Oracle DB consolidation on EMC/VMware

How to optimize service levels? How to reduce cost?

LYCON.

an MH a

vmware[®]

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Tutima



USO:

EMC added value for Oracle Investment for Customers

ORACLE

1995–Present

Basic infrastructure advantage

Availability, Predictable Performance & Scalability, Data Integrity, Freedom of connectivity & disk type)

ILM for Oracle & FAST

Reducing TCO, allowing growth, eliminating performance, manageability and scalability issues

Application (Database) cloning

For backup, firefighting, test/dev/acceptance refresh, DWH loading, app or DB upgrades

Business Continuity

D/R replication, Backup/Restore, business consistency, enabling stretched HA clusters

Database & App Virtualization

Reducing license & HW cost, improving flexibility, enabling (private) cloud

Security

Database & storage encryption, key management, Data Leakage Prevention (DLP)

Joint solutions to shorten time to value

Whitepapers and reference architectures, assessments, Design & Deployment Services

Joint support services to reduce risk

Joint EMC/Oracle Escalation Center (JEC)



Why EMC is the best platform for Oracle¹

Availability	99,999% proven uptime. Keeps running at high performance and protection, even if components fail
Reliability	Product quality, Interoperability testing, extreme redundancy
Data Integrity	Avoids corruptions due to silent data (block) corruption, by adding disk checksums (T10DIF compliant) , scrubbing and power fail destage of all dirty cache data
<u>Predictable</u> High Performance	High performance is no good if you can only get this during POCs, with small datasets and no use of advanced features like replication. Only EMC Flash drives real high performance whilst maintaining high reliability
Scalability	Small to large, seamless migrations using storage virtualization
Freedom of choice	Connectivity protocol, RAID level, Disk type (including EFD)
Control	Instead of one-size-fits-all black box, customer controls data placement (policy based, using EMC FAST)
Support	Joint Escalation Center (JEC aka JSC), Oracle and EMC working together to resolve issues, Avoid finger pointing

1) By just putting your database on EMC infrastructure, before implementing additional Oracle/EMC integration

What is (Database) Consolidation?

con-sol-i-date¹

1: to join together into one whole : unite <consolidate several small school districts>

- 2: to make firm or secure : strengthen < consolidate their hold on first place>
- 3: to form into a compact mass

It is all about:

- Standardization
- Getting the maximum benefit from as few resources as possible (Lean & Mean)
- Improve service levels (performance, availability, reliability, ...)
- Ease of management, deployment, maintenance, control, performance

So the business goals are: Lowering cost (TCO) and improving service levels ¹) source: Merriam Webster Dictionary



Database consolidation goals

- 1. Maximize use of license investment
- 2. Maintain or even improve performance
- 3. Improve High Availability
- 4. Avoid (planned and unplanned) downtime
- 5. Achieve hardware independence
- 6. Avoid Vendor lock-in
- 7. Simplify server & storage refresh cycles
- 8. Speed up provisioning of new databases
- 9. Improve security, compliance and auditing
- **10.** Simplify management

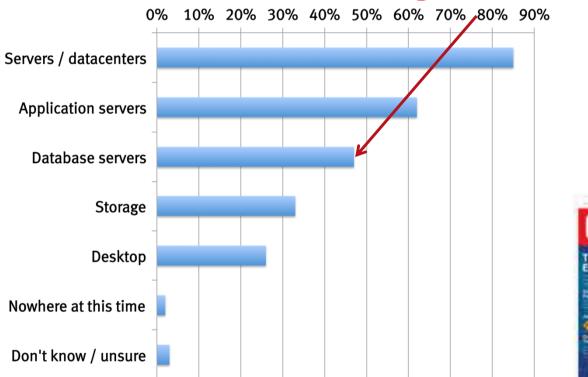






Virtualization is gaining momentum

Passed 50% in 2011*



UKACLE THE VIRTUAL ENTERPRISE

Source: 2010 IOUG Enterprise Platform Decision Survey: <u>Toward a Smarter Information Foundation</u> *Source: Paul Mauritz keynote, VMware vSphere 5 launch Oracle Magazine July / August 2010



Call to action

Follow the money!

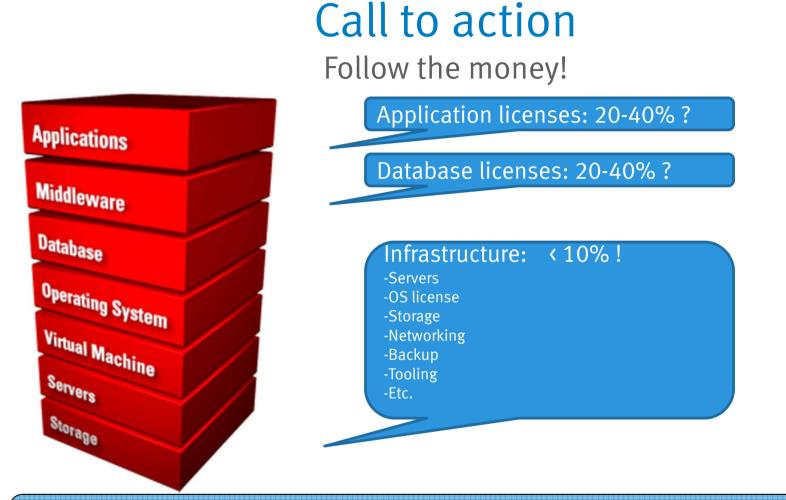


Question:

Where do organizations spend most money in the Business Application stack?

Storage? Servers? Networks? Management tooling?





If we can save 10% on db/application licenses... We easily justified 50% more expensive infrastructure



Oracle database technology pricing (List price, US\$, as an example, street prices are lower)

	Named Use	er Plus	Software Update License & Support	Processor License	Software License &	
Database Products					8	
Oracle Database						
Standard Edition One		180	39.60	5,800		1,276.00
Standard Edition	Licence for 1 cpu (core)	350	77.00	17 500	PER CPU	3,850.00
Enterprise Edition		050	200.00	47,500	>	10,450.00
Personal Edition	You need one of these *per CPU core*	460	101.20	-		-
Lite Mobile Server		-	-	23,000		5,060.00
Enterprise Edition Options:	No options available for Standard Edition					
Real Application Clusters	So you need Enterprise Edition if you want to use optio	ns 460	101.20	23,000		5,060.00
Real Application Clusters One N	abol	200	44.00	10,000	PER CPU	2.200.00
Active Data Guard	lode	200	44.00	10,000	FER CPU	2,200.00
Partitioning		230	50.60	11,500		2,530.00
Real Application Testing		230	50.60	11,500	PER CPU	2,530.00
Advanced Compression	Licence uplift for each option	230	50.60	11,500	PER CPU	2,530.00
Total Recall	you need another license *per CPU core*	120	26.40	5,800		1.276.00
Advanced Security		230	50.60	11,500		2,530.00
Label Security			50.60	11,500		2,530.00
Database Vault	25	460	101.20	23,000		5,060.00
OLAP	ontions	460	101.20	23,000		5,060.00
Data Mining	-st 5 ⁰⁴	460	101.20	23,000		5,060.00
Spatial	atleast	350	77.00	17,500		3,850.00
In-Memory Database Cache	have at	460	101.20	23,000		5,060.00
Retail Data Model	ershe	800	176.00	40,000		8,800.00
Communications Data Model	stome	800	176.00	40,000		8,800.00
Communications Data model	Nost customers have at least 5 options	000	110.00	40,000		0,000.00
Database Enterprise Management						
Diagnostics Pack		100	22.00	5,000		1,100.00
Tuning Pack		100	22.00	5,000		1,100.00
Change Management Pack		70	15.40	3,500		770.00
Configuration Management Pack for Oracle Database		100	22.00	5,000		1,100.00
Provisioning and Patch Automation Pack for Database		70	15.40	3,500		770.00
Data Masking Pack		230	50.60	11,500		2,530.00
						10 A

Source: http://www.oracle.com/us/corporate/pricing/technology-price-list-070617.pdf









License costs

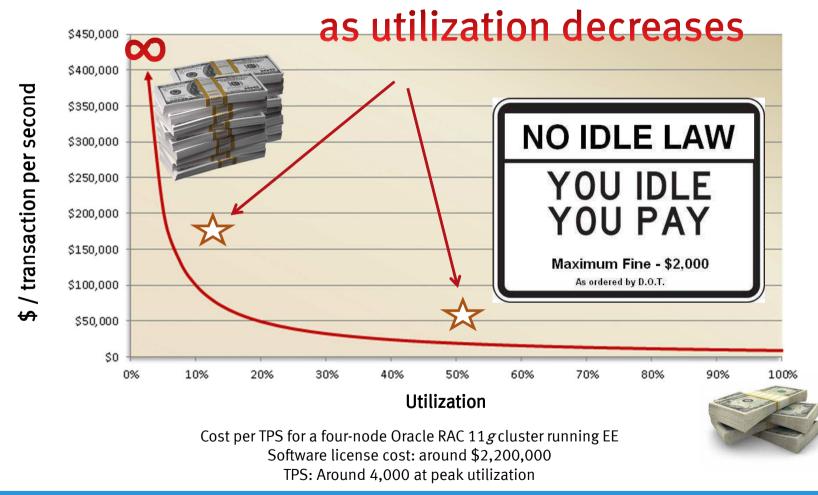


Questions:

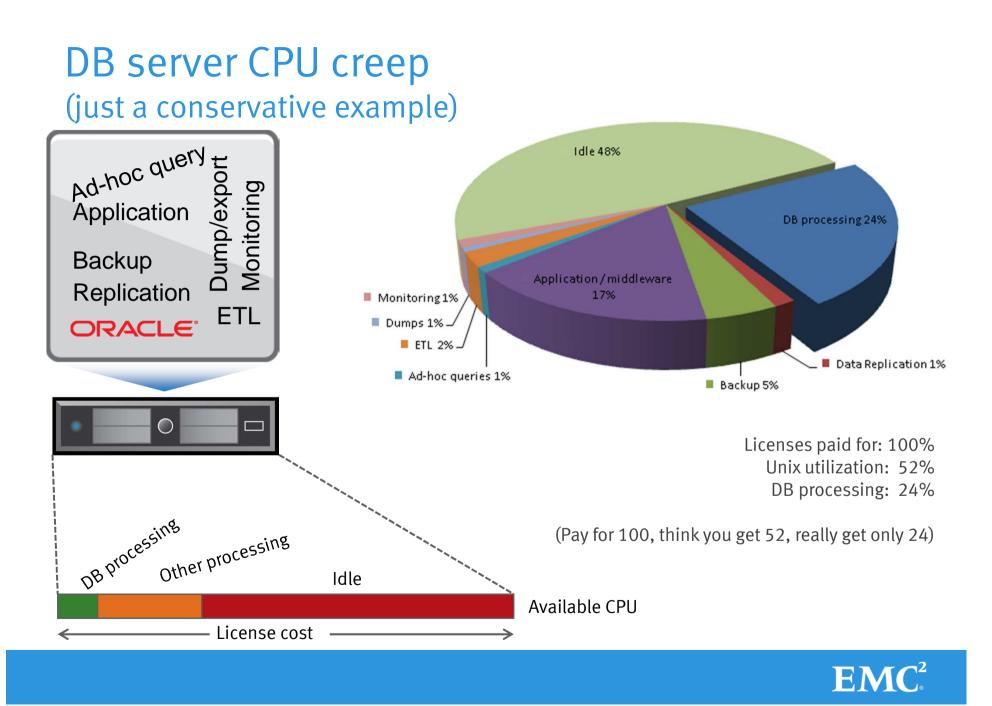
- What's the cost of my server hardware?
- What's the cost of the DB CPU licenses? (including DB options, maintenance, support)
- So what's the cost of a CPU cycle? (assuming 100% utilization)
- How much cycles are spent idling?
- How much cycles are spent on other tasks?
- So, what's my CPU *license* utilization?



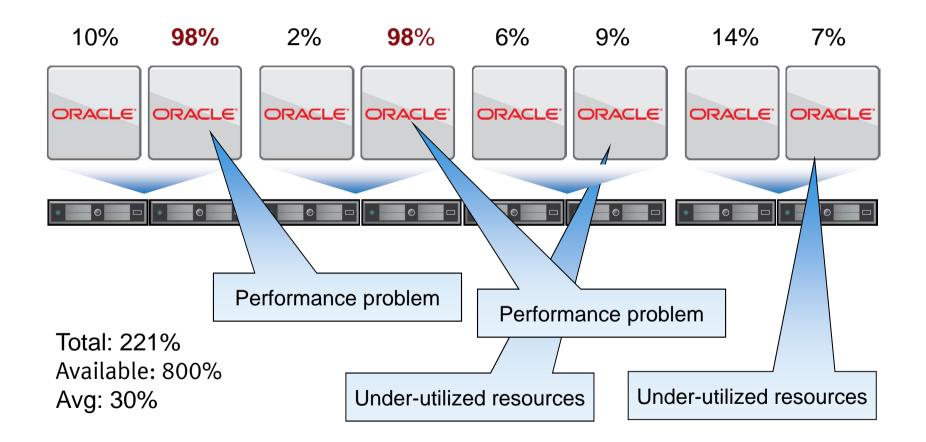
Transaction cost vs. utilization \$\$ per transaction increases



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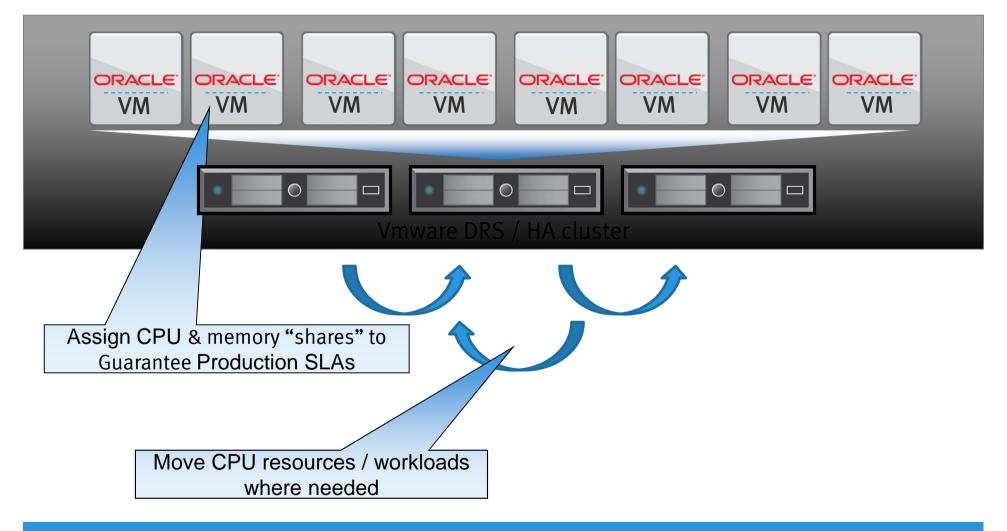


Classic problem of resource management (applied to DB processing power)

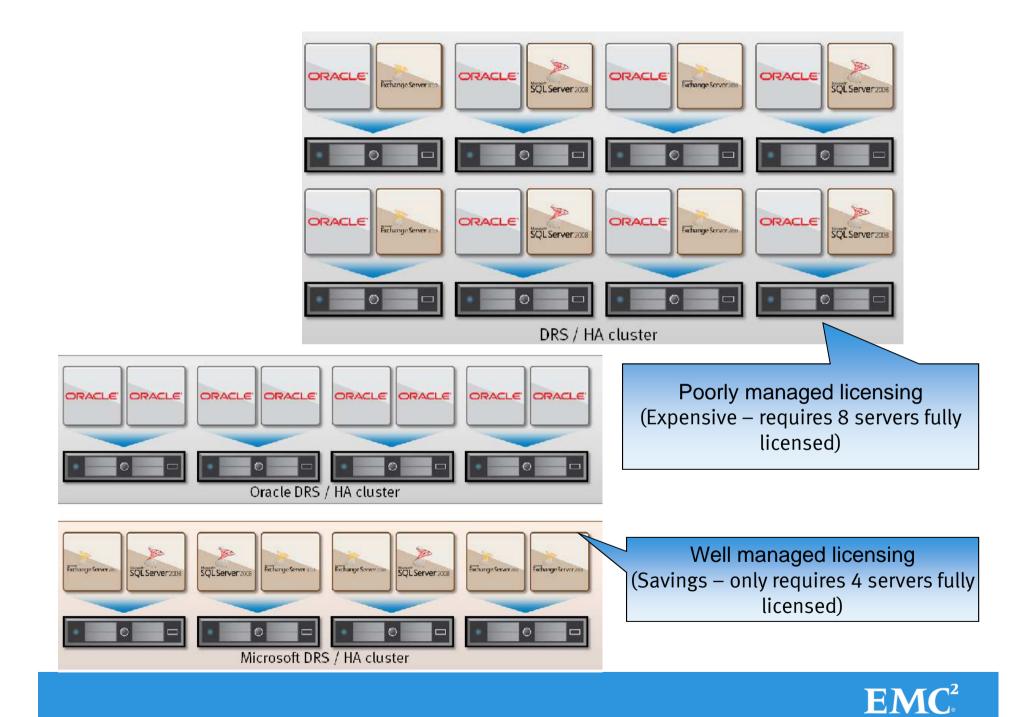




Resource Management (Vmware "Mainframe" style)







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VIDEO

Virtualizing Oracle: Caging the Licensing Dragon http://www.youtube.com/watch?v=FuXBMS2UwyE

<u>Oracle's Richard Garsthagen on Oracle licensing with Vmware</u> <u>http://www.licenseconsulting.nl/vmworld-richard-garsthagen-oracle-over-licenties-in-gevirtualiseerde-omgevingen/</u>



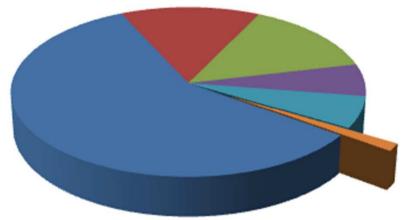
Helping our customers save \$\$\$



- Database servers are sized for peak loads
 - CPU Utilization typically less than 50% avg (or much lower)
 - This is a <u>complete</u> waste of money!
- Customers run other stuff on the same DB servers
 - App servers, replication, load / ETL processes, middleware,
 - Management agents, backup, ad-hoc queries, etc
- DB servers do not all peak at the same time
 - Dev vs Acceptance vs Prod
 - Batch vs OLTP vs load /ETL
- What if we could share CPU resources?
 - And dynamically move horsepower to production servers that require it
- Isn't this what virtualization is all about?
- Virtualize Oracle databases and save \$\$\$\$!!
 - Mostly on license cost
 - But: hard to measure/justify



VMware – Expensive?



- Enterprise Edition 58.2%
 Partitioning 14.1%
 Advanced Compression 14.1%
 Diagnostics Pack 6.1%
 Tuning Pack 6.1%
 Vmware Enterprise + 1.4%
- Vmware licenses make up less than 2% of total SW licensing
- Will even be lower if you go to 8 cores/socket (common)
- Or if you use Oracle RAC or other additional options

Server: Dual-Socket, 12 core X64 DB licenses: Oracle Enterprise + Partitioning + Advanced Compression + Diagnostics & Tuning pack VMware licenses: Enterprise Plus (most expensive type)

Based on publicly available list pricing - All other costs (HW&SW) ignored for simplicity



Why does EMC care? The 3-stage rocket

Our opinion:

- 1. Virtualizing Oracle Databases brings huge cost savings and significant operational benefits for our customers
- 2. VMware is the best platform to make this happen
- 3. EMC has the best infrastructure and integration to run VMware and Oracle for that matter



Saturn V liftoff (Apollo 15 mission)



Impact of CPU power on license cost

- CPU power
 - The more powerful the CPU is per core, the more workload you can run with the same footprint (Without adding licenses!)
- Memory size
 - Oracle runs better with lots of RAM (SGA)
 - More RAM allows more VM's per host
- TPC-C benchmark for OLTP
 - The industry standard
 - Not all servers listed (Oracle "Engineered" systems are missing ⁽ⁱ⁾)
 - If you're creative you can find similar CPUs and their TPC ratings – or look at SPEC ratings to compare CPU power
- Powerful CPU cores are more efficient
 - High TPC-C and/or SPEC ratings will allow you to drive higher consolidation ratios
 - And provide better performance
- Minimize overhead where possible
 - Vmware: 4% (verified by EMC)
 - Oracle RAC 10%? (conservative estimate)





Processor types and TPC ratings	TpmC/Core	
Intel X5690	87758	
Intel E7-8870	63199	
Intel E5-2690	100574	
Intel E5-2643	100574	



OLTP License Cost – An Example

Physically deployed vs virtually deployed



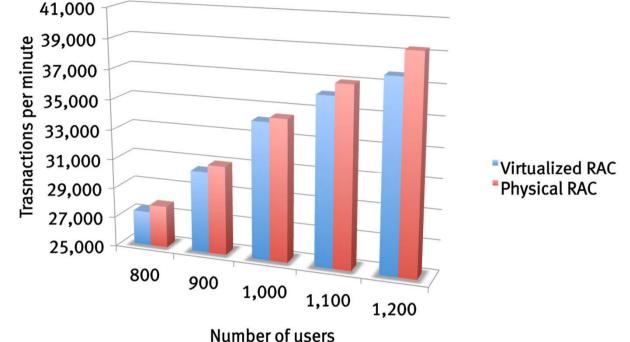
Item	Physical cluster E7-8870	Virtual cluster E5-2690
DB nodes	2	4
Total DB cores	160	64
Clustering/Replication	RAC + Adv. Data Guard	VMware HA / DRS + EMC
Oracle licenses	\$4,540,000	\$1,288,000
Vmware licenses	\$0	\$ 27,960
Theoretical TpmC @ 100%	10,111,840	6,436,736
Overhead (RAC / Hypervisor)	10%	4%
Real TpmC (100%)	9,100,656	6,179,267
Average utilization	20%	50%
Effective TpmC (avg load)	1,820,131	3,089,633
Price / TpmC @ 100% load	\$0.50	\$0.21
Price / TpmC @ average load	\$2.49	\$0.43

Note that HW cost, and licenses for other software except DB and Vmware are not included for now TPC numbers for specific processors derived from tpc.org



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Physical & virtual Oracle RAC comparison



- OLTP database workload
- SAN / RDM (storage config 1)
- Virtual environment delivered performance consistently within 4% of physical environment
 - NFS / dNFS difference is higher

EMC²

Oracle Performance on VMware- an issue?

From:	De Witte, Eric	Sent:	Tue 1/31/2012 2:03	
Fo:	Sjerps, Bart			
Cc				
Subject:	Oracle on Vblock			
Bart,				
FYI, we have sold 2 Vblocks 300 GX in Luxemburg. Part of the acceptance criteria during the POC was Oracle performance.				
They were running Oracle natively on Linux on Dell Egenera blades connected to DMX 4.				
For the test they recorded user activity on Oracle instances for 4-8 hours, then exported the DB/app to VMs on the Vblock and replayed the activity again to compare performance.				
The Virtual instances performed between 30 and 50 % faster than the native instances. $;)$				
Best reg	gards,			
De Witte Eric vSpecialist Technical Lead, EMEA-North				



My Oracle Support note 249212.1

Purpose

Explain to customers how Oracle supports our products when running on VMware

Scope & Application

For Customers running Oracle products on VMware virtualized environments. No limitation on use or distribution.

Support Status for VMware Virtualized Environments

Oracle has not certified any of its products on VMware virtualized environments. Oracle Support will assist customers running Oracle products on VMware in the following manner: Oracle will only provide support for issues that either are known to occur on the native OS, or can be demonstrated not to be as a result of running on VMware.

If a problem is a known Oracle issue, Oracle support will recommend the appropriate solution on the native OS. If that solution does not work in the VMware virtualized environment, the customer will be referred to VMware for support. When the customer can demonstrate that the Oracle solution does not work when running on the native OS, Oracle will resume support, including logging a bug with Oracle Development for investigation if required.

If the problem is determined not to be a known Oracle issue, we will refer the customer to VMware for support. When the customer can demonstrate that the issue occurs when running on the native OS, Oracle will resume support, including logging a bug with Oracle Development for investigation if required.

NOTE: Oracle has not certified any of its products on VMware. For Oracle RAC, Oracle will only accept Service Requests as described in this note on Oracle RAC 11.2.0.2 and later releases.

Source: My Oracle Support website



VMWare extended support onOracle

Total Ownership

VMware Support will accept accountability for any Oracle-related issue reported by a customer. By being accountable, VMware Support will drive the issue to resolution regardless of which vendor (VMware, Oracle, or others) is responsible for the resolution. In most cases, reported issues can be resolved via configuration changes, bug fixes, or feature enhancements by one of the involved vendors.

In the rare situation that another vendor is unable or unwilling to provide a satisfactory technical resolution, VMware Support will immediately notify the customer, assist in escalation and explore other potential technical workarounds with the customer.

VMware will also assist its customers with technical issues for other Oracle software products, besides the Oracle Database and provide similar escalation assistance if needed.

Besides technical assistance, VMware Support will advocate on the customer's behalf to:

- Provide any relevant evidence that virtualization does not play a part in the Oracle product technical problem
- Engage Oracle Support in resolving the customer's technical issue, escalating management attention as appropriate

http://www.vmware.com/support/policies/oracle-support.html



EMC support for Oracle on VMWare

EMC E-Lab and VMware have tightly collaborated on support for use of Oracle Database 11g in VMware environments. This includes extensive testing and qualification of VMware virtualization software with EMC and Oracle technologies, combined with EMC and VMware joint support.

In addition, EMC and VMware have documented a series of Proven Solutions which outlines how to design, deploy, and manage VMware virtualization software in EMC and Oracle environments. Through seamlessly integrating VMware into EMC and Oracle environments, IT organizations can dramatically increase hardware utilization, consolidate servers, and improve efficiency.

http://www.emc.com/solutions/application-environment/oracle/oracle-virtualization-vmware.htm

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Virtualization for DB consolidation goals



#	Benefit	Notes
1	License optimization	Maximize licensing ROI by driving up CPU utilization and remove overhead
2	Performance	Use most recent CPUs, apply DRS and set CPU shares to guarantee SLAs, use EMC FAST-VP and Flash for high performance
3	High Availability	VMware HA, optionally stretched active/active cluster with EMC VPLEX
4	Avoid planned downtime	Use VMotion to move workloads before HW maintenance
5	Hardware independence	Virtual Machines can be easily migrated to other HW
6	Vendor lock-in	VMware / EMC can be replaced, if you like, by other virtualization platforms / storage vendors – not so easy on physical HW
7	Simplified refresh cycles	Add new storage/server hardware to the cluster, then just Vmotion
8	DB provisioning	Apply DB templates, or use VMware vFabric Director
9	Security, compliance, auditing	Completely isolated VM, users, memory, resources – VMware + EMC auditing & compliancy, RSA integration
10	Management	End-to-End VMware analysis tools, EMC DBClassify database analysis, Precise performance management, EMC performance algorithms and tools, chargeback integration



Top-10 objections (FUD)

#	Objection	Reply
1	VMware is not supported	Oracle Metalink note is available showing support from Oracle
2	VMware is not certified	There is no certification of any platform (OS/HW) except from Oracle/SUN. But all you need is good support
3	Performance is limited	Single VM can have 64 vCPUs, 1TB memory, 300.000 iops
4	Requirement to reproduce problems on physical server	Rare – but if it happens, this is easy with EMC snapshot/cloning technology and offers additional benefits
5	License cost is higher on VMware	Only if you do not build separate DB processing nodes
6	Performance overhead	Minimal, and less than Oracle RAC (typical)
7	No workload isolation	Both VMware and EMC have excellent workload management tools
8	No End-to-end "platinum" Customer Service	EMC offers JEC support, VMware has Oracle accountability program Both do not require additional support contracts
9	No integrated stack	Vblock or similar platforms are completely integrated and tested in EMC's E-lab
10	Alternative hypervisors are cheaper	You need the one that has the right enterprise features and provides the highest consolidation ratios – license cost is very small part of TCO

But the most common objection: we don't want to change because we are familiar with what we have today / frightened of new innovations

Current Oracle RAC / VMware vSphere customers











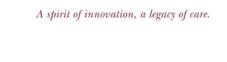
SYSTEM











+ CATHOLIC HEALTH







Case study



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Oracle 11/eBusiness Suite: Replatform



- One of the largest single global instances of Oracle 11*i*
- Core mission-critical applications
- 75+ application tiers VMware/RHEL
- Oracle Database 10*g* R2
- 8 TB database; 8.8 billion rows of data
- 52 million transactions per day
- 79K IOPS
- 40K blocks per second interconnect traffic
- 40,000+ named users
- 4,000+ peak concurrent users



EMC IT: Replatform



Sun Fire Server

- Sun Fire E25K
- UltraSPARC IV processor
- CPU 224 Cores
- CPU utilization 80%
- OS Solaris 10
- Storage Symmetrix DMX-3



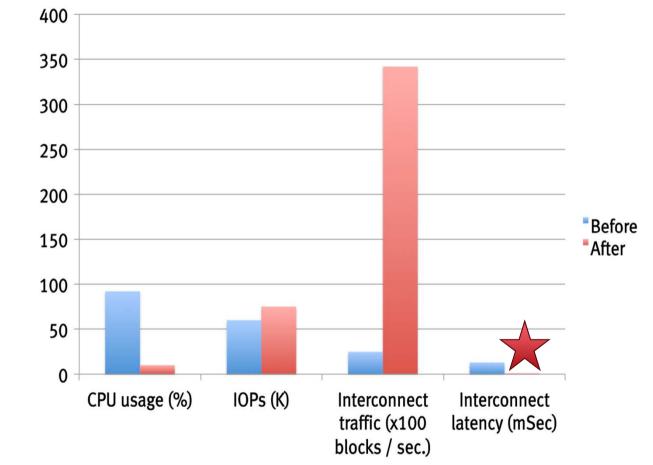
CISCO Unified Computing System

- Cisco UCS B440
- Intel Nehalem EX processor
- CPU 128 Cores
- CPU utilization 10%
- OS Red Hat Linux / vSphere
- Storage Symmetrix VMAX





EMC IT: 11*i* system performance statistics



50%-90% reduction in times for online transactions (i.e. 2-10 times faster)

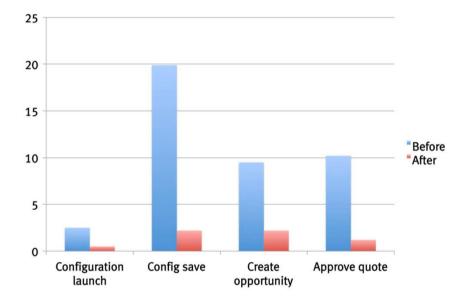
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EMC IT: 11*i* performance improvements - online

Application login Configurator Config save My quotes

CXP transaction times (sec)

DXP transaction times (sec)

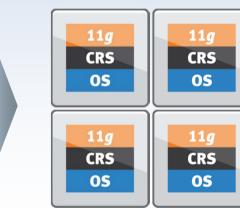




EMC IT updates: Underway today

CISCO Unified Computing System

- Cisco UCS B440
- Intel Nehalem EX processor
- CPU 192 cores
- CPU utilization 10%
- OS Red Hat Linux / vSphere*
- Storage Symmetrix VMAX



vSphere 5.0: 32 cores per VM Moved to 128 cores

4 x B440 blades



EMC Community Network Everything Oracle at EMC (EO@EMC) site

Resources	Welcome to Everything Oracle at EMC	Recent Blog Posts C
Community Getting Started Terms and Conditions Weekly Update Events	This community is designed for you someone who wants to chat, connect, comment, post documents, view recent Oracle Proven Solutions , and ask questions about their Oracle infrastructure. EMC's Oracle specialists monitor the site for questions and should get back to you within 48 hours. We update things daily on the site, so make sure you're checking back in.	 In-place, online VMFS3 to VMFS5 upgrade: True or Not True? in Everything Oracle at EMC Oracle Virtualization Launch: Game on! in Everything Oracle at EMC
Virtualization	To start, get to know others in the community and tell us about yourself.	Oracle & vSphere 5.0: VAAI Hardware-Accelerated Zero in
Solutions		Everything Oracle at EMC EO@EMC is now live in
Follow Us		Everything Oracle at EMC
Demos	Hot Items	
Share Your Story	How does one of the largest Oracle Applications	Voice of the People C
Posting Content	deployments in the world (EMC IT) deploy Oracle technologies with EMC technologies in its Data Center? 3 weeks ago	What will the big announcement be at OOW?
Popular Tags _1_backup_recovery_and_archiving _1_business_continuity _1_oracle_solutions _1_tiered_unified_storage _1_virtualized_infrastructure celerra dnfs emc Oracle rac solutions symmetrix vm vmware vsphere View all	Cracle Storage Strategy Update: Fact or Fiction? by Sam Lucido	 New verison of the database? New verison of Oracle Virtual Machine (OVM)? New Exadata / Exalogic machine?
	Recent Content C	Something entirely new?
	In-place, online VMFS3 to VMFS5 upgrade: True or Not True? 1 day ago in Everything Oracle at EMC by Sam Lucido	Other? Votel Votes: 6
	P Oracle Virtualization Launch: Game on! 1 day ago in Everything Oracle at EMC by Sam Lucido	Create a poll

- Provides a focal point for all of EMC's Oracle-related activities
- EMC's Oracle-related Proven Solutions content now publicly available and searchable on Google
- Go to:<u>http://community.emc.com/community/connect/everything_oracle</u>

EMC²

References

Blog http://bartsjerps.wordpress.com

Blog post on Oracle/Vmware licencing (and how to save money):

http://bartsjerps.wordpress.com/2011/11/09/oraclevmware-licensing-cost-savings/

Everything Oracle @ EMC (community): https://community.emc.com/community/connect/everything_oracle

EMC Resource library (whitepapers): <u>http://www.emc.com/resource-library/resource-library.esp</u> (search "oracle" and check "whitepapers")

Dirty Cache

A storage infrastructure perspective on optimizing business applications



- Thank you, Larry Ellison

Stop Idling - Start Saving

CTOBER 23, 2012 I LEAVE A COMMENT



One of my missions is to help customers saving money (Dirty Cache Cash). So considering the average enterprise application environment, I frequently ask them where they spend most of their IT budget on. Is it servers? Networks? Middleware? Applications?

Turns out that if you look at the operating cost of an Oracle database application, a very big portion of the TCO is in database licenses. Note that I focus on Oracle (that's my Job) but for other databases the cost ratio might be similar. Or not. But it makes sense to look at Oracle as that is the most common platform for mission-critical applications. So let's look at a database environment and forget about the application for now. Let's say that 50% of the operating cost of a database

server is spent on Oracle licensing and maintenance





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THANK YOU

