Oracle RAC on Vsphere 5

Solution Presentation - Don Sullivan

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- Oracle Certified Master, Server Products Trainer for Oracle University and consultant with Oracle Advanced Technology Services - 1998-05.
- Oracle SA for Polyserve/HP – 05-10
- Vmware SE DB specialist 2010 – Present

Agenda

- **RAC on Vmware – The Vsphere Platform**
  - Why use vSphere 5 as the platform for Oracle RAC
  - How to setup RAC on Vsphere - The installation process
  - Vsphere 5 features that make Vsphere complimentary to RAC
- **Performance capabilities**
- **Customer Success Stories**
- **The VRAC-DBA**
- **Summary**
- **Q/A**

Why RAC on Vmware (ESX/vSphere 5)

- **Uptime**
  - Greater uptime than RAC on physical
    - Vsphere HA and RAC are complimentary technologies
- **Provisioning**
  - New RAC nodes provisioned in minutes rather than hours
- **Comprehensive Resource Management**
  - The VM/Server is created to the exact specifications desired
  - The VM/Server resources can be adjusted as requirements change
  - Zero Downtime Hardware maintenance
- **The changing role of the DBA – The *VRAC-DBA***
  - The modern Oracle DBA has influence over the entire stack
  - Database Administrators do not have to re-lean their skill set
  - The *VRAC-DBA* occupies the preeminent position in modern IT
    - From the Virtualized Infrastructure to the RAC instances and Apps
    - From Storage through the network Architectures

vSphere High Availability Features

VMware HA

- Detects operating system and hardware failures
- Automatically restarts failed database virtual machine
- Provides a simple and reliable first line of defense for all databases
- Can be used in conjunction with Symantec App HA to provide application aware protections

VMware vMotion

- Enables live migration of database virtual machines from one physical server to another without service interruption
- Can reduce virtual machine planned downtime
- Perform host maintenance any time of the day

VMware DRS

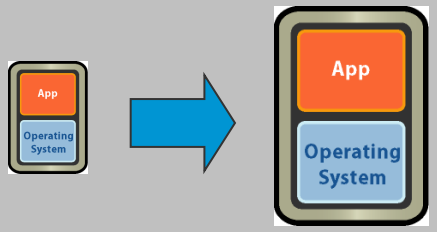
- Monitors state of virtual machine resource usage
- Can automatically and intelligently locate virtual machine
- Directs compute resources where needed
- Maintains database response time and SLAs

Scalability on Demand

Dynamic Scaling on VMware

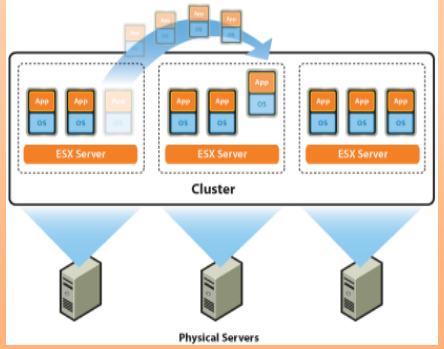
Hot-Add Capacity

1 vCPU
2 GB



4 vCPU
64 GB

VMotion to More Powerful Host



Provision Additional App Instance in Minutes

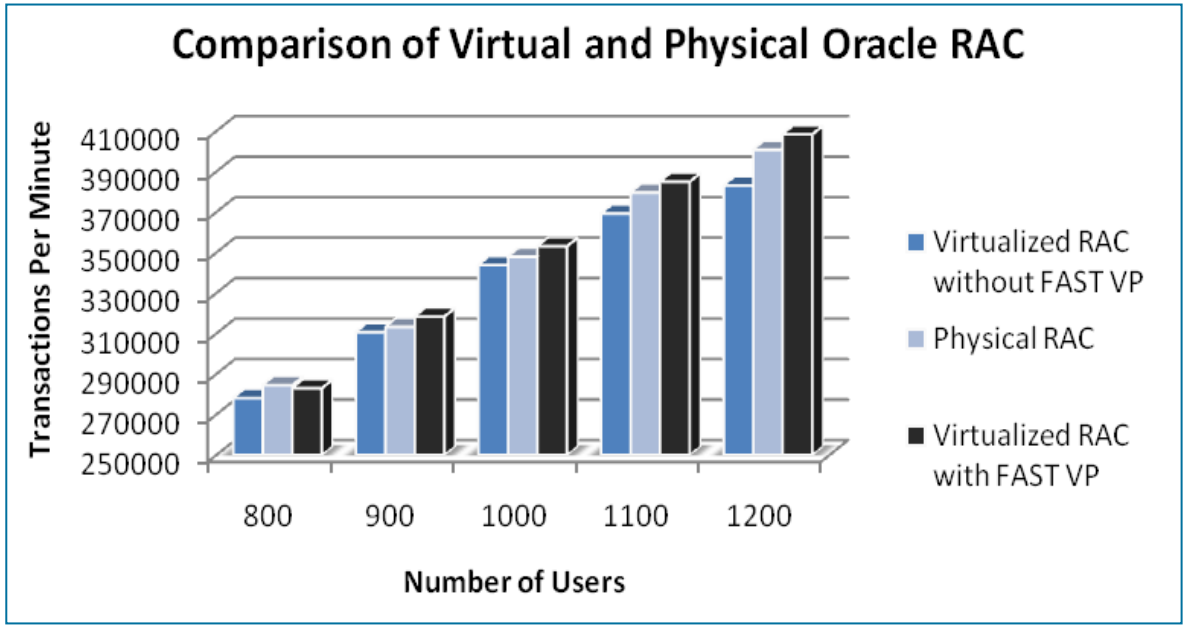
Maximum Scalability and Performance With vSphere 5

Application's Performance Requirements

% of Applications

	95% of Apps Require	ESX 1	ESX 2	VMware Inf. 3.0/3.5	VMware vSphere 4	VMware vSphere 5
CPU	1 to 2 CPUs	1 VCPUs	2 VCPUs	4 VCPUs	8 VCPUs	32 VCPUs
Memory	< 4 GB at peak	2 GB per VM	3.6 GB per VM	16/64 GB per VM	256 GB per VM	1,000 GB per VM
Network	<2.4 Mb/s	<.5Gb/s	.9 Gb/s	9 Gb/s	30 Gb/s	>36Gb/s
IOPS	< 10,000	<5,000	7,000	100,000	300,000	1,000,000

RAC on Vsphere - Physical & Virtual Oracle RAC comparison



- Virtual environment delivered performance consistently within 4% of physical environment (without FAST VP)
- Virtual environment processed 2% more transactions after FAST policy applied

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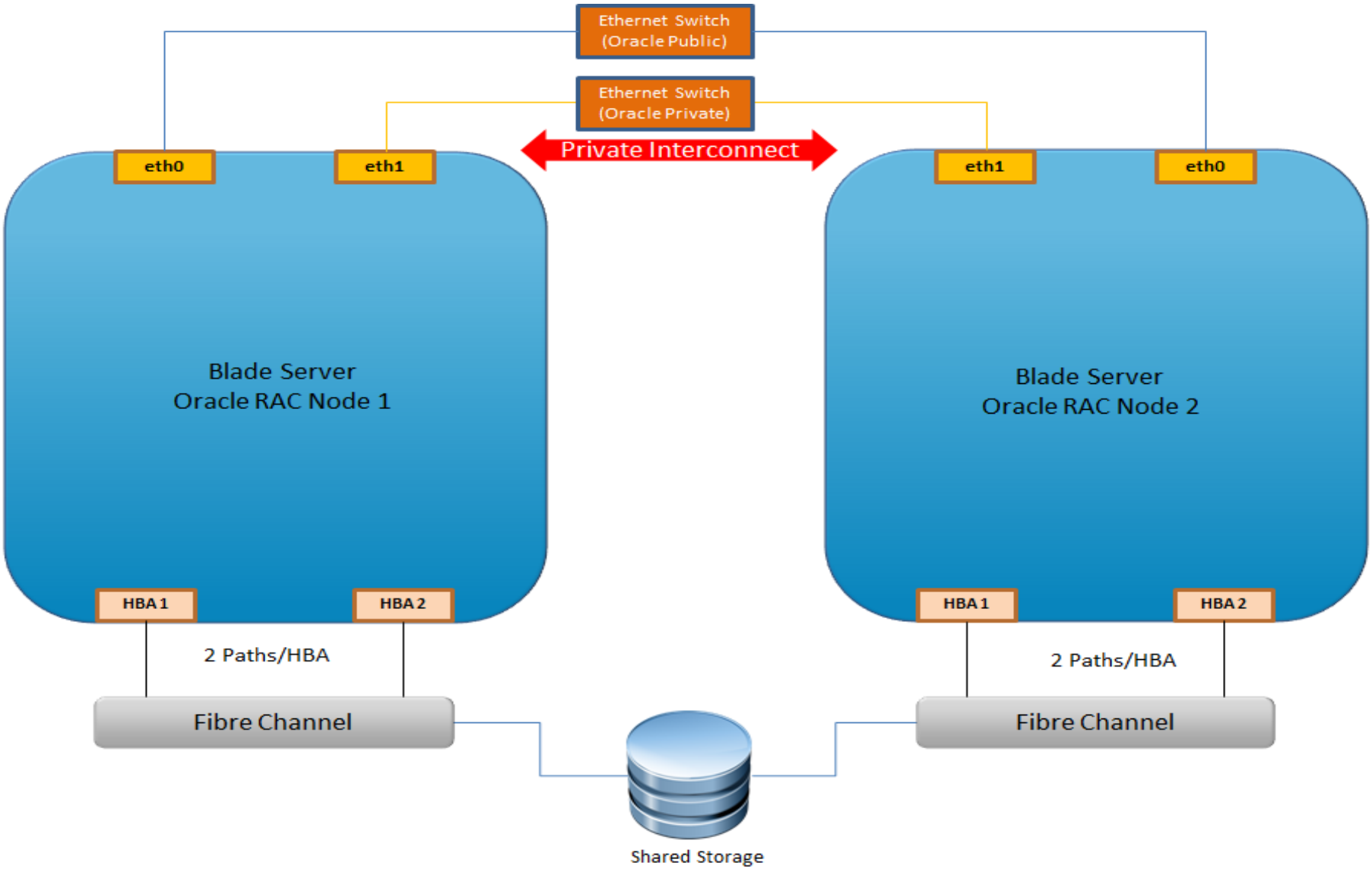
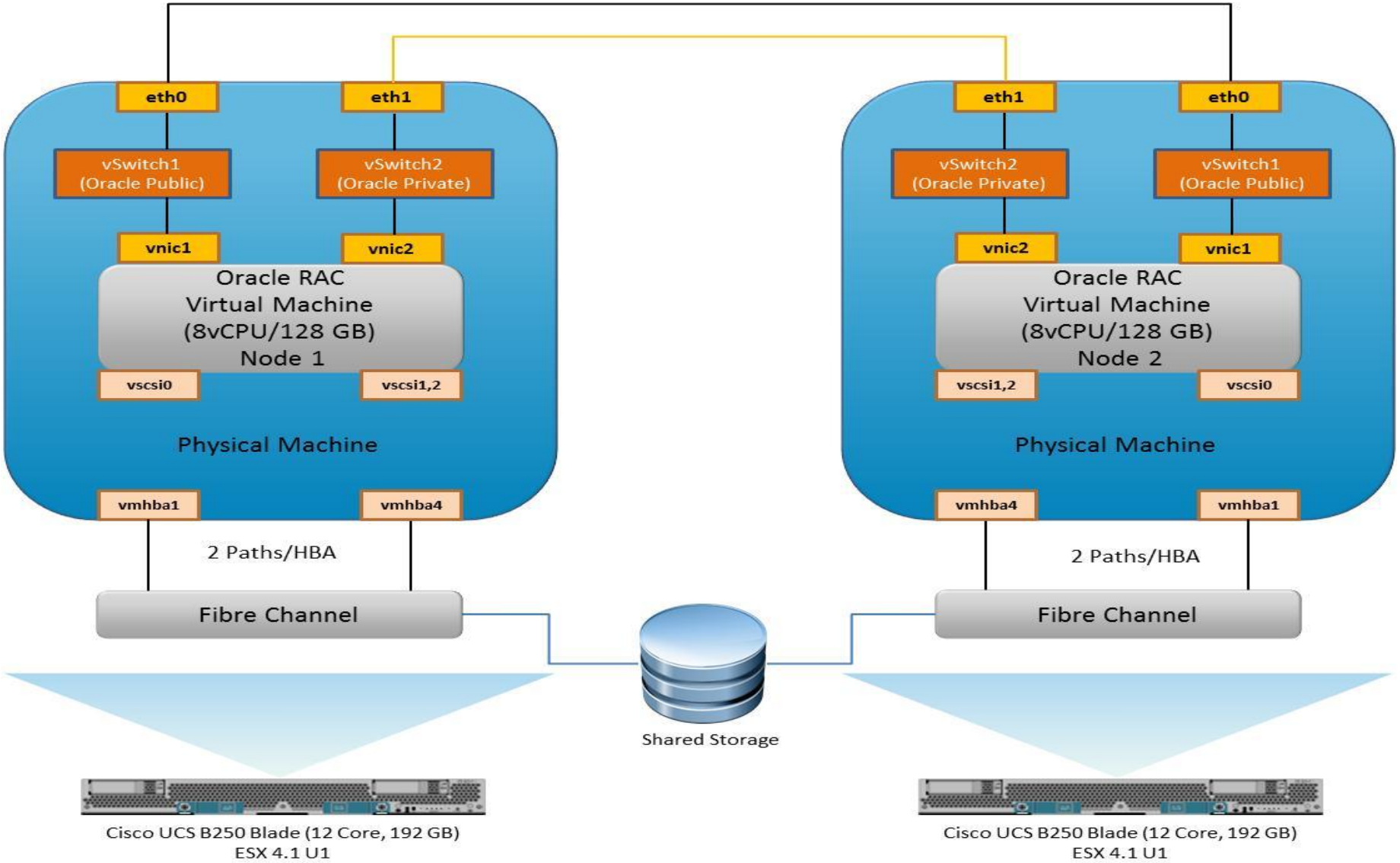
RAC on Vsphere - History

- **Milestones**
  - Oracle support statement extension – 11.2.0.2 – Fall 2010
    - MyOracleSupport.com Note 249212.1
      - "For Oracle RAC, Oracle will only accept Service Requests as described in this note on Oracle RAC 11.2.0.2 and later releases."
  - Release of the "Oracle Databases on Vmware - RAC Deployment Guide" – Jan 2011
- **Methods**
  - RDMs
  - ISCSI Gateway – Cognizant Corporation – Chris Williams
  - VMFS/VMDK

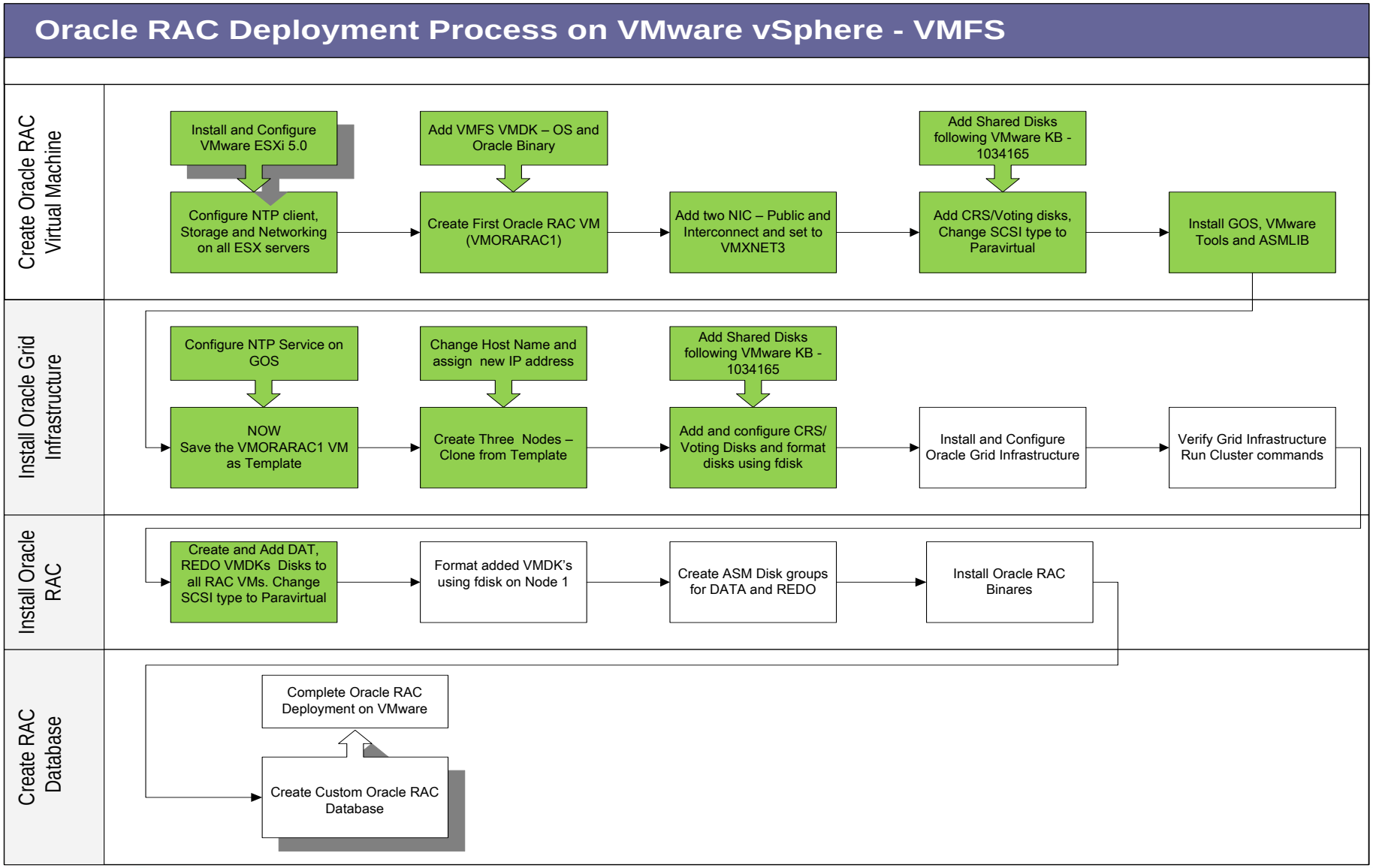
Oracle Real Applications Clusters (RAC) – Physical Server



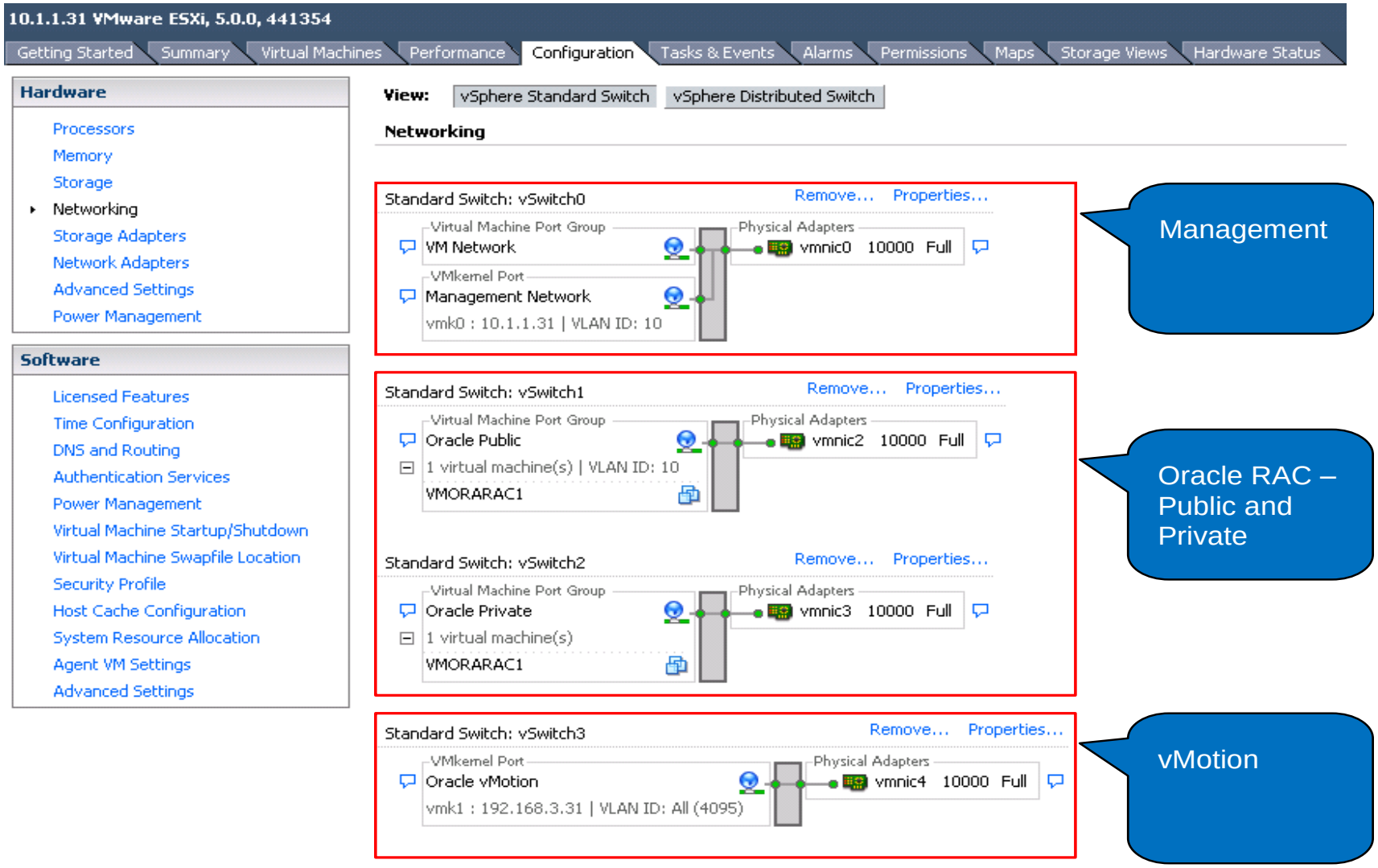
Oracle Real Applications Clusters (RAC) – VMware VMs



Oracle RAC on vSphere – Deployment Process Chart



RAC on Vsphere – Networking



Oracle RAC on vSphere – Deployment Steps

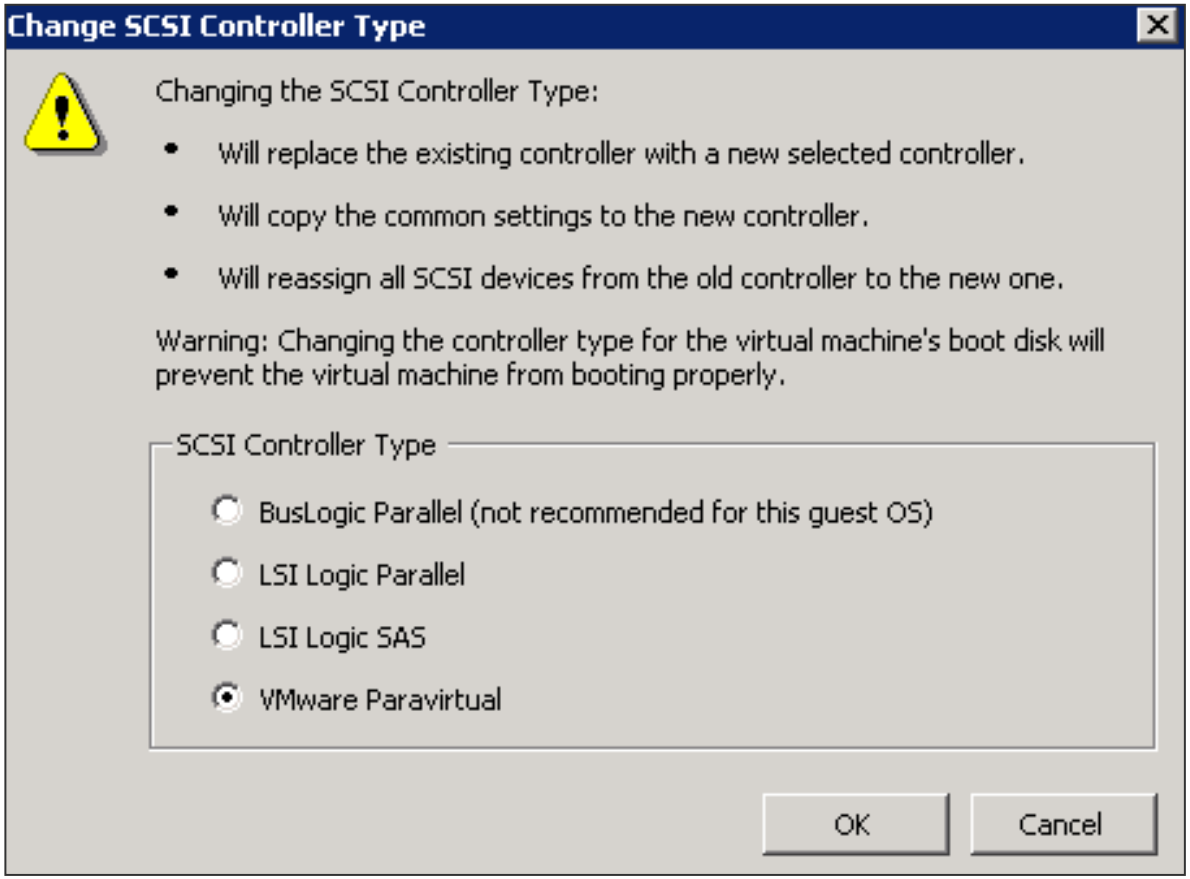
- Install and Configure VMware ESXi 5.0
  - Configure Storage, Networking and NTP for all ESXi servers
- Create Oracle RAC VM Template
  - Add VMDK for Guest OS and binary
  - Add two vNICs for Oracle Public and Private – Change the adapter to VMXNET3
  - Add voting and CRS disks – Follow VMware KB – 1034165 for sharing the VMDKs
  - Change the SCSI type to Paravirtual
  - Install GOS, VMware tools, ASMLIB
  - Configure NTP service in GOS
  - Save the VM as Oracle RAC VM Template
- Install Oracle Grid infrastructure
  - Create Clones from RAC VM Template
  - Change the Cloned VM Host name and IP address
  - Add existing voting and CRS disks – Follow VMware KB – 1034165 for sharing the VMDKs
  - Install, configure and verify Oracle Grid infrastructure

Oracle RAC on vSphere – Deployment Steps …Continued

- Install Oracle RAC
  - Create Data, Redo VMDKs and add to all RAC VMs - Follow VMware KB – 1034165 for sharing the VMDKs. Change the SCSI type to paravirtual.
  - Format VMDKs using fdisk and create ASM disk groups for DATA and REDO
  - Install Oracle RAC software
- Create Oracle RAC Database
  - Create custom oracle database
  - Configure Oracle Enterprise Manager

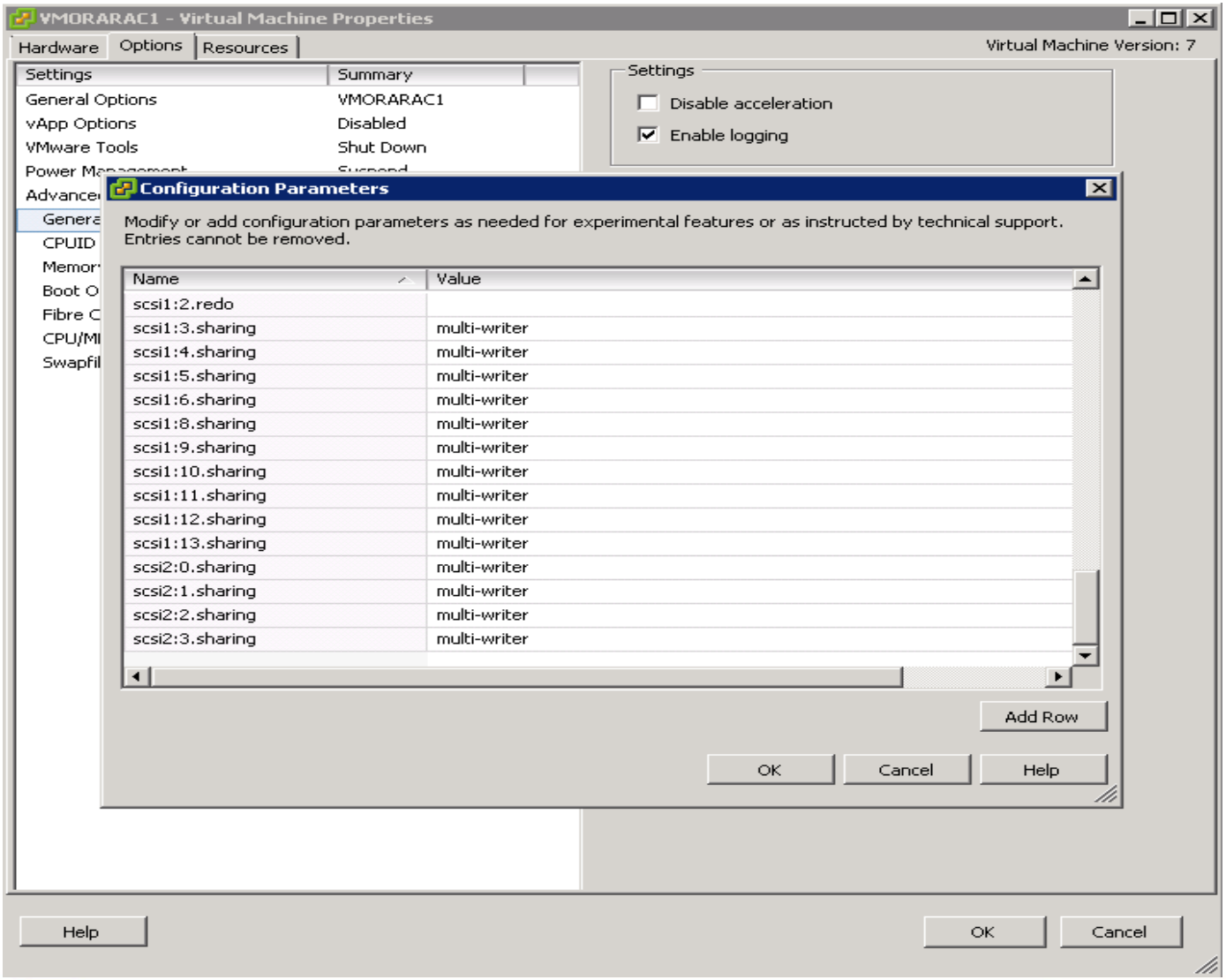
RAC on vSphere - Storage

- **Provision the storage – for the database VMDKs**
  - Change the SCSI controller to PVSCSI (VMware Paravirtual) for Data, Redo and Temp

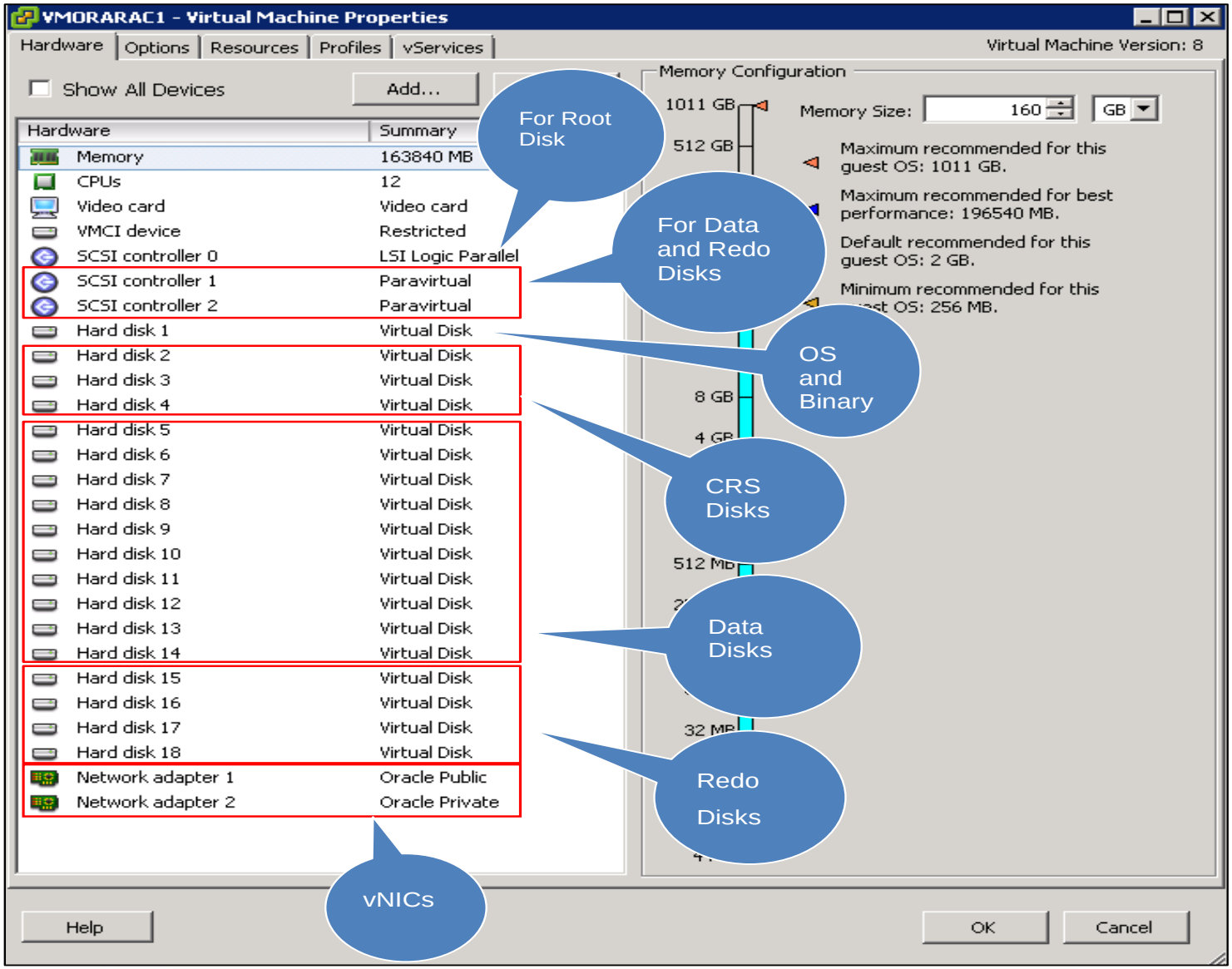


RAC on Vsphere – Storage – Multi-Writer Flag

- Setup SCSI multi-writer (VMware KB – 1034165)



RAC on vSphere – RAC VM Properties



RAC on vSphere – crsctl

- Observe the rac install
  - srvctl, crsctl & olsnodes

grid@vmorarac1:~

```
[root@vmorarac1 oraInventory]# su grid
[grid@vmorarac1 oraInventory]$ cd
[grid@vmorarac1 ~]$ . .bash_profile
 +ASM1 /home/grid -> crsctl check crs
CRS-4638: Oracle High Availability Services is online
CRS-4537: Cluster Ready Services is online
CRS-4529: Cluster Synchronization Services is online
CRS-4533: Event Manager is online
 +ASM1 /home/grid ->
```

grid@vmorarac1:~

```
 +ASM1 /home/grid -> olsnodes -n
vmorarac1       1
vmorarac2       2
vmorarac3       3
vmorarac4       4
 +ASM1 /home/grid ->
```

RAC on vSphere – OCR and voting disk

- Observe the Grid Files

```
grid@vmorarac1:~
+ASM1 /home/grid -> ocrcheck
Status of Oracle Cluster Registry is as follows :
         Version                  :          3
         Total space (kbytes)     :     262120
         Used space (kbytes)      :       2636
         Available space (kbytes) :     259484
         ID                       : 1585277307
         Device/File Name         :       +CRS
                                    Device/File integrity check succeeded

                                    Device/File not configured

                                    Device/File not configured

                                    Device/File not configured

                                    Device/File not configured

         Cluster registry integrity check succeeded

         Logical corruption check bypassed due to non-privileged user

+ASM1 /home/grid ->
```

```
grid@vmorarac1:~
+ASM1 /home/grid -> crsctl query css votedisk
##  STATE    File Universal Id                File Name Disk group
--  -----    -----------------                --------- ---------
 1. ONLINE   91667ba2625c4fefbf7e2c8938b8ebf8 (ORCL:CRSVOL1) [CRS]
 2. ONLINE   29277d62fa324f5dbfad8b987c6b7332 (ORCL:CRSVOL2) [CRS]
 3. ONLINE   490468754f174f0fbff297cd027925e8 (ORCL:CRSVOL3) [CRS]
Located 3 voting disk(s).
+ASM1 /home/grid ->
```

RAC on vSphere – NFS and DNFS

- **Commentary on NFS and DNFS**
  - NFS to ESX
    - NFS Datastores
  - In-Guest NFS with DNFS
    - Use Direct NFS (dNFS) with NetApp
    - Optimized for Oracle databases direct I/O access
    - Easy to configure - mount tab settings; change disk mount library
    - Still requires Kernel NFS for RAC quorum disk

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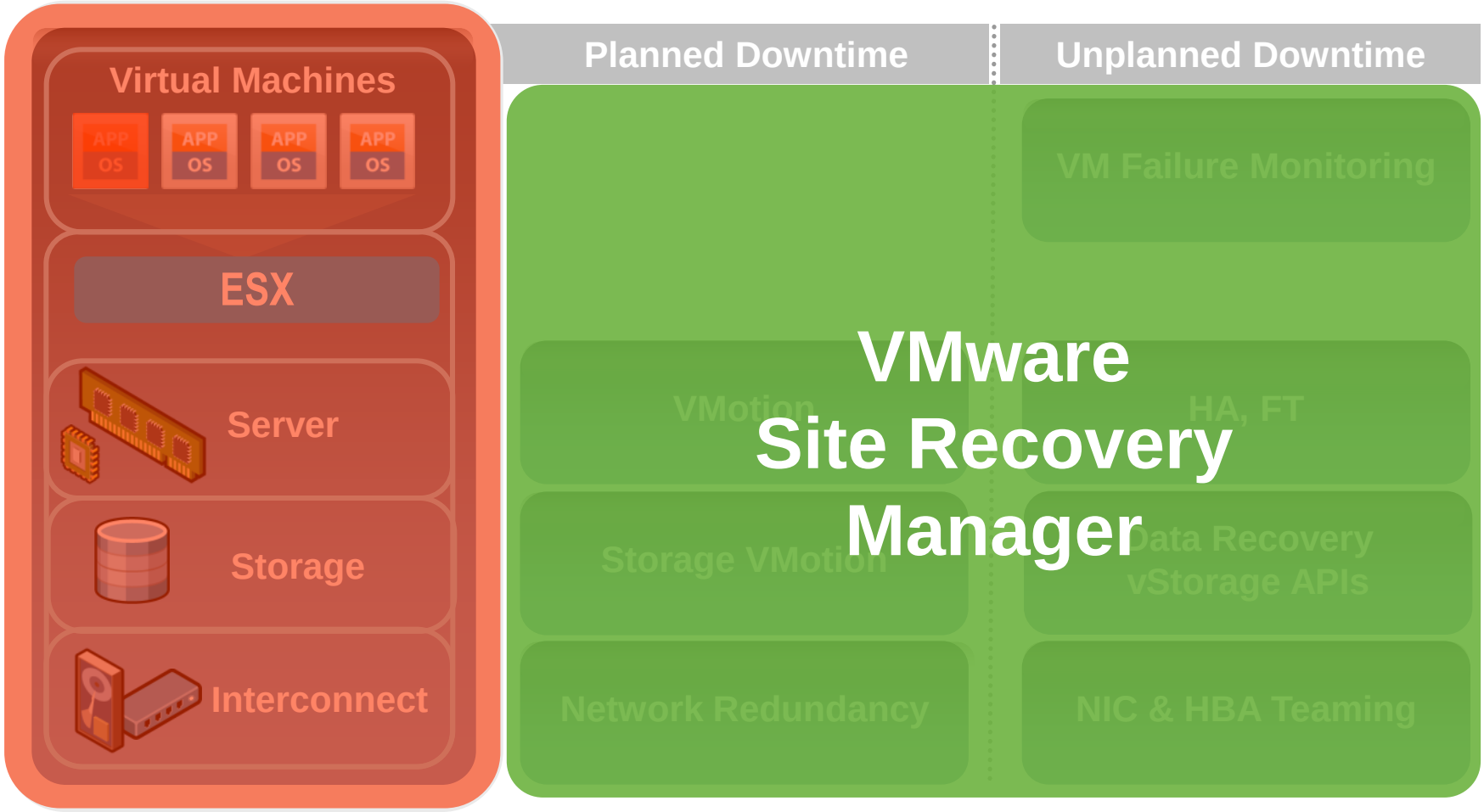
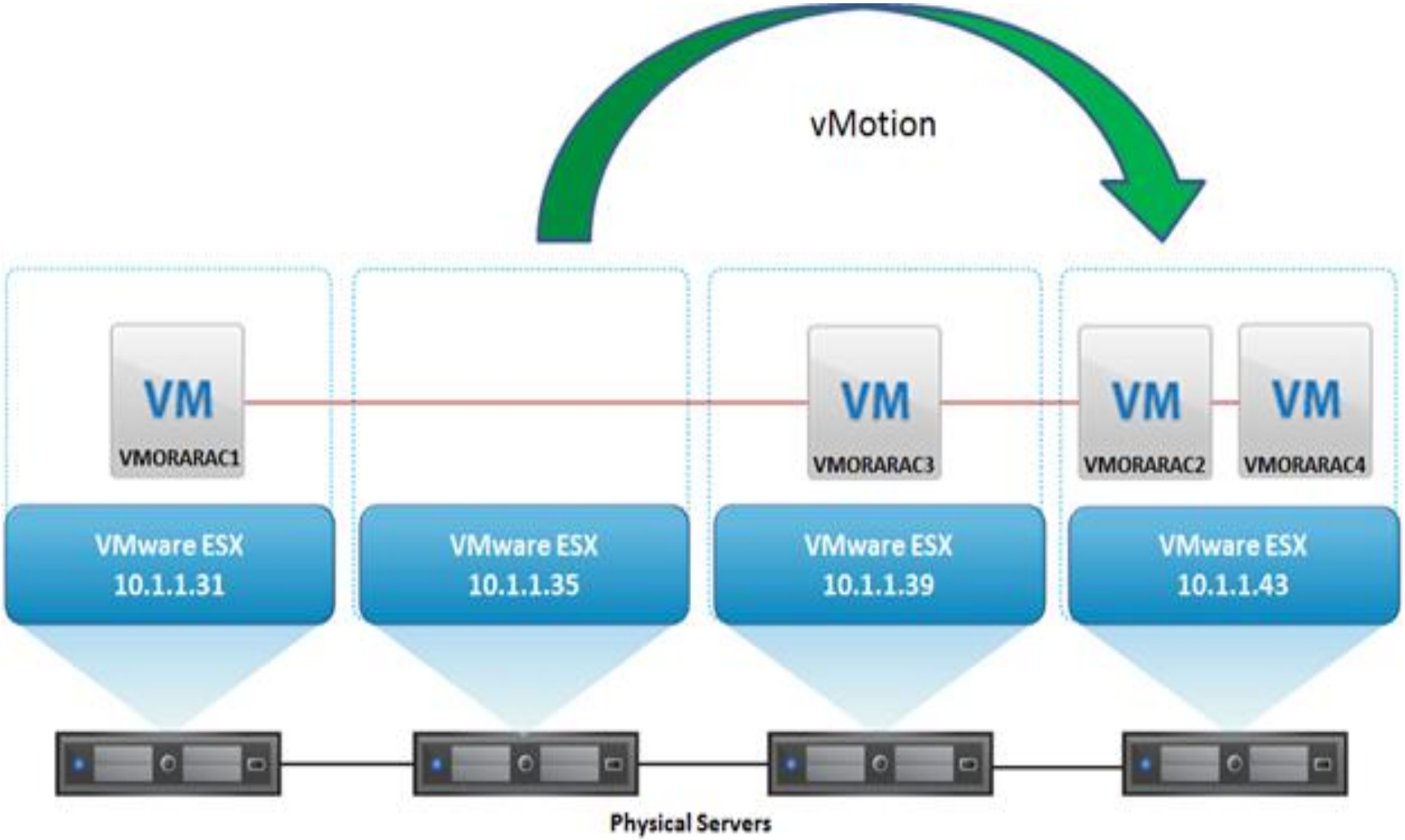
VMware Features to Eliminate Planned/Unplanned Downtime



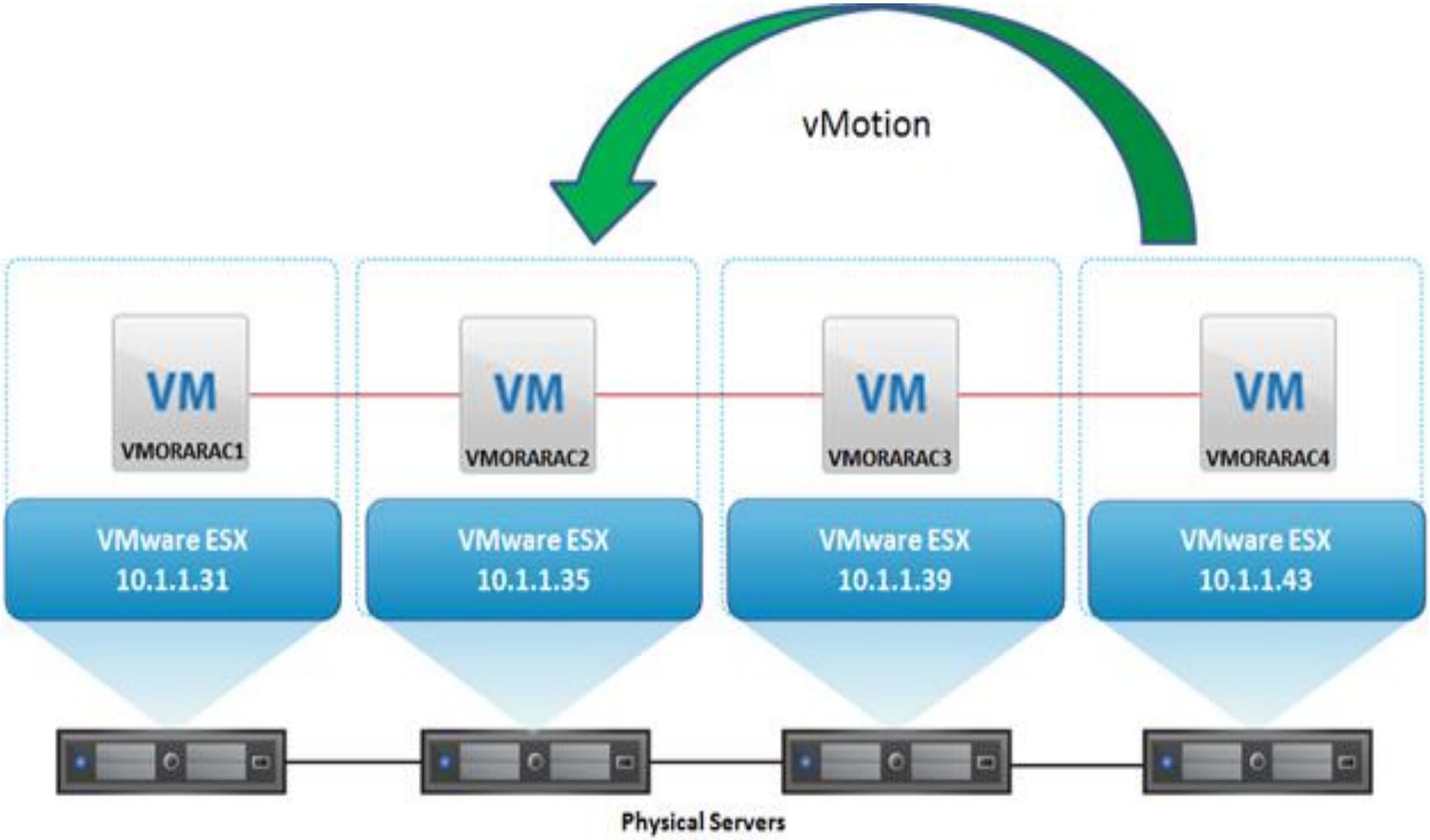
RAC on Vsphere – Vsphere 5 Features

- **Useful features for RAC**
  - Vmotion any Logical RAC node to an available ESX host
  - HotAdd one vCPU to any node
  - VMware HA – RAC Node restart on available ESX Hosts.

RAC on Vsphere – Features – Vmotion for Maintenance



RAC on Vsphere – Features – After Maintenance Completion



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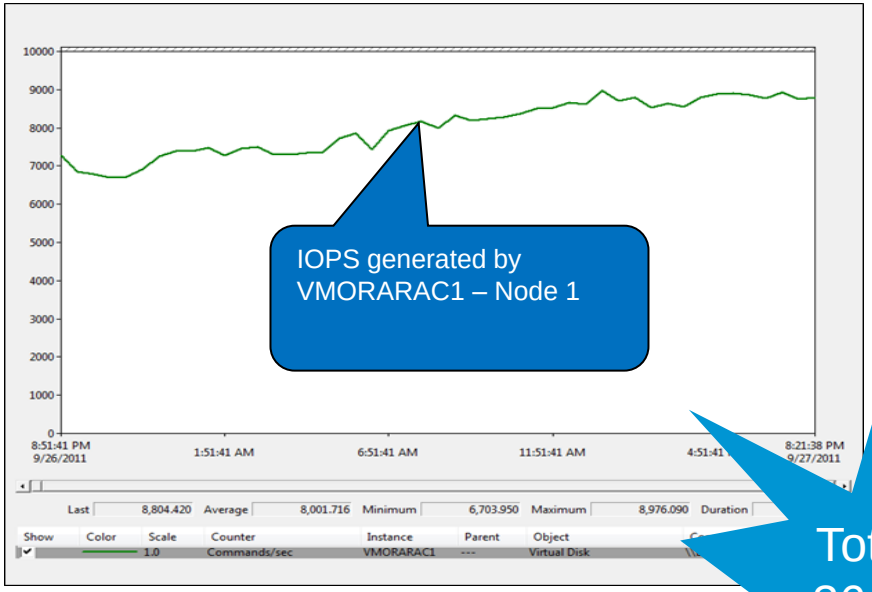
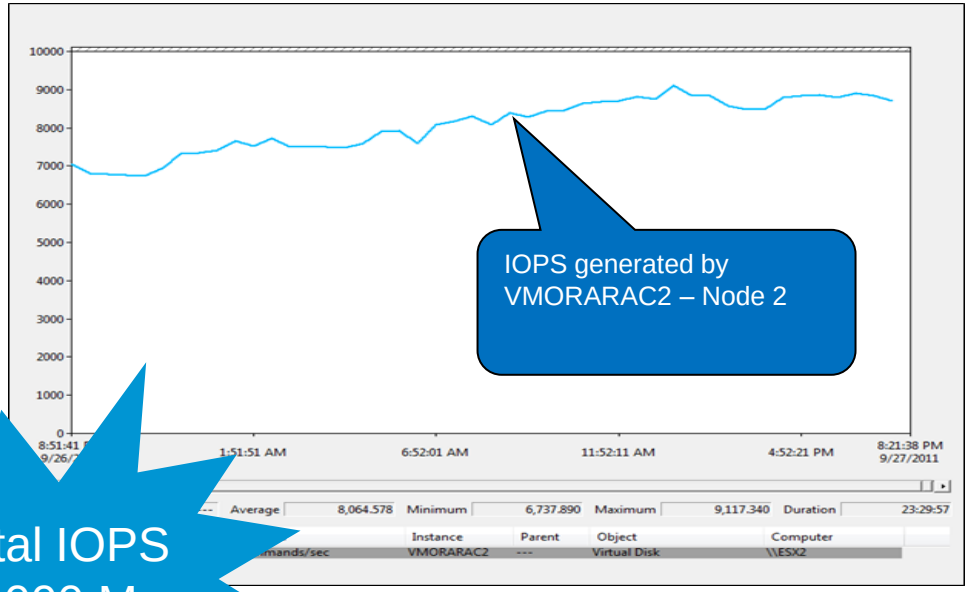
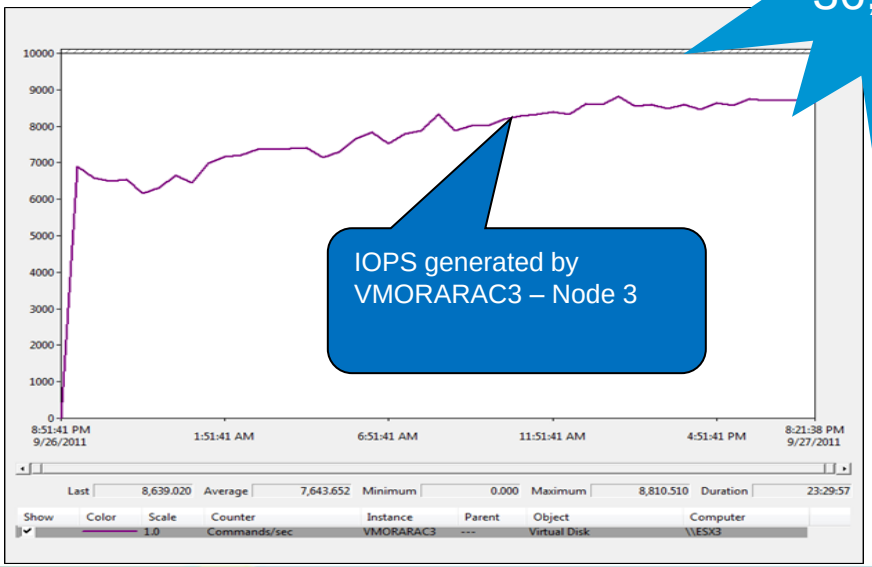
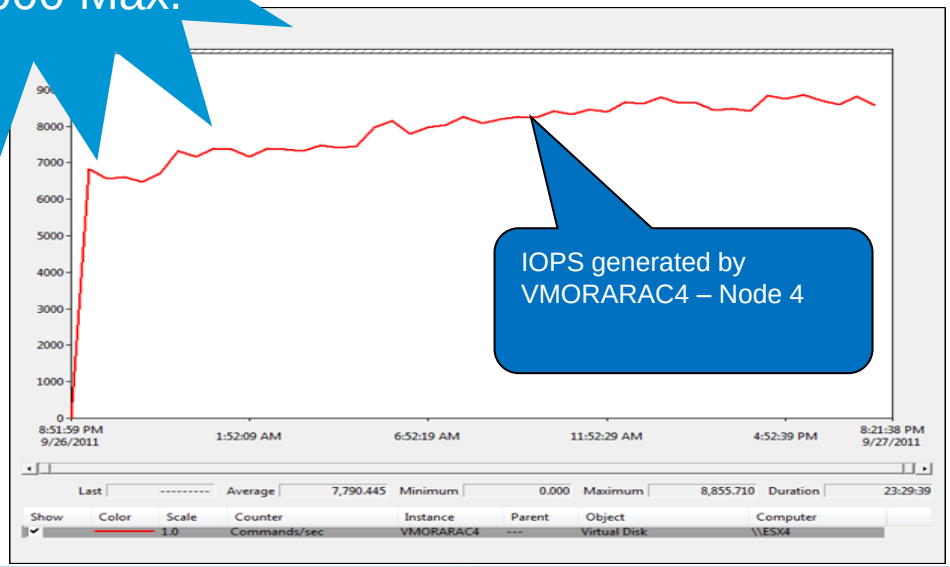
Performance - IOPS for all the Four Node Oracle RAC VMs





Total IOPS
~ 36,000 Max.





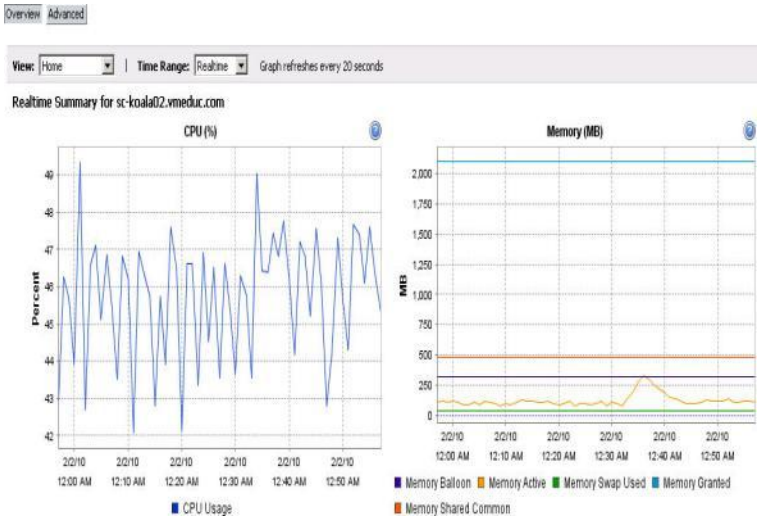
Storage: Key Indicators

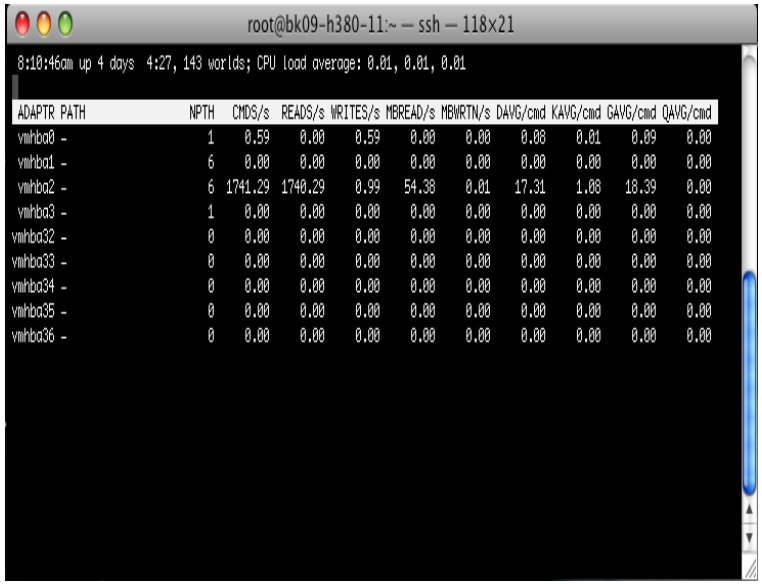
- **Kernel Latency Average (KAVG)**
  - This counter tracks the latencies of IO passing thru the Kernel
  - Investigation Threshold: 1ms
- **Device Latency Average (DAVG)**
  - This is the latency seen at the device driver level. It includes the roundtrip time between the HBA and the storage.
  - Investigation Threshold: 15-20ms, lower is better, some spikes okay
- **Aborts (ABRT/s)**
  - The number of commands aborted per second.
  - Investigation Threshold: 1

Host Level Monitoring

- **vSphere Client:**
  - GUI interface, primary tool for observing performance and configuration data for one or more ESX/ESXi hosts
  - Does not require high levels of privilege to access the data

- **Resxtop/Esxtop**
  - Gives access to detailed performance data of a single ESX/ESXi host
  - Provides fast access to a large number of performance metrics
  - Requires root-level access
  - Runs in interactive, batch, or replay mode





RAC on vSphere – Performance Monitoring

CPU Utilization during vMotion Test – vCenter Chart

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Oracle RAC on vSphere – Joint Effort with Partners

- EMC
  - EMC IT's "On-Ramp" to the Journey to the Private Cloud - http://www.emc.com/collateral/hardware/white-papers/h8170-emc-it-on-ramp-cloud-wp.pdf
  - EMC IT's Virtual Oracle Deployment Framework, EMC IT is one the largest Oracle deployment which is running on VMware vSphere - http://www.emc.com/collateral/hardware/white-papers/h8989-emc-it-virtual-oracle-deploy-framework.pdf
- NetApp
  - NetApp's Oracle Database 11g Release 2 Performance Using Data ONTAP 8.1 Operating in Cluster-Mode (4- Node Oracle 11gr2 RAC on vSphere compared with Bare Metal) - http://media.netapp.com/documents/tr-3961.pdf

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RAC on Vsphere – VRAC-DBA

- **The Future of the Oracle DBA**
  - Virtualization endorsement
  - Where will Virtualization be in 3-5 years?
  - Ubiquitous and Comprehensive Tier1 Resource management
  - Provisioning turnover expectations greatly increased
  - Involvement in the creation and adjustment of the VM/Server to the exact specifications required
  - Zero Downtime Hardware maintenance execution
- **The changing role of the DBA – The *VRAC-DBA***
  - The modern Oracle DBA has influence over the entire stack
  - Oracle DBAs do not have to re-learn their skill set
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RAC on Vsphere - Resources

- http://www.vmware.com/solutions/partners/alliances/oracle-database.html
- http://www.emc.com/solutions/application-environment/oracle/oracle-virtualization-vmware.htm
- www.houseofbrick.com/oracle-on-vmware
- http://blogs.vmware.com/apps/oracle/

- Great Videos
  - http://www.youtube.com/watch?v=V51en55eVnM
  - http://bit.ly/uy7o7W
  - http://bit.ly/t1Kskb

Thank You

Solution Presentation - Don Sullivan

– Senior Systems Engineer - Database Specialist

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