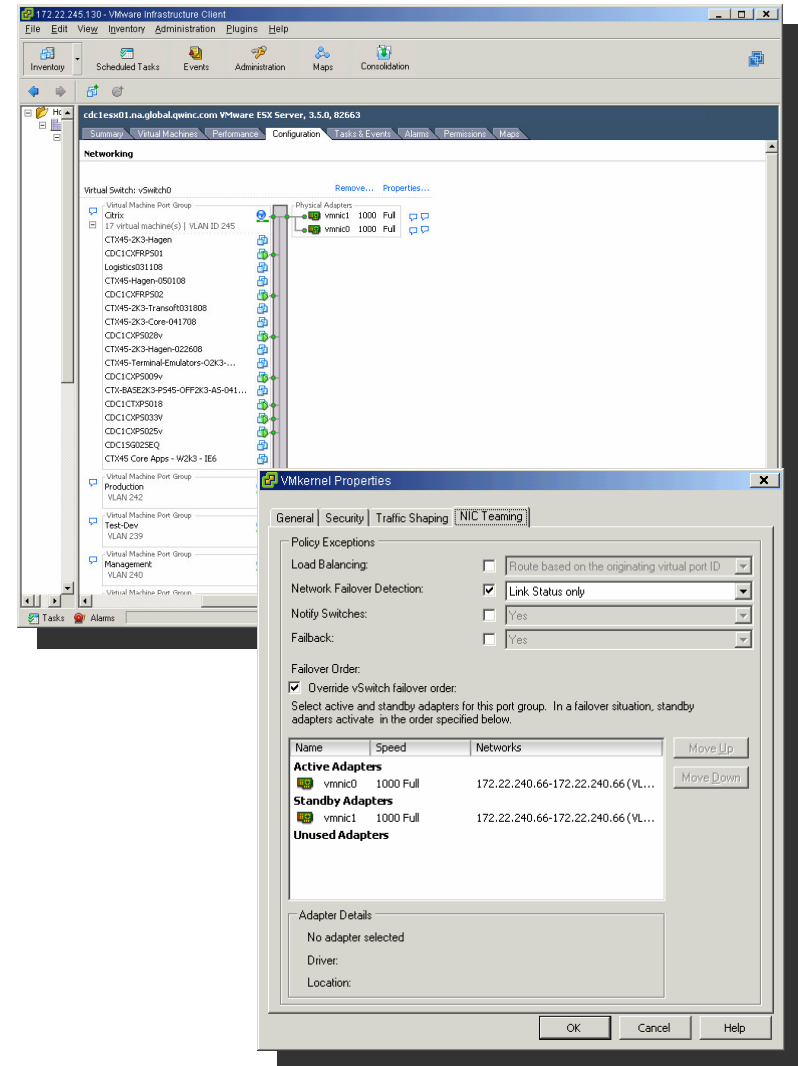
**Allows VMs that reside on a failed host to be powered-on on a different host.**

**Requires all DNS settings to be correct (VERY IMPORTANT)**

- Including:
  - DNS Entries for hosts on DNS server
  - Correct entries in HOSTS file for localhost
- When installing ESX, make sure you put in the FQDN for the hostname.
- Now HA can detect OS problems (BSOD) and reboot VM if needed

# Networking

- vSwitches
- Use vLANs if possible
- Configure a single vSwitch with 2 physical NICs dedicating 1 NIC for VMs and the other for Service Console\VMotion while still allowing for failover.
- Utilize the Failover Order under NIC Teaming within your Port Groups.



# Time Configuration

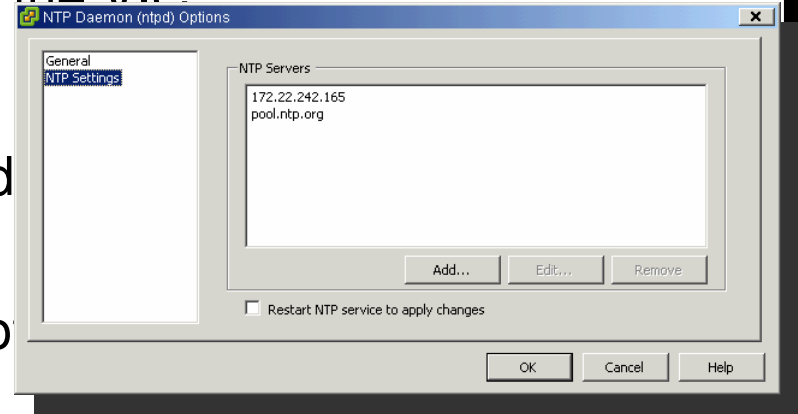
## NTP Server

- In 3.5 this can be achieved through the VIC

- Used to have to edit the config files

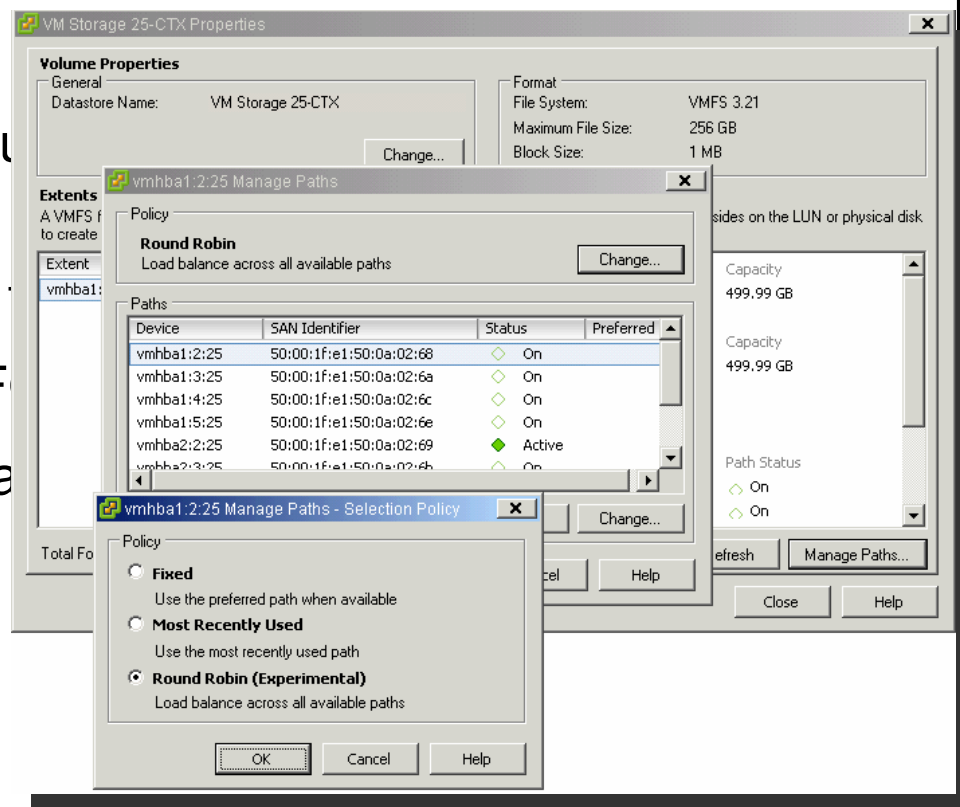
- Set your ESX servers to point to a d pool.ntp.org

- If using VM Tools Time Sync, turn o could cause a conflict if using both.



# Storage Round Robin for Data Stores (Experimental)

- Utilize Round Robin
- Considered Experimental, but usable in production
- Changes the FC path taken
- Eliminates bottle necks on FC
- Must be set on each SAN data store



VMware Technical Article: [https://www.vmware.com/pdf/vi3\\_35\\_25\\_roundrobin.pdf](https://www.vmware.com/pdf/vi3_35_25_roundrobin.pdf)

# Storage Fiber Channel Configuration (Zoning)

Create a separate fabric zone for each ESX server and the storage controllers

## Zone 1

- ESX Host 1
- Storage Controller 1
- Storage Controller 2

## Zone 2

- ESX Host 2
- Storage Controller 1
- Storage Controller 2

## Zone 3

- ESX Host 3
- Storage Controller 1
- Storage Controller 2

**Zoning each server separately will reduce FC communication when there is a change in a zone.**



## Storage Data Store Sizes

When setting up your datastores think about what will be running on it.

**250GB is what I typically use**

**Typical VM is 15-20GB**

- $250\text{GB} \div 20\text{GB} = 12$  VMs (leaving about 10GB free space on the data store for snapshots)
- Use smaller Datastores when you have small VMs.
- Use a single Datastore or RDM for high IO servers.
- Tests have shown that there is no performance increase with RDM over VMFS.

HP Recommends 8-10 VMs per LUN

[http://h71019.www7.hp.com/ActiveAnswers/downloads/VMware3\\_StorageWorks\\_BestPractice.pdf](http://h71019.www7.hp.com/ActiveAnswers/downloads/VMware3_StorageWorks_BestPractice.pdf)

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## **Storage RDM vs. VMFS**

**Use VMFS for all hard disks except for large volumes**

**The reason for using RDM on large volumes is because of “dead space” overhead.**

- Roughly 5% “dead space” on VMFS data stores for snapshots and extra space.
- VMFS formatting overhead
- NTFS formatting overhead

# Dead Space Theories

## Original Configuration of using 200GB VMDK

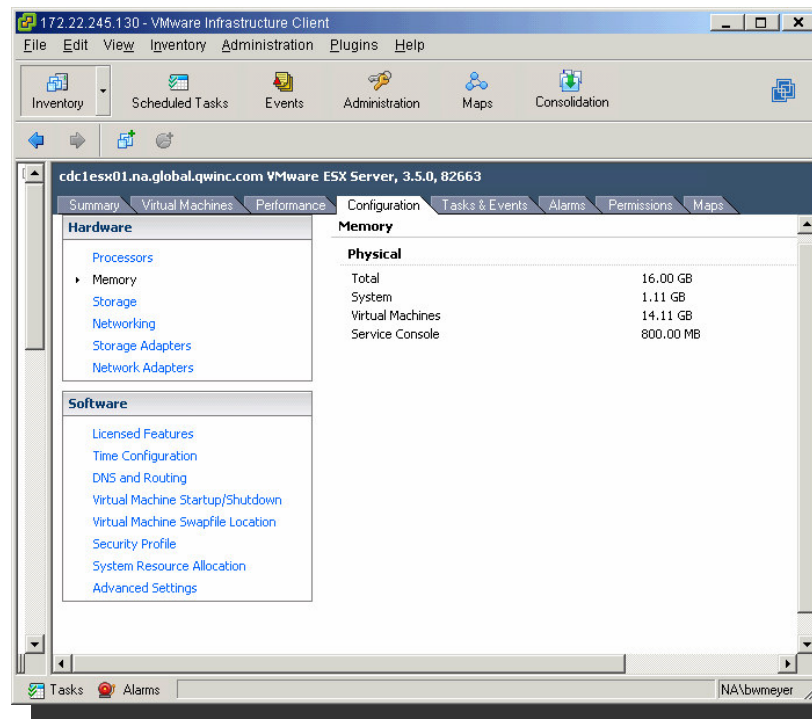
- 250GB VMFS data store – 20GB (OS) VMDK – 200GB (DATA) VMDK = 30GB Available for Dead Space for snapshots
- Total Dead Space of 35-40GB for the entire VM.
  - This includes extra VMFS space and NTFS overhead.

## Alternatively you can use a 200GB RDM instead of VMFS file

- 250GB VMFS data store – 20GB VM – 200GB RDM
- 2.5GB (VMFS Dead Space) + 5GB (NTFS on RDM) = 7.5GB of dead space if you utilized RDM for the 200GB volume as opposed to using a VMDK file.

# Memory For the Service Console

- By default the Service Console is allocated 272MB of RAM. This is insufficient when using DRS and HA causing excessive swapping.
- Change memory for Service Console to 800MB.



Discussed in the following thread:

<http://communities.vmware.com/thread/153623;jsessionid=9E80523E1E24D5F64B84EEB43592DDB6?tstart=0>

# Snapshots

## When to Use Them

Snapshots can be your best friend in certain situations

**DO NOT** run a VM always on a snapshot

- Some people might be tempted to use Snapshots to revert to every couple of days to have a pristine TS environment
  - This adds latency to IO requests
  - This adds disk usage
- Adds disk usage because of the REDO file. Data is written to the REDO file, not the actual VMDK.
- Adds latency in IO because the VMkernel needs to check for the data in multiple places
- Creates SCSI locks on the LUN, not good for performance of other VMs running on the same LUN.

Check out <http://communities.vmware.com/thread/135663> for a good discussion on SCSI Reservations and locks

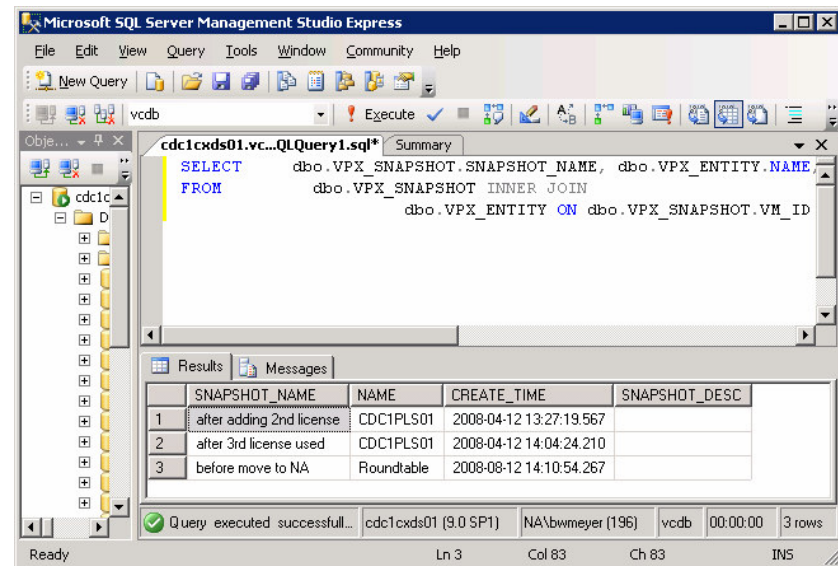
## Snapshots When to Use Them

- Only keep a snapshot on a VM for a couple days at maximum. Such as after an update or upgrade, then delete the snapshot after you confirm everything is working.
- Deleting a snapshot can take a long time when kept on a VM for a long period of time.
  - Personal experience, I had a snapshot take 5 hours to commit.
  - Personal experience, I had a snapshot take all of disk space, locked up VM.
- VM performance is seriously degraded while committing a snapshot.
- Real World experience of keeping a snapshot too long

<http://www.vmwarez.com/2006/11/beware-long-snapshot.html>

# How Many Snapshots Do I Have in My Environment?

This is a SQL script you can run against the VirtualCenter database to get a list of all of you snapshots in your environment



```
SELECT      dbo.VPX_SNAPSHOT.SNAPSHOT_NAME, dbo.VPX_ENTITY.NAME,  
dbo.VPX_SNAPSHOT.CREATE_TIME,  dbo.VPX_SNAPSHOT.SNAPSHOT_DESC  
FROM        dbo.VPX_SNAPSHOT INNER JOIN  
                dbo.VPX_ENTITY ON dbo.VPX_SNAPSHOT.VM_ID =  
                dbo.VPX_ENTITY.ID
```

# **Citrix Server Configuration**

## **Host Population\VM Setup**

### **Server Configuration**

- Turn Off Unneeded Services

### **Setting up DRS for Citrix Servers**

- Configure Rules for Servers

### **Setting up HA for Citrix Servers**

- Configure Rules for Servers

### **Use VMware Consolidated Backup**

- Minimizes performance impact during backups



# Citrix Server Configuration

## Host Population\VM Setup

**The overall recommendation is 1.5 Citrix VMs per CPU Core.**

- 2-Dual Core (4 cores) server = limit 6 VMs for that host.
- Always set up your Citrix VMs with 1 vCPU
  - Due to the scheduling done by VMware at the hypervisor layer you will degrade performance if you use 2 vCPUs
- It is usually recommended to have 2GB of RAM per vCPU, depends on applications
- To limit the “dead space” of your VMs, designate just enough hard drive space for Windows \ Citrix \ Applications \ Profiles
- Do not allow you users to save data on the Citrix server!
- Use Microsoft DelProf to delete profiles off of servers, recommend daily.
- Set PageFile size (max and min) to 2.5 times your RAM

These statements are average recommendations, as always you should test your setup with your specific applications.

# Citrix Server Configuration

## Turn Off Unneeded Services

- Disconnect Cdrom and Floppy drives connect to the VM
  - Windows checks the CDrom every few minutes, this increases the resources needed on the host
- DHCP Client if you are using static IPs
- “Help and Support”
- “HTTP SSL”
- “IPSEC Services”
- “IMAPI CD-Burning COM Service”
- “Indexing Service”
- “Intersite Messaging”
- “Messenger”
- “Remote Access Auto Connection Manager”
- “Remote Access Connection Manager”
- “Remote Desktop Help Session Manager”
- “W32Time” If using VMtools Sync with host

# Citrix Server Configuration

## Setting up DRS for Citrix Servers

**Utilize DRS to load balance your Citrix servers in a cluster.**

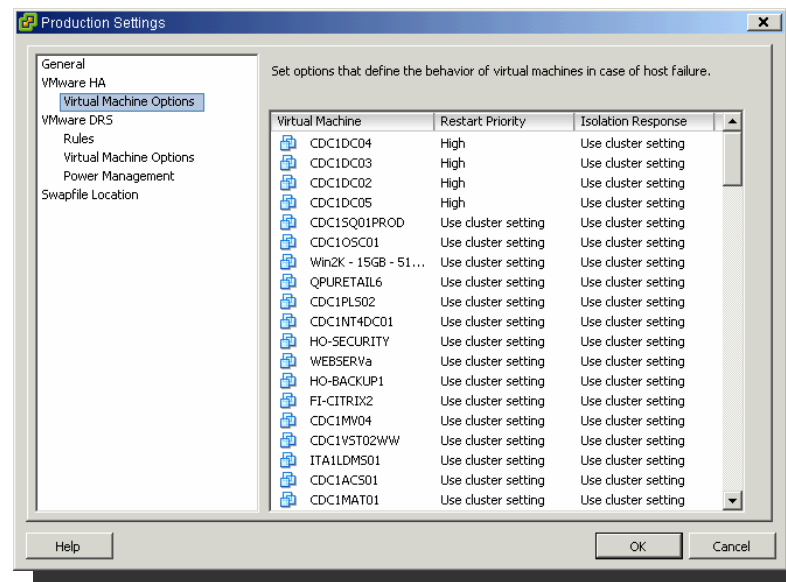
- Set up a cluster specifically for your Citrix servers
- Configure the rules so that redundant servers are not on the same host at the same time
  - Web Interface servers
  - Data Collectors
  - Servers in silos (doesn't work if you have more VMs than Hosts in your silos, works well if you have a silo with 2-3 servers in it)
  - Redundant Citrix Data Store servers (if using SQL replication)
- Set Automation Level
  - Fully Automated
    - Set Migration Threshold to "Apply Recommendations with four or more stars"
    - This will allow to load balance when needed, not just to make it even.
  - If you have the Migration Threshold set too Aggressive then you will be VMotioning your servers too much and it will degrade performance

# Citrix Server Configuration

## Setting up HA for Citrix Servers

Utilize VMware HA to boot up VMs that are on a failed host on a good host

- Configure the restart priority for your VMs so that your data store and data collectors are restarted first and then your other servers.



## **Citrix Server Configuration Use VMware Consolidated Backup**

- VMware Consolidated Backup allows you to backup your VMs from a proxy server without a noticeable performance hit on your VMs.
  - Automatically creates a snapshot
  - Presents snapshot to your supported backup software of choice
  - Breaks down snapshot after backup is complete
- You do not need to install backup agents on all of your Citrix servers.
- You eliminate the network created during backups, which could effect your Citrix sessions

## **Citrix Server Templates\Cloning**

- Steps to perform before cloning\creating template
- Creating multiple templates for easy deployment

## **Citrix Server Templates\Cloning Creating Multiple Images**

### **Create one base template with only Windows installed**

- This will allow you to deploy servers more rapidly for something like Web Interface.

### **Create one base template with only Citrix installed. This will be your Citrix Gold Template**

- This should not contain any management tools for Citrix.
- This allows you to rapidly deploy a new Citrix silo.
- Use your Gold Template to create your data collectors as well.
- Use your Gold Template to create your management servers for your farm.
  - A little hint, publish the VMware Virtual Infrastructure Client in Citrix.

### **Create an intermediate Silver Template for each silo you have within Citrix.**

- If you are using Published Desktops with all applications on all servers then you will only need one Silver Template
- If you install your applications in silos, as we do, then you would create a Template for each separate silo
  - This allows you to deploy a new server in your different silos within minutes. If you only use your Gold Template then you will still need to install your applications after deploying.

## **Citrix Server Templates\Cloning Deploying Multiple Images**

**When you have multiple images (Gold, Silver1, Silver2, etc.) you will need a plan to deploy your templates efficiently.**

- Keep your templates up-to-date with MS updates each month. Use VMware Update Manager.
- If you have an application update or addition to a silo then update that silo's template and deploy the template out.
  - This keeps all your Citrix servers identical and then you don't need to install and test the update\addition on all servers. Saves on regression testing.



# Citrix Server Templates\Cloning

## Updating Your Templates with VMware Update Manager

**Use VMware Update Manager to keep your templates up-to-date easily.**

- Automatically apply MS updates
  - No need to manually change the template to a VM
  - Turn off the network card (because it has the same IP as your first server)
  - Turn on the VM, now you can't get to the Windows Update site because your network card is turned off.
- VMware Update Manager automatically updates VM Templates
  - Turns on your template
  - Presents a pseudo ISO image with the required updates
  - Installs updates
  - Shuts down VM

# Citrix Server Templates\Cloning

## Prepping Your Server

### Quick Steps to prepare your server to clone:

- Install the first server in the farm
- Install any additional software you would like on your template such as MS Office, AV, etc.
- Reboot Server
- Delete the wfname.ini file, if it exists, from the root of C:
- Stop the IMA server and set to Manual start up
- If Presentation Server is Enterprise Edition you need to remove the local host cache located at “%ProgramFiles%\Citrix\Citrix Resource Manager\LocalDB”
- Shut down your server
- Clone server to template
- Complete instructions for cloning a Citrix server can be found at <http://support.citrix.com/article/CTX107406>

## Citrix Server Templates\Cloning Prepping Your Server

**Caution:** Do not attempt to image a server with an SSL certificate installed because SSL certificates are unique to the hardware.

**Caution:** Do not attempt to use drive image software to restore an image of a Presentation Server with remapped drives. Remapped drives will partially revert to the original configuration on the deployed server rendering the server unusable. Servers with remapped drives may be duplicated using a hardware solution such as Compaq Smart Array controllers with RAID1 drive mirroring.

Complete instructions for cloning a Citrix server can be found at <http://support.citrix.com/article/CTX107406>

## Simple Performance Metrics

- CPU Usage
- Memory Usage
- CPU Ready – What is this?
- Network Usage (VM and Host)
- Do not use Windows metrics for performance in a virtualized server

## **Simple Performance Metrics**

### **CPU Usage (Host)**

**The most important thing to keep an eye on is your Host's CPU usage**

- When CPU cycles get short you start running into contention and slowness on your VMs
- Keep your servers below 70% utilization
  - This allows for spikes in usage so the host can handle it
  - Use DRS to have VMware monitor this for you
  - Use Notifications to alert you when CPU utilization is too high

## Simple Performance Metrics

### CPU Usage (VM)

#### The second is your VM's CPU usage

- Use the Virtual Infrastructure Client's performance tab for your CPU utilization (Do NOT rely on the Windows Task Manager)
- Keep below 50%
  - This is because the higher the CPU utilization on your VM, the more Context Switches you will probably have.
  - Context Switches are worse in a Virtual environment
  - Use Notifications to alert you when CPU utilization is too high
  - You can quickly add another VM by deploying a template if you notice high CPU on all your Citrix servers

## **Simple Performance Metrics**

### **Memory Usage**

**Checking Memory usage is difficult in VMware because Windows does paging and VMware does Memory Sharing**

- Memory Page Sharing is where VMware will share memory pages for multiple virtual machines
  - This allows you to utilize less physical RAM for your virtual machines
- Check Perfmon stats to find out how much Windows is paging.
  - Paging in a VM creates multiple resource requests.
    - Memory IO to check if the requested page is in RAM
    - Disk IO if the requested data is paged to disk
    - Use Citrix Load Evaluator for excessive paging
- Test and monitor your servers to see how much memory your applications use.

# Simple Performance Metrics

## CPU Ready – What is this?

### CPU Ready

- This is the amount of time when the vCPU is ready to execute a command but the pCPU is not ready.

**A high CPU Ready time will show in a VM by lagging or waiting for things to happen.**

**Should be in single or double digits.**

- You can monitor this within the VM Performance tab and change the chart options to include CPU Ready time.
- You can also monitor this in real-time in the CLI under ESXTOP (CPU - %RDY)

**High CPU ready times can appear when:**

- High Context Switching
- CPU Contention

**You can add more VMs to reduce the number of users per Citrix server.**

**Information about CPU Ready in a Citrix environment**

**<http://theether.net/kb/100072>**



## Simple Performance Metrics

### Network Usage (VM and Host)

- With multiple VMs going through the same NIC, keep an eye on the Host's network usage
  - Network IN
  - Network OUT
- Keep chatty applications with a database together on the same host
  - This eliminates traffic going onto the physical LAN
    - \*except when your servers are on separate vLANs.
    - The vSwitches are only Layer 2 and do not do Layer 3 routing.
- You can use DRS rules to keep these VMs together on the same host.

## **Benefits of Using VMware to Upgrade our Citrix Environment from 4.0 to 4.5**

- Started with 55 Citrix Presentation Server 4.0 servers
- Needed to upgrade to 4.5
- Didn't want to do an "in place" upgrade

## **Benefits of using VMware to upgrade our Citrix environment from 4.0 to 4.5**

**Having our Citrix environment on VMware allowed us to build out our new 4.5 farm and have it running side by side with our 4.0 farm.**

- This way we could build our 4.5 farm, install applications and test without needing too much additional hardware and we could leave our users working on the 4.0 farm with no interruption.

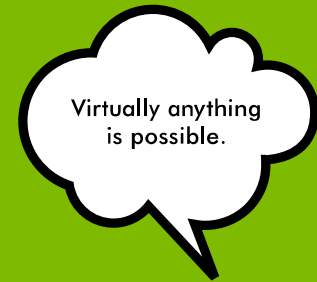
**When our 4.5 servers were ready we would deploy the template, publish the applications to those servers and users wouldn't know the difference.**

### **Built new 4.5 Web Interface Server first**

- The 4.0 and 4.5 farm then used the same 4.5 Web Interface servers.

## Conclusion

- Design and Configure your virtual environment before putting VMs in it
- Configure your Citrix servers to run in VMware with minimal downtime with DRS and HA
- Use templates and cloning to deploy Citrix servers in minutes, not days
- Use the Performance Metrics in VMware to get a real idea of your Citrix Server's performance



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# Q&A

## Breakout Session # VD2591

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