How to save on license cost: Re-platforming Oracle on Dell EMC

How Oracle re-platforming can achieve significant license cost reduction

Best practices and additional benefits

Myths, facts and experiences on Oracle licensing

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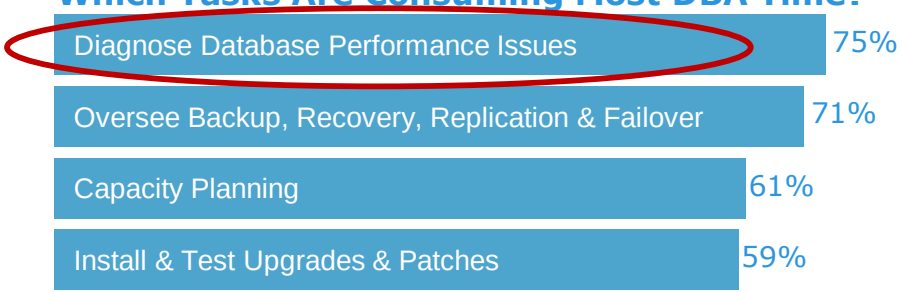
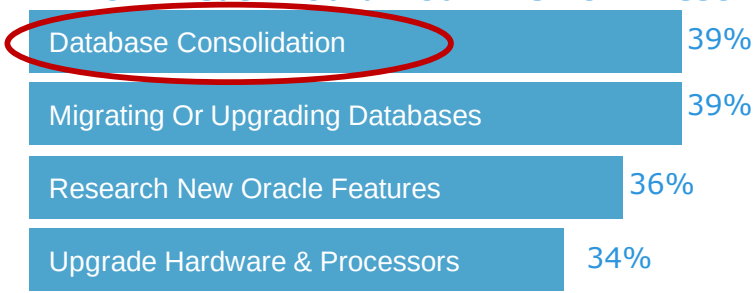
Oracle Customer Challenges

Too Much Time & Budget Spent Maintaining Oracle

Which Tasks Are Consuming Most DBA Time?

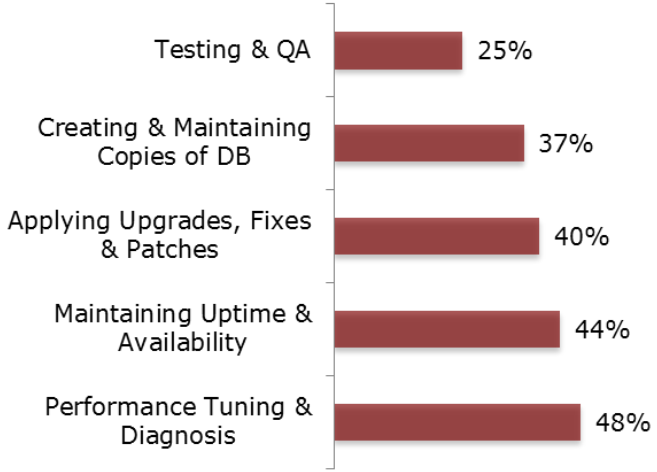


Which Areas Would You Like To Invest More?



(Source: IOUG - DBA Survey)

Time Spent on Maintenance



Top 5 Database Activities
(Source: 2014 IT Resource Strategies Survey)

DATABASE RE-PLATFORMING: GOALS

1. *Maximize use of license investment*
2. Maintain or (better even) improve performance
3. Reduce downtime / increase SLAs
4. Avoid Vendor lock-in
5. Simplify server & storage refresh cycles
6. Speed up provisioning of new databases
7. Improve security, compliance and auditing
8. Simplify management

WHY LOOK AT LICENSING?

- Oracle DB licensing is expensive
  - One single midsize server (44 cores):

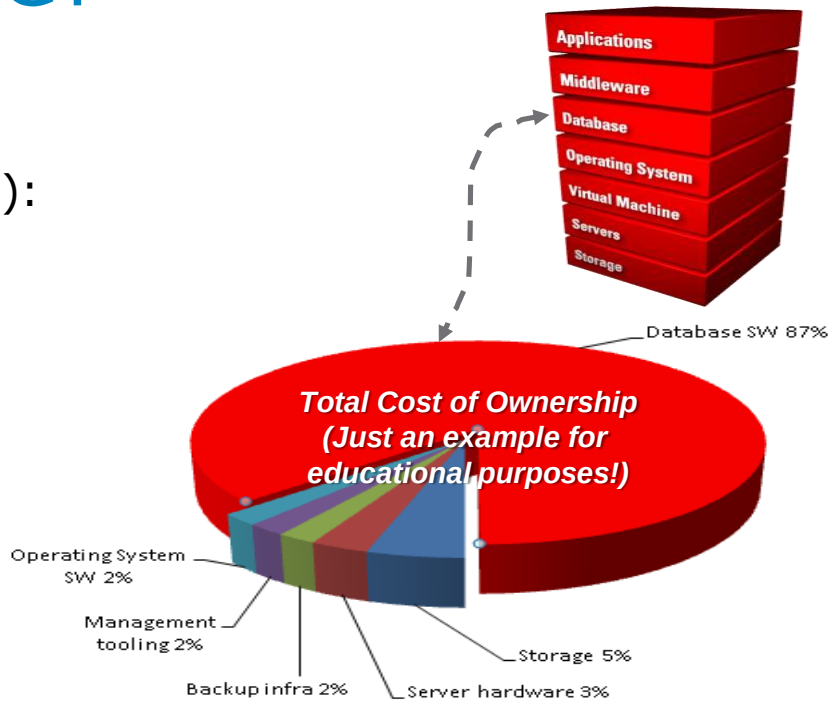
  HW ~ $ 50,000 (server, storage, etc)

  SW ~ $ 913,000 @ 50% discount

  5Y maintenance ~ $1,000,000

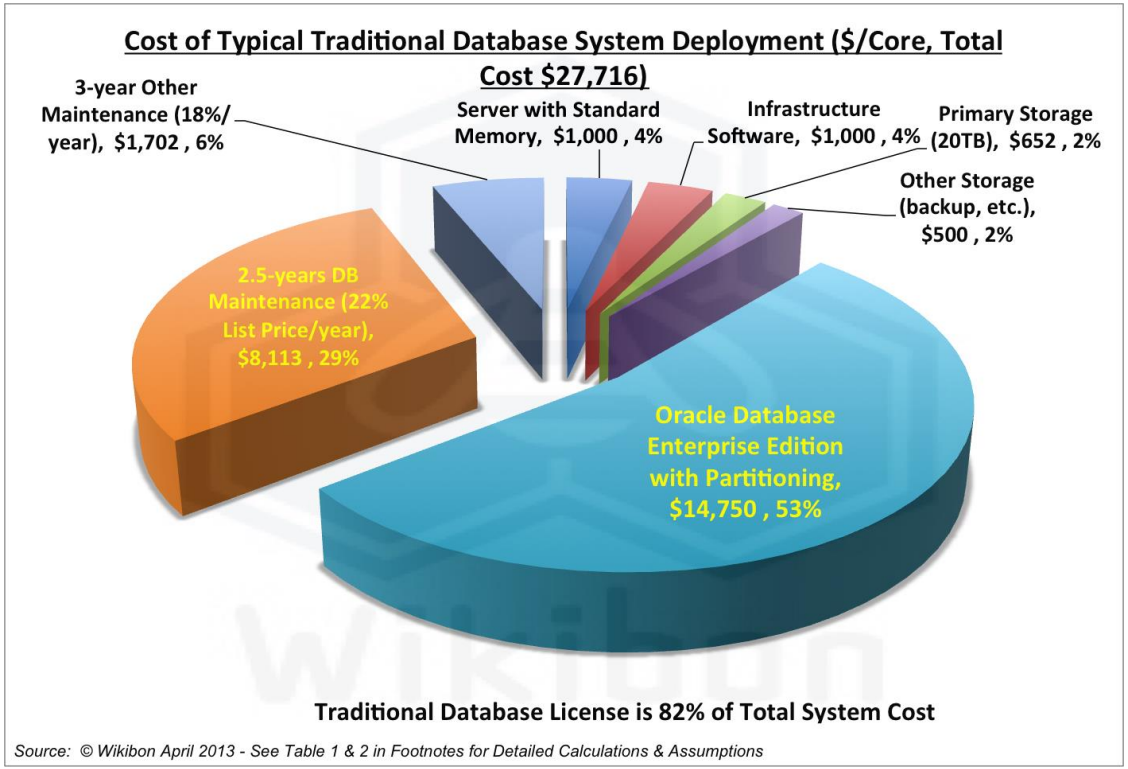
  (Enterprise Edition + basic options)

  - What if we add RAC? Active DG? Multitenant?
- Large part of the TCO of a database infrastructure stack



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

VALIDATION: WIKIBON RESEARCH



Wikibon Article: [Virtualization of Oracle Evolves to Best Practice for Production Systems]

BEFORE WE START…

BEWARE OF THE LICENSE DEMON

100% SURE YOU ARE COMPLIANT?

ORACLE LICENSE MANAGEMENT SERVICES

If needed…

Bring in the license experts

They help you with licensing & legal issues

LC Licenseconsulting.eu

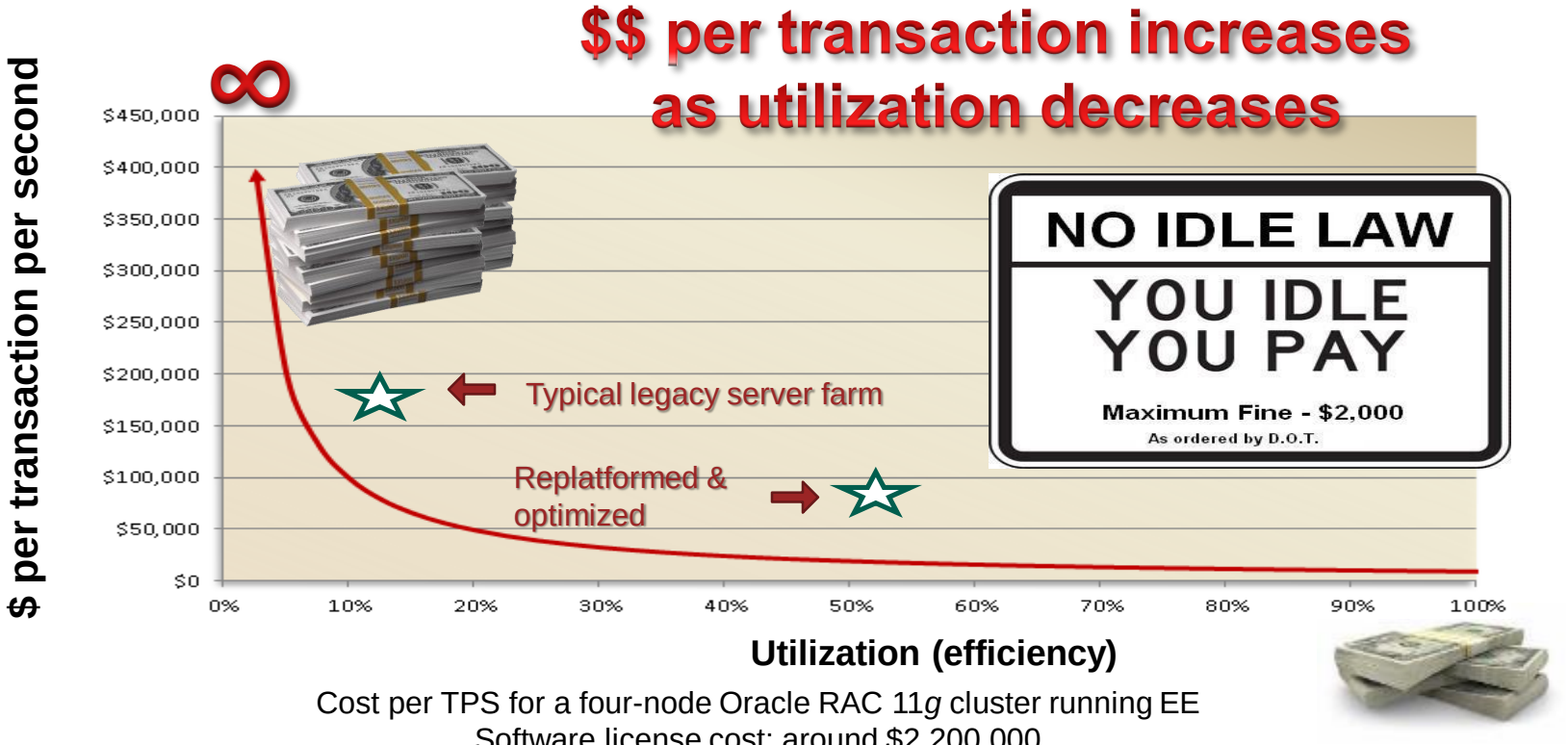
Madora Consulting

Madora Consulting UK

LICENSEFORTRESS®

DELL EMC

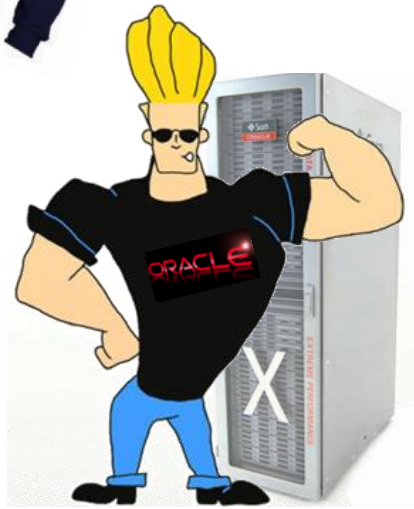
TRANSACTION COST VS. UTILIZATION



Cost per TPS for a four-node Oracle RAC 11*g* cluster running EE
Software license cost: around $2,200,000
TPS: Around 4,000 at peak utilization

Why are database servers heavily oversized?

- Lack of good performance metrics (i.e. “SAPS”)
- Must be able to handle peak load
  - User login storms
  - Regular batch processing (end-of-week etc)
  - Crazy ad-hoc queries (no tuning)
- Future growth
- Unpredictable app/db behaviour
  - Sudden changes in app SQL code or DB schema
- Consultant / DBA who sizes the system is not responsible for license cost
  - But will get blamed if the app does not perform
- “Show off” EGO factor
  - We like to show off how big our systems are



See blogpost: [Getting the most out of your server resources]

Maximum Oracle License Efficiency

Design rules

1. Use CPU cores that drive maximum Oracle transactions per minute
   - Replatform from old / inefficient CPU to latest, best CPU for DB workload
2. Use the minimal (database) license set where possible
   - Avoid expensive licensed options where alternatives available
   - Consider using different edition (Standard Edition vs Enterprise Edition)
   - Consider alternative database platforms (such as EnterpriseDB) – beyond this presentation
3. Drive CPU cores to the maximum average utilization
   - IMHO, can only be done with VMware (but prove me wrong)
   - IBM pSeries is 2nd best and good alternative
   - Avoid OracleVM, other hypervisors or Oracle Multitenant (Pluggable databases)
4. Use CPU only for database transactions
   - Avoid applications, middleware, management tools, replication etc on the licensed CPU
5. Get the lowest cost per license
   - Re-negotioation of contracts, consider changing ULAs, cancel maintenance on unused licenses

EDB ENTERPRISEDB

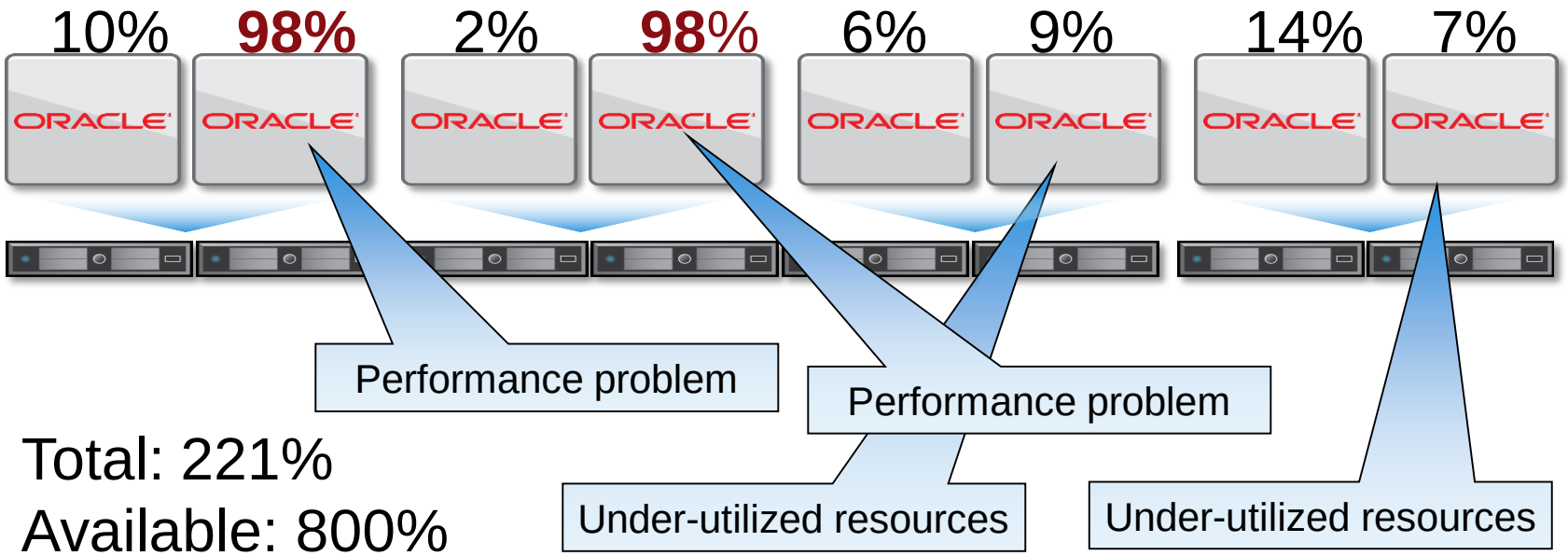
LICENSEFORTRESS

Madora Consulting

LC Licenseconsulting.eu

DELL EMC

CLASSIC PROBLEM OF RESOURCE MANAGEMENT

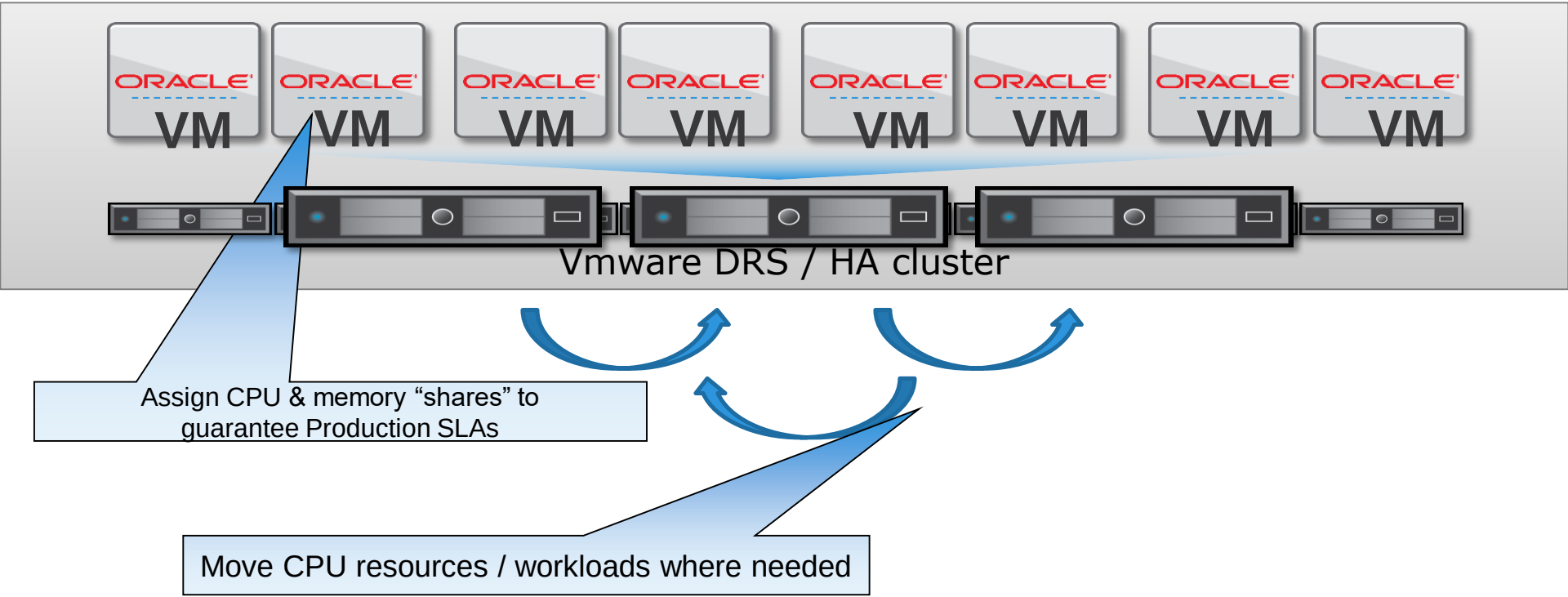


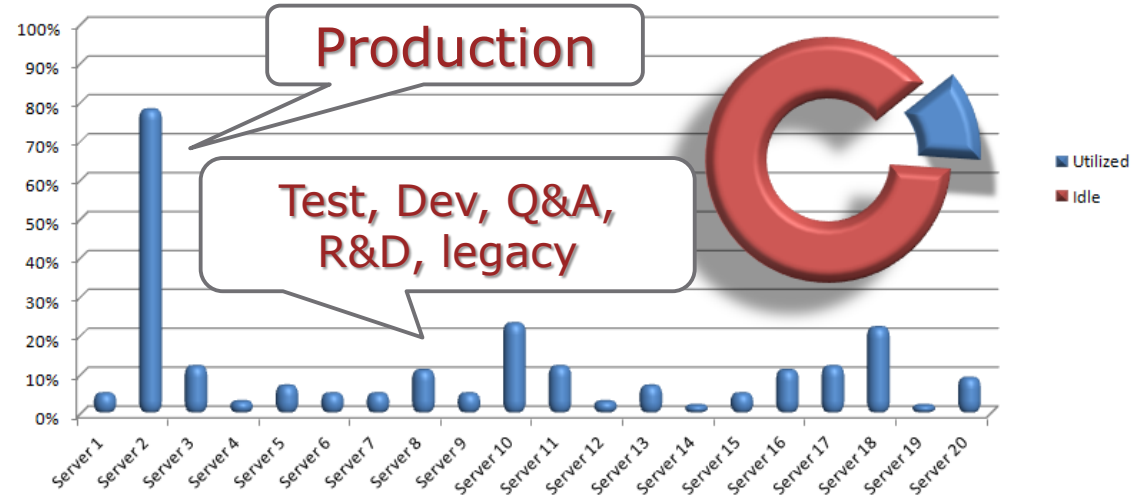
Total: 221%
Available: 800%
Avg: 30%

*APPLIED TO DB PROCESSING POWER

RESOURCE MANAGEMENT

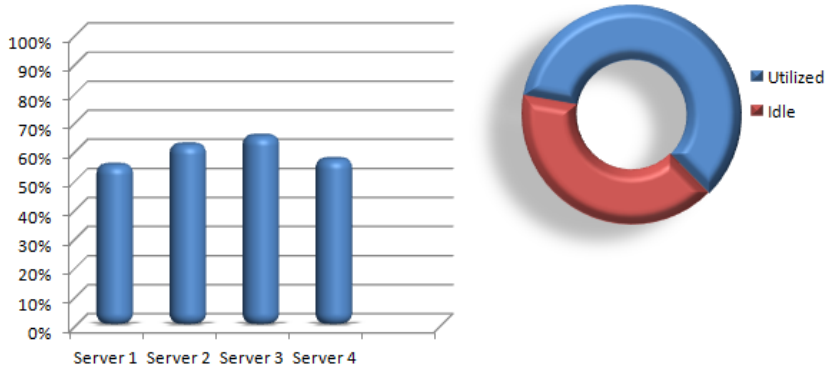
"MAINFRAME STYLE"





Typical legacy database server farm:

- Physically deployed
- Oversized
- Outdated platforms
- Very poor CPU utilization
- IO & CPU bottlenecks
- Servers running mix of:
  - Apps, middleware & DB
  - Tooling
  - Replication & Backup



Optimized database server farm:

- Virtualized
- Significantly less CPUs on Modern HW
- High average CPU utilization
- No I/O bottlenecks
- Sized correctly
- Servers running ONLY Oracle
- Minimal required licenses & options

ROAD BLOCK #1: SUPPORT

ORACLE NOT SUPPORTED ON VMWARE?

ORACLE ON VMWARE

- Oracle is FULLY supported on VMware
  - Including Oracle RAC
  - Any other claim is FALSE
  - Platform certification is NOT required
  - Escalation paths exist from Oracle/EMC and VMware to avoid fingerpointing
  - Reproduce on physical is RARE but easy with EMC (snapshots)
- Potential licensing issues can be avoided
  - Including recent Oracle claims about Vsphere 5.5 and Vsphere 6
- Performance scaling & overhead is no issue
  - 1 VM: 128 vCPU, 4TB memory, 1M+ IOPS

ORACLE SUPPORT NOTE 249212.1

Purpose

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

Scope & Application

For Customers running Oracle products on VMware virtualized environment

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.

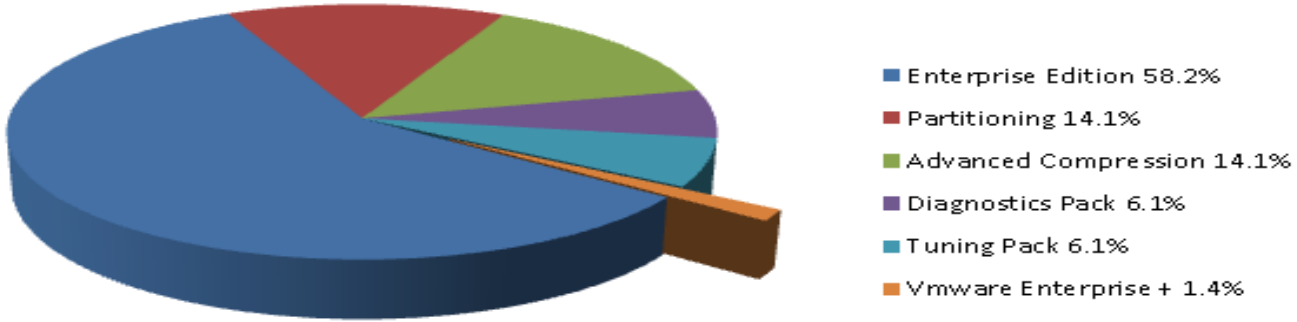
Oracle Support will assist customers running Oracle products on VMware
… in the following manner…

Source: My Oracle Support website, VMware Oracle Support Statement

ROAD BLOCK #2: LICENSE COST

LICENSE COST HIGHER ON VMWARE VS PHYSICAL OR OTHER HYPERVISORS?

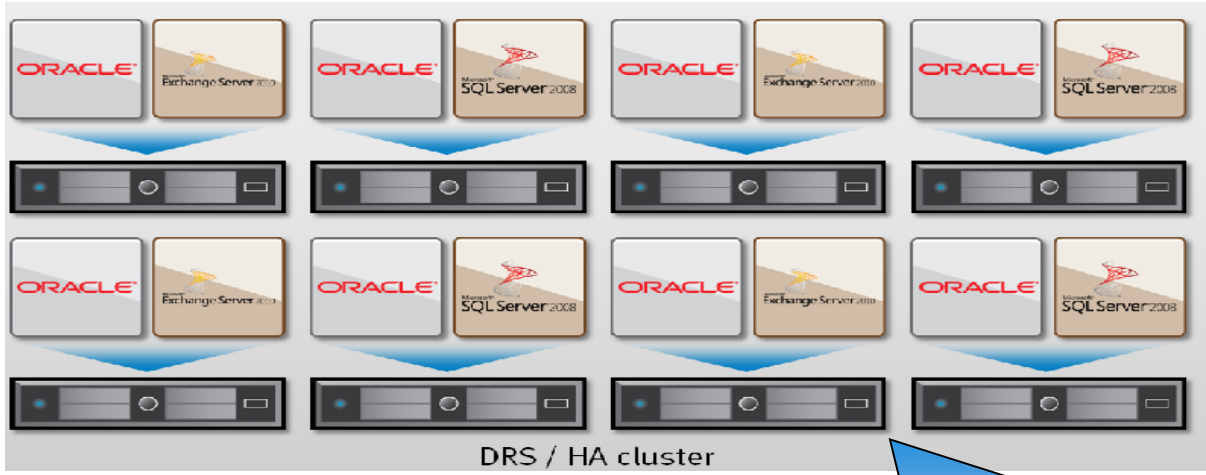
VMWARE – EXPENSIVE?



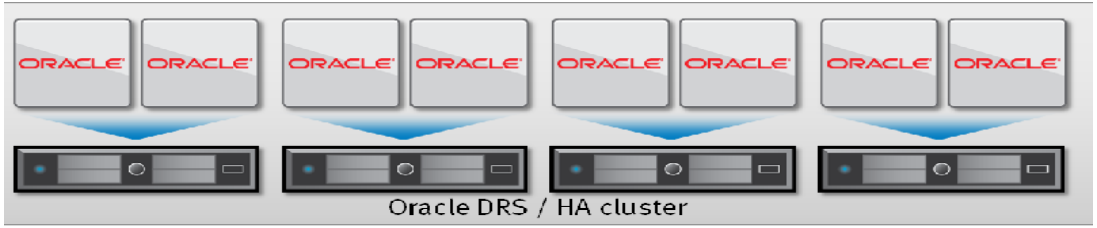
- VMware licenses make up less than 1% of total SW licensing (modern CPU)
- Even lower if you use Oracle RAC or other additional options
  - Active Data Guard, in-memory, etc

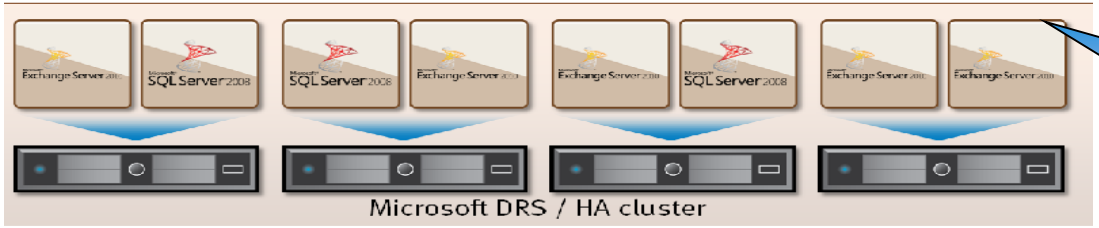
Server: Dual-Socket, 12 core X64
DB licenses: Oracle EE + Partitioning + Advanced Compression + Diagnostics & Tuning pack
VMware licenses: Enterprise Plus (most expensive type)

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



Poorly managed licensing
(Expensive – requires 8 servers fully licensed)





Well managed licensing
(Savings – only requires 4 servers fully licensed)

UNLIMITED LICENSE AGREEMENT

ONE WAY TICKET TO THE BLUES?

"We can install as much as we like without additional cost, we have a ULA"

- Customer DBA

Reality?

LICENSING VMWARE (1)

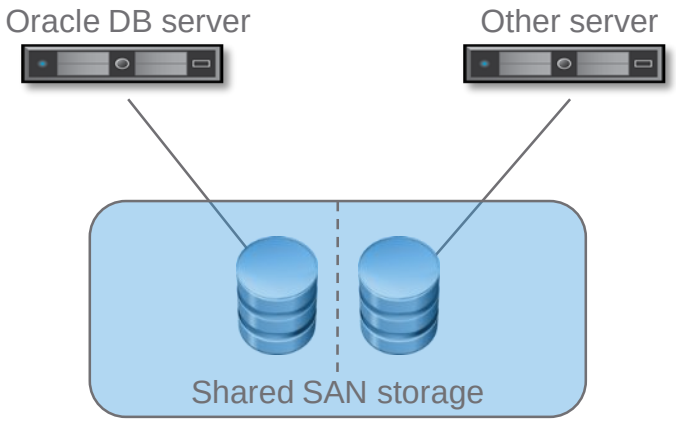
WHICH SERVER NEEDS TO BE LICENSED FOR ORACLE?

"Processor: shall be defined as all processors where the Oracle programs are installed and/or running."
- License definitions and rules, oracle.com

***Not*:**
- Where Oracle programs could be running sometime in the future
- Storage Arrays or other media where Oracle software or data is stored

LICENSING VMWARE (2)

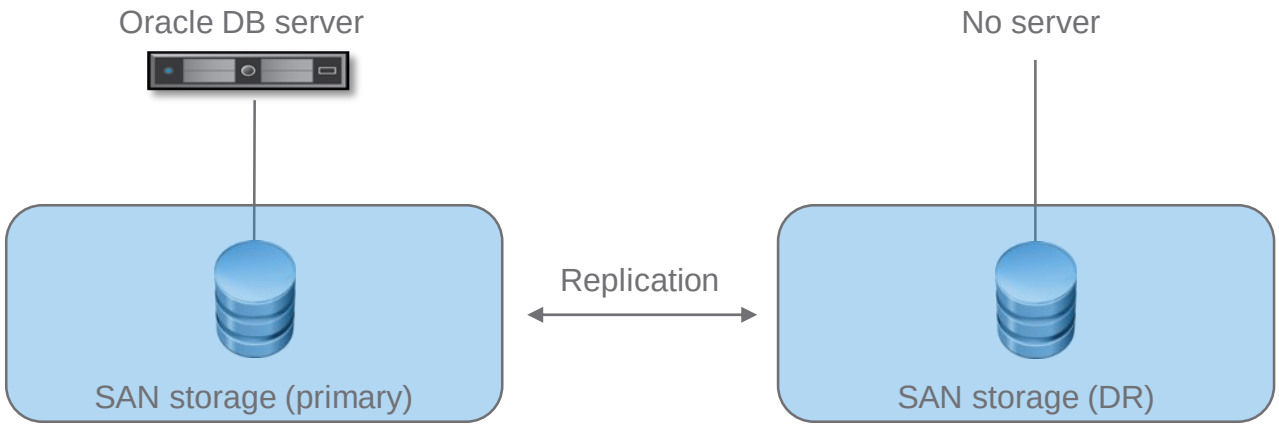
SERVER CONNECTED TO THE SAME SHARED STORAGE?



"Processor: shall be defined as all processors where the Oracle programs are installed and/or running."
- License definitions and rules, oracle.com

LICENSING VMWARE (3)

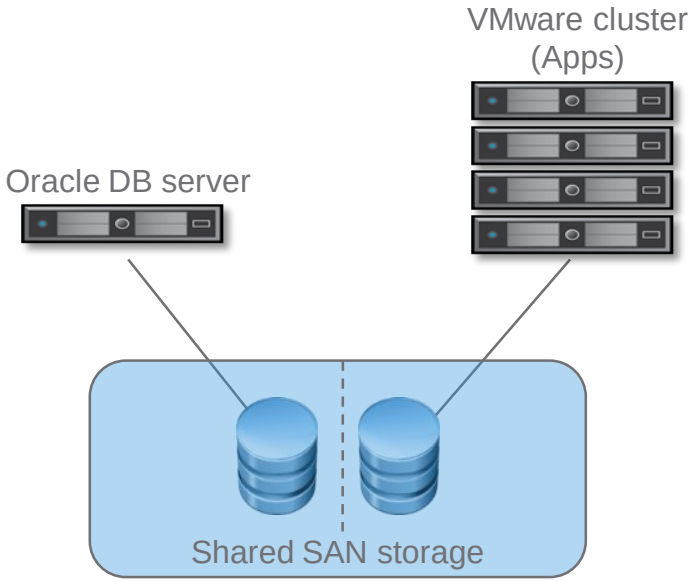
SAN REPLICATION?



"Processor: shall be defined as all processors where the Oracle programs are installed and/or running."
- License definitions and rules, oracle.com

LICENSING VMWARE (4)

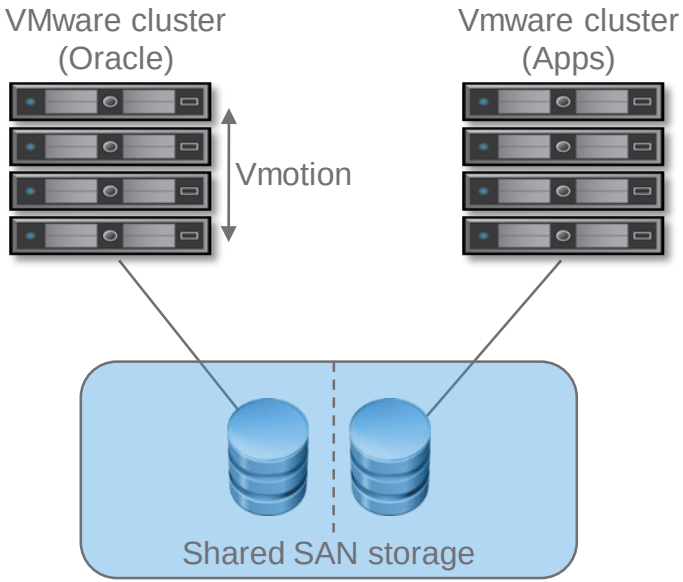
VMWARE CLUSTER CONNECTED TO THE SAME STORAGE?



"Processor: shall be defined as all processors where the Oracle programs are installed and/or running."
- License definitions and rules, oracle.com

LICENSING VMWARE (5)

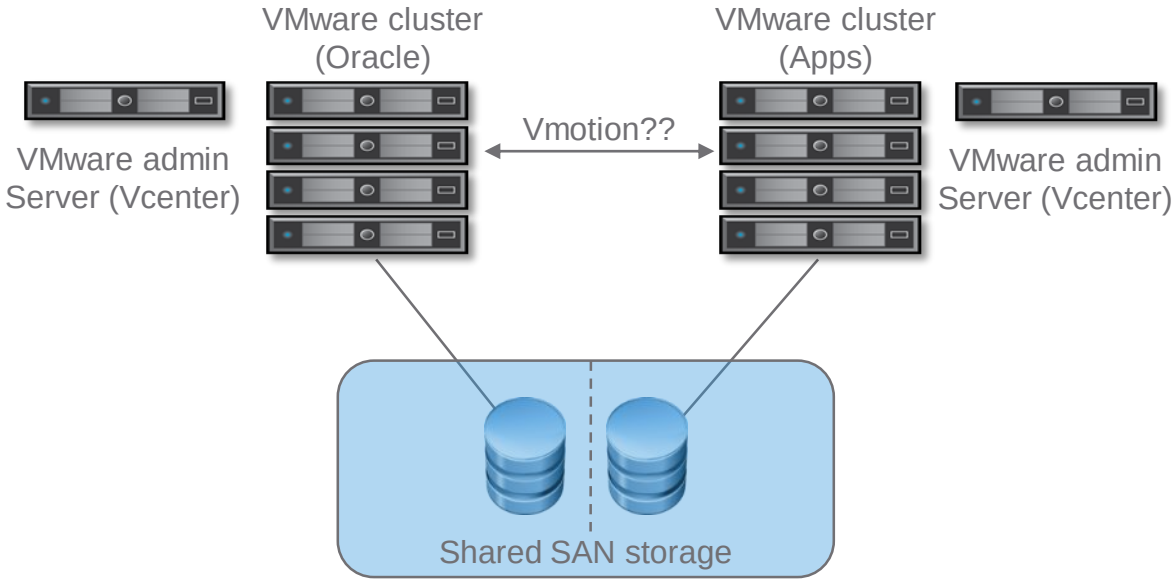
VMWARE CLUSTER RUNNING ORACLE DB VIRTUAL MACHINES



"Processor: shall be defined as all processors where the Oracle programs are installed and/or running."
- License definitions and rules, oracle.com

LICENSING VMWARE (6)

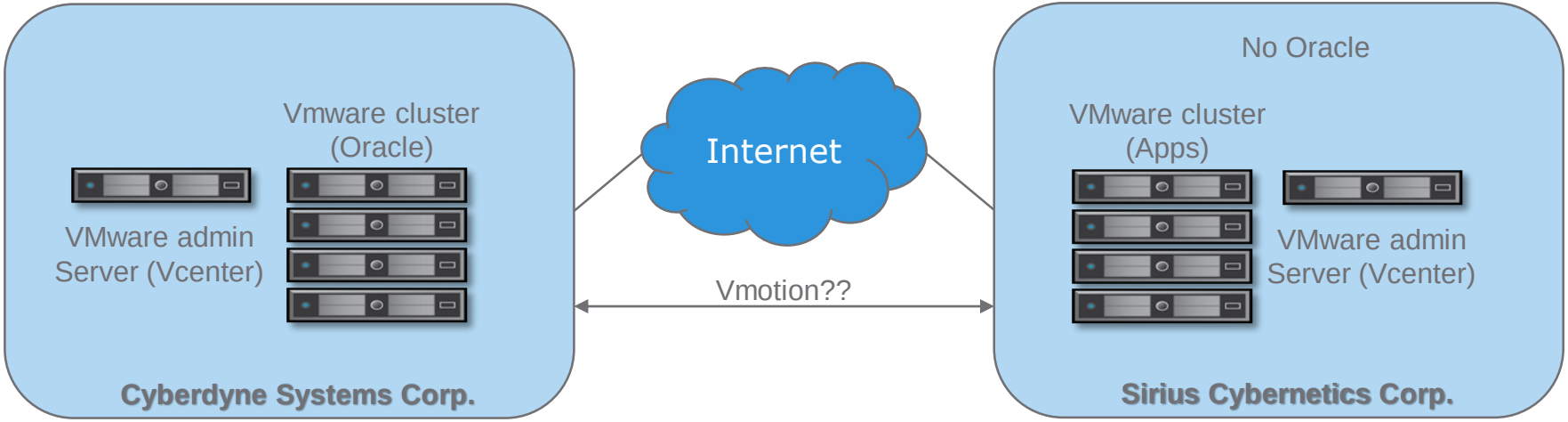
VMWARE VSPHERE 6 – CROSS VCENTER VMOTION?



"Processor: shall be defined as all processors where the Oracle programs are installed and/or running."
- License definitions and rules, oracle.com

LICENSING VMWARE (7)

GETTING RIDICULOUS - LICENSE THE ENTIRE INTERNET?



"Processor: shall be defined as all processors where the Oracle programs are installed and/or running."
- License definitions and rules, oracle.com

THE ORACLE PARKING GARAGE

WHAT ORACLE TELLS CUSTOMERS

See blogpost: [House of Brick - The Oracle Parking Garage]

CROSS VCENTER VMOTION REQUIREMENTS

VMWARE KB 2106952

To enable migration across vCenter Server instances, your environment must meet these requirements:

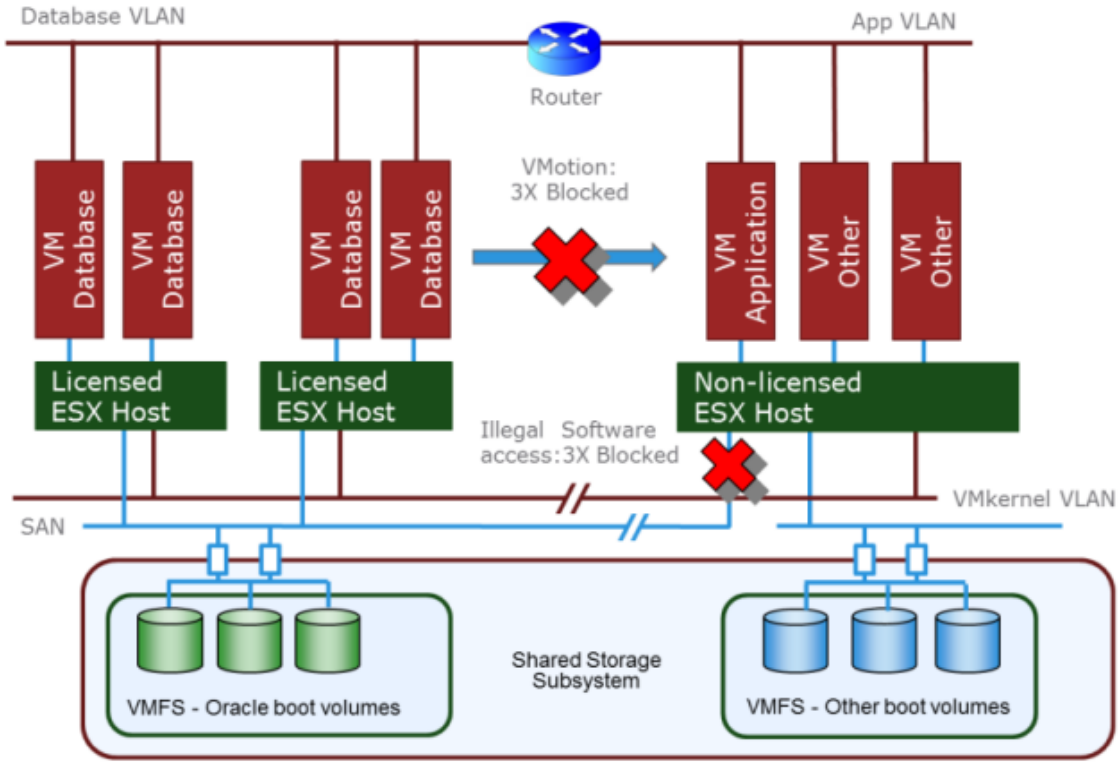
- The source and destination vCenter Server instances and ESXi hosts must be running **version 6.0 or later.**
- The cross vCenter Server and long distance vMotion features require an **Enterprise Plus license**. For more information, see Compare vSphere Editions.
- When using the vSphere Web Client, both vCenter Server instances must be in Enhanced Linked Mode and **must be in the same vCenter Single Sign-On domain** so that the source vCenter Server can authenticate to the destination vCenter Server.
- Both vCenter Server instances must be time-synchronized with each other for correct vCenter Single Sign-On token verification.
- For migration of compute resources only, both vCenter Server instances must be connected to the **shared virtual machine storage.**
- When using the vSphere APIs/SDK, both vCenter Server instances may exist in separate vSphere Single Sign-On domains. **Additional parameters are required when performing a non-federated cross vCenter Server vMotion**. For more information, see the VirtualMachineRelocateSpec section in the vSphere Management SDK Guide.

Conclusion - You are not exposed to license issues between Vcenters if:

- You are not using VMware Enterprise Plus license;
- Or (most important) you keep Vcenter for Oracle cluster in a separate (i.e. Active Directory) logon domain

- For further safety:
  - Isolate networks (VLAN)
  - Isolate storage (zoning/masking/mapping or even physical isolation)

AVOIDING THE VMOTION TRAP



Oracle on VMware: Caging the license dragon

Do's

- Prevent "illegal" Vmotion moves by creating multiple barriers
- Place Vcenters in separate domains
- Keep Vmotion audit trails
- Watch the IOUG "straight talk" video on my blog
- Make DB admins responsible
- Hire external licensing expertise

Don'ts

- Believe Oracle sales reps
- Give LMS all info they ask for
- Run hypervisors that don't achieve maximum TCO reduction

Know

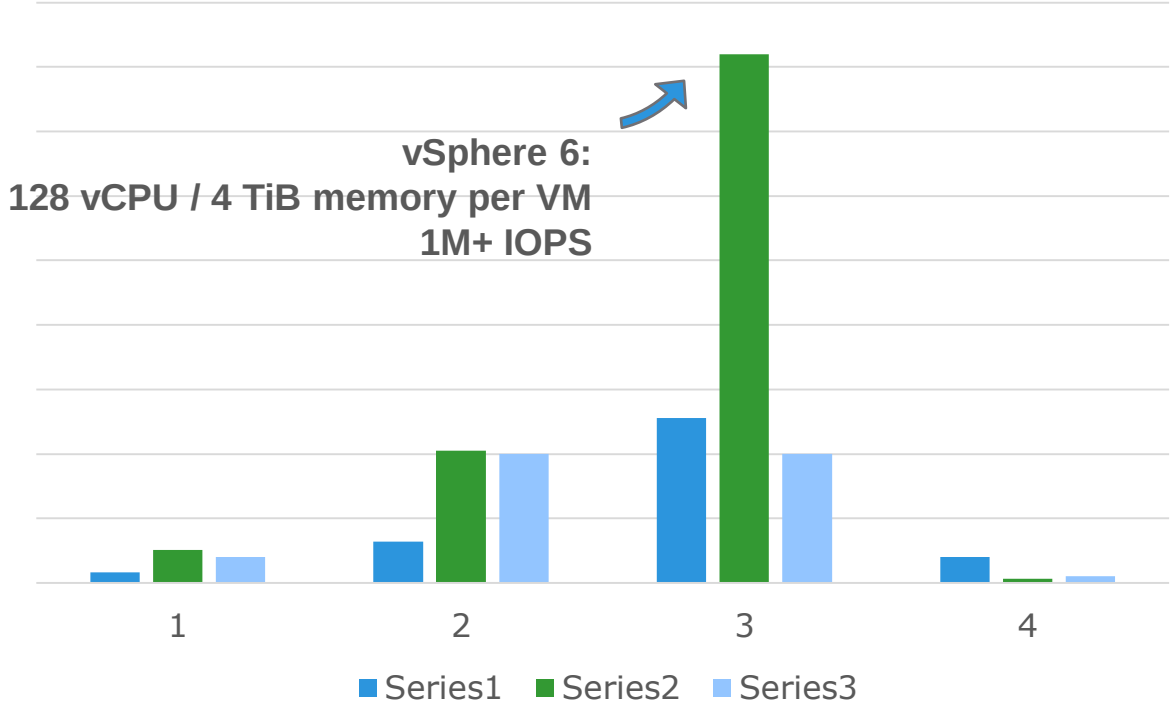
- You only have to license Oracle where it IS running (not where it might run in the future)
- Oracle FUD/Scare tactics

ROAD BLOCK #3: SCALABILITY

MAXIMUM WORKLOAD ON A SINGLE VM

VSPHERE SIZING LIMITS

(RELATIVE, PER VM)

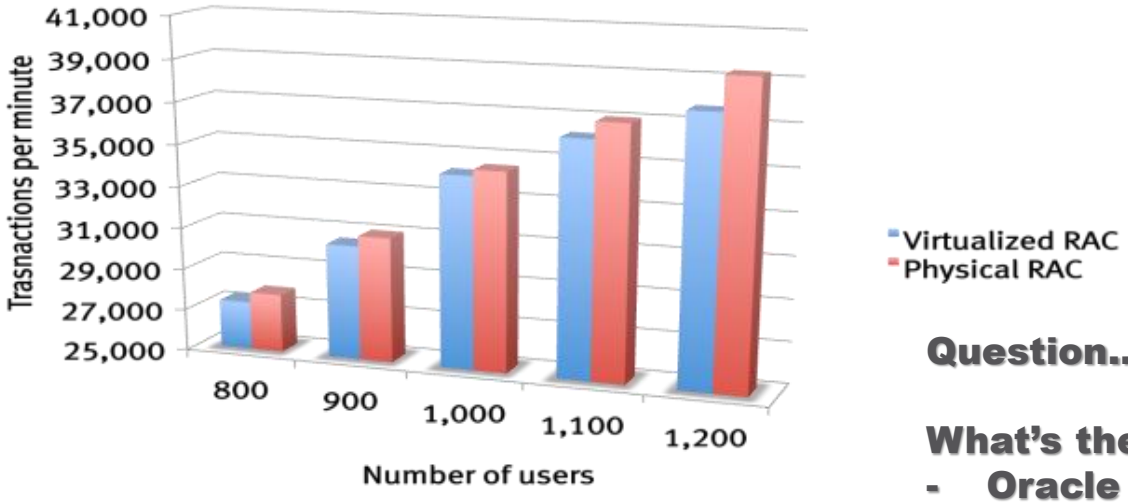


ROAD BLOCK #4: OVERHEAD

PERFORMANCE IMPACT OF VIRTUALIZATION

VMWARE OVERHEAD VS PHYSICAL

EMC IT ANALYSIS: 4% (ON VSPHERE 5.1!)



Question…

What's the performance overhead of:

- **Oracle RAC ?**
- **Host replication ?**
- **Advanced Compression ?**
- **Transparent table encryption ?**
- **Enterprise Manager agents?**
- **Etc.**

ROAD BLOCK #5: PLATINUM SUPPORT

ONE STOP SHOPPING FOR SUPPORT?

VMWARE EXTENDED SUPPORT FOR ORACLE

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.

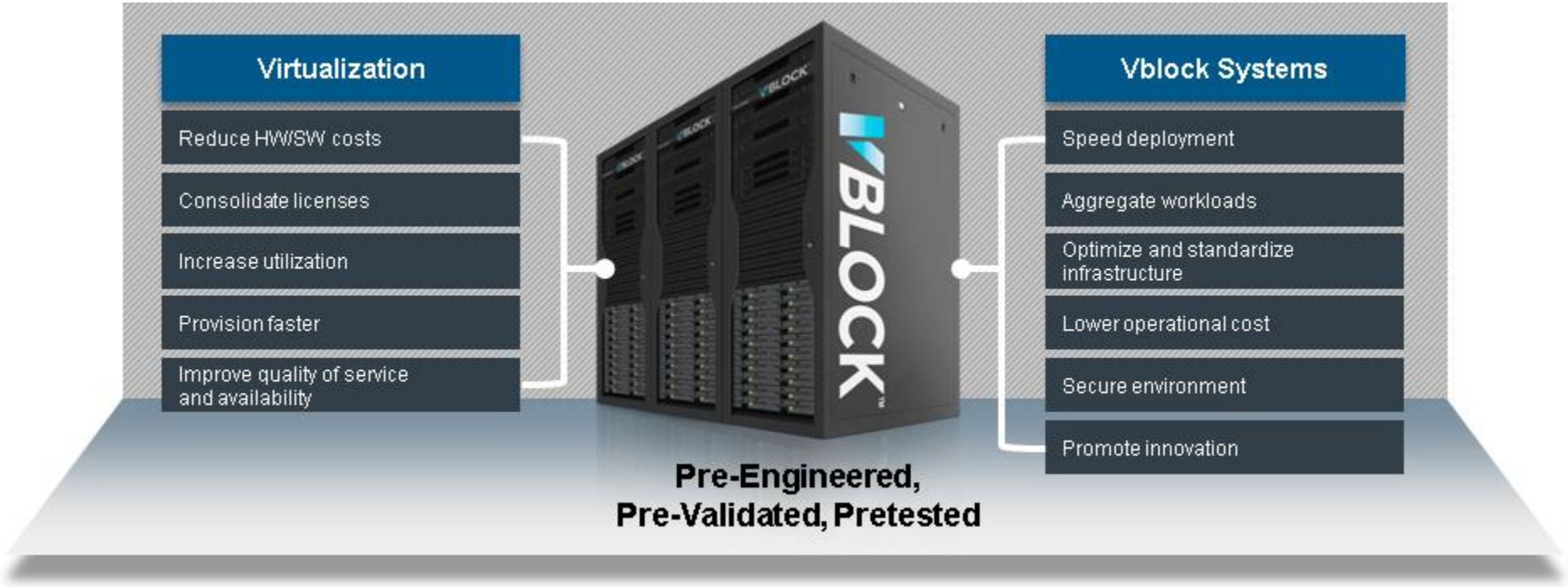
http://www.emc.com/solutions/application-environment/oracle/oracle-virtualization-vmware.htm

ROAD BLOCK #6: NO INTEGRATED STACK

OPTIMIZED SYSTEM FOR DATABASE WORKLOADS?

DELL EMC ENGINEERED SOLUTIONS

SINGLE SKU – ALL-FLASH - OPTIMIZED FOR DATABASE WORKLOADS



With DELL EMC, expect more engineered solutions / optimized designs / reference architectures i.e. VxRack, VxRail etc

ORACLE ON VMWARE

BEST PRACTICES AND GUIDELINES

AVOID COMPLIANCY ISSUES

MAKE SURE YOU ARE ALWAYS COMPLIANT WITH LICENSING

- Prohibit illegal live migrations
  - IO fencing, rules, network & storage isolation, separate logon domains
- Audit movements
  - Insurance policy against the license police
- Know the rules
  - 10-day rule? Sub-server partitioning? SE vs EE? CPU based vs NUP? Etc etc.
  - Don’t hesitate to hire external license consulting (LMS audits can be much more expensive)
- CxO / IT management: Make your DBA team directly responsible for being compliant
  - Let them report every 6 months

CAPITALIZE ON BETTER INFRASTRUCTURE

REPLACE OR ENHANCE EXPENSIVE LICENSED OPTIONS WHERE POSSIBLE

- Advanced Compression -> Storage compression
  - Works for ALL data
  - No additional license
- RAC -> VMware HA
  - Reduces complexity, improves performance and eliminates $$$ license
  - No free lunch: HA is active/passive (failover = few minutes, crash restart)
- Active Data Guard -> SAN replication
  - Replicate an ENTIRE Business Landscape AT ONCE (1 point of control)
  - RELIABLE (zero dataloss or async – but always consistent), independent from DB, OS, Server, etc
  - Improves failover/failback scenarios (no standby rebuild)
  - No Force Logging or even archive logging required

CHOOSE THE BEST CPU

BASED ON $/TRANSACTION (TPC-C PER CORE)

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 – but not all servers listed (Oracle "Engineered" systems are missing…)
- 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) – vSphere 5.1 (!)
- 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

Note: Intel E5-2697v2 ~ 115,000 TpmC/Core (estimate)
Intel E5-v3 ~ 125,000 TpmC/core (estimate)
SPARC T5 ~ 66,800 TpmC/Core (used in SPARC Supercluster T5)
IBM POWER 7+ ~ 150,000, POWER 8 200,000+ (but beware of core factor)

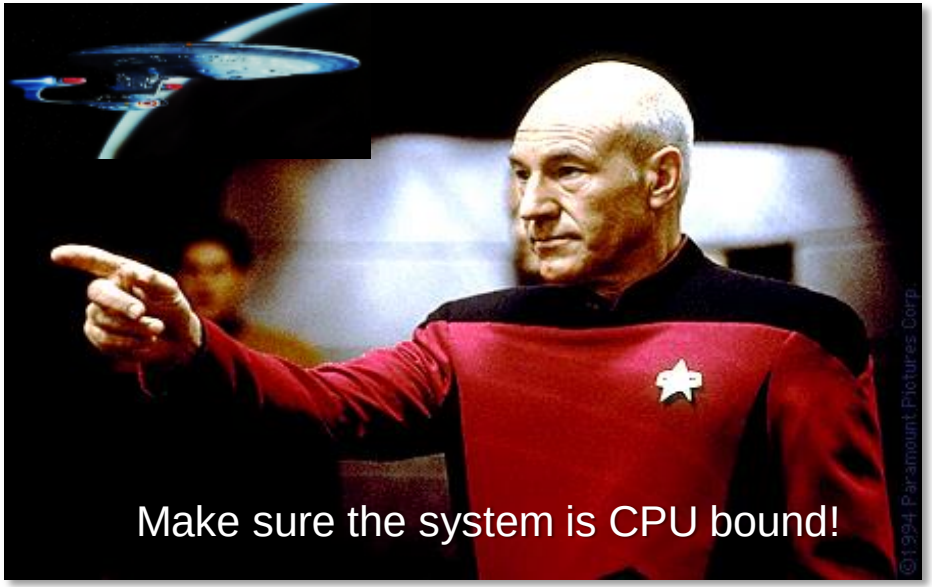
DELL EMC

ELIMINATE I/O BOTTLENECKS

- Driving up CPU utilization only possible if we can feed data quickly enough
  - Some apps need high bandwidth (measured in Mbyte/s)
  - Some apps need many IOPS (I/Os per second) at low latency
- Traditional "spinning disk" storage is limited
  - Disk Capacity is high, bandwidth and latency is poor
- Solution: Flash based storage
  - All-flash
  - Future: NVMe (replaces FC SAN)
- Typical All-flash Array metrics:
  - 100,000's of IOPS @ sub-millisecond latency
  - Many Gigabytes/s bandwidth
  - Not sensitive to mixed workloads
  - Some beneficial side effects (inline compression, de-duplication, zero-overhead snapshots, …)

DATABASES SHOULDN'T HAVE HIGH I/O WAIT

- Adding CPU does not speed up I/O bottlenecks
  - Memory does somewhat
- IOPS are relatively (!) cheap
- CPU cycles are expensive
  - Because of licenses
- Consolidation leads to
  - Higher IO requirements
  - I/O bottlenecks
  - Bandwidth issues
- Flash storage can solve these limitations



STORAGE IS NO LONGER THE BOTTLENECK

ENJOY FREEDOM OF CHOICE

BREAK THE STOCKHOLM SYNDROME

- What's a Virtual Machine?
  - Just Config file + Data
  - Standardized, HW independent X86 platform
- Could be moved easily to other platforms
  - Different hypervisors
  - Different servers
  - Different storage
  - As long as it's x86-64bit

(But… Keep running on EMC ;-)

REFERENCES

Contact

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My Blog "Dirty Cache"

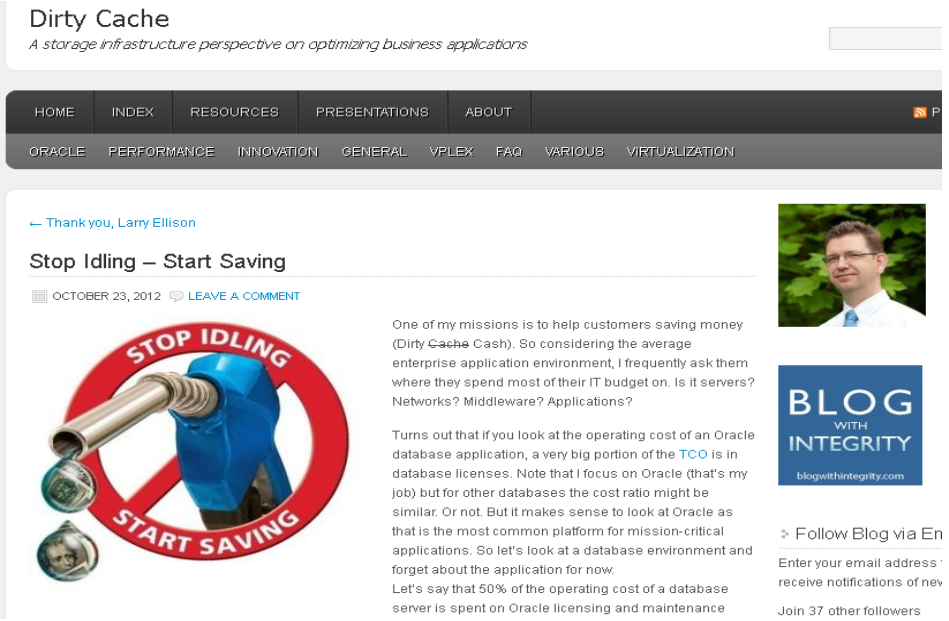
http://bartsjerps.wordpress.com

Everything Oracle @ EMC (community):

http://emc.com/everythingoracle

Licensing Databases on EMC and VMware Technology – White paper

http://houseofbrick.com/whitepaper-database-licensing/




DELL EMC