Changing The Game For Database Applications

with the HP/Violin Open DB Solution

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Date: 2/25 & 28/11 V7

HP/Violin Open Database Solution

Agenda:

- Database Customers Needs
- What is the Oracle/Exadata Solution?
- How is Oracle/Exadata Marketed?
- What is the HP/Violin Open DB Solution?
  - The DL980
  - Violin Flash Memory
- HP/Violin Reference Architecture and TCO Analyses
- How to Sell Against Oracle/Exadata
- Recommended Sales Approach
- Summary
- Resources

HP High-Performance Database Solution

What are database customers looking for?

- A high-performance, reliable and manageable scale-up OLTP/ application system that supports their existing infrastructure, or a Converged Infrastructure
- A production database solution that integrates a single 8p HP ProLiant server with state-of-the-art 100% flash memory array in a single rack
- A solution that delivers both outstanding I/O capability and enterprise-level reliability
- 8X to 10X OLTP performance improvement over Oracle Exadata
- An open architecture capable of supporting all current versions of Oracle database, i.e., Oracle 10g, 11g, etc., NOT JUST 11g!
- A solution offering the choice of any OS strategy (Linux, Oracle Linux and Windows)

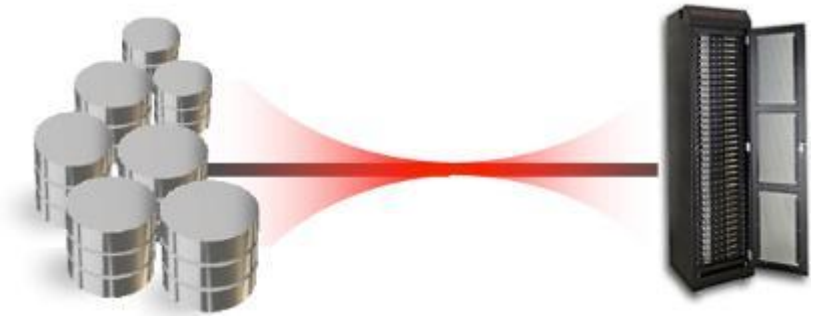
And at a reasonable price!

*Based on internal HP testing

What is the Oracle/Exadata Solution?

Oracle Evolution - Very Frequent HW Upgrades

Disks are slow



- Oracle Parallel Server
- 64-bit
- Internet and Grid(8i,9i,10g,11g)
- Real Application Cluster (RAC)
- Exadata V1 (HP hardware) — Sept 2008
- Exadata V2 (Sun hardware/PCIe Flash cache for performance (unpublished) — Oct 2009
- Exadata X-2 & X2-8 — Sept 2010
- SPARC T3 with the Sun Storage 5100 flash Memory Array — Dec 2010
  - Used to create the Sun SuperCluster for December 2010 TPC-C record
    - SuperCluster price tag $30 million
    - (of which $22 million was flash Memory Arrays used to eliminate the physical limitations of disk IO)

Exadata is becoming Exascale, **Exa-Costly**

The two Database Machine Configurations: Exadata X2-2 and X2-8

Hardware in each full rack

Exadata X2-2 config — 8 x86 RAC DB Server Nodes

Exadata X2-8 config — 2 x86 RAC DB Server Nodes

- **Common Exadata X2-2 & X2-8 hardware**
  - 14 x86 Storage Server Nodes
  - 5 TB of Flash Storage
  - 3 Sun Datacenter Infiniband Switches
  - 16 x 10GBe ports for connection to datacenter
  - 1 Cisco 48 Port Ethernet switch for Admin
  - Redundant PDUs

Software for Exadata X2-2 & X2-8

- Oracle 11g R2 Database
- Oracle RAC software
- Oracle Exadata unique features
- Partitioning
- Oracle Spindle licenses
- Choice of Solaris or Oracle Linux on DB nodes
- Oracle Linux on storage nodes

Source: Oracle

Exadata 2 Software Added Improvements

- Storage Indexing
  - Eliminate unnecessary I/Os to disk
- Hybrid Columnar Compression
  - Compression increases effective storage capacity and increases user data scan bandwidths by a factor of 10X
- Smart Flash Cache access
  - Like secondary L2 cache for the SGA
  - Breaks random I/O bottleneck by increasing IOPs Scans on data
- In-Memory Parallel Execution
  - Harnesses memory capacity of entire database cluster for queries
- Data Mining model scoring
  - CPU-intensive operations are moved from database servers to Exadata storage servers
- Interleaved Grid Disks
  - Write data to faster outer section of each disk
- I/O Resource Manager (IORM)
  - Enables storage grid by prioritizing I/Os

Technologies Only Available on Exadata 2

These Database technologies gives Oracle key control points

- Hybrid Columnar Compression
  - Typically delivering 5x compression and greater
- Smart Scan technology
  - Reduces amount of query data sent to db servers
- Smart Flash Cache
  - Sun PCI Flash in Exadata Storage Server used for intelligent, adaptive caching
- Interleaved Grid Disks
  - Also works on non-Exadata JBOD

How is Oracle/Exadata Marketed?

Oracle Exadata Database Machine

Changing the Game

- Database intelligence and massively parallel scaling in the storage tier
  - Using state of the art industry standard hardware
- Complete, Integrated Data Warehouse, OLTP and consolidation solution
  - High availability
  - Enterprise Security
  - Advanced analytics
- Innovative new technologies:
  - Hybrid Columnar Compression
  - In-memory parallel execution
  - FlashFire hardware + flash-optimized software

Source: Oracle

Main Oracle Exadata X2 Talking points

Extreme Performance for Data Warehouses—Improves both query performance and concurrency by offloading intensive query processing and data mining scoring from database servers and bringing it closer to the data.

Extreme Performance for OLTP Applications—Addresses the disk random I/O bottleneck problem by transparently moving hot data to Sun FlashFire. You get ten times faster I/O response time and use ten times fewer disks for business applications from Oracle as well as third-party providers.

Extreme Performance for Mixed Workloads—Allows you to consolidate data warehousing, transaction processing, and mixed workloads on a massively parallel server grid and eliminate the cost of third-party specialty hardware, security, and management solutions.

Source: Oracle

Business Value Claims of Exadata X2

- **Extreme Performance**: Dramatic performance improvements (10-100X) for your data warehouses. Dramatic performance improvements (20X) for OLTP applications
- **Linear Scalability**: Performance scales linearly with increase in data volumes.
- **Enterprise Ready**: Get up and running quickly with a complete system containing all the required hardware and software. Single enterprise level support for all hardware and software from Oracle.
- **Redundant and Fault Tolerant:** Failure of any component is tolerated. Data is mirrored across storage servers
- **No application migration:** Easy to move existing Oracle environment to Exadata
- **Easy to Mange:** Single appliance for all DW and DB installations
- **Standard:** Works transparently with existing applications. Manage your databases and applications the same way you do today.
- **Integration:** Seamlessly integrates with Exalogic via the common internal InfiniBand backbone (Mix and match Exadata and Exalogic racks)
- **Multi-OS:** Support for Oracle Linux and Solaris

Exadata is presented as Oracle's answer to all problems

- Exadata X2 is the Answer
  - Now, what was your problem?

ERP

CRM / HR

Multimedia

Batch Process / Reporting

Warehouse

Data Mart

Consolidate every workload onto a Database Machine

- No need for any other storage system
- For all applications
- Handles all data management needs
- Lower cost by consolidation of multiple special-purpose environments

What is the HP/Violin Solution?

HP DL980 G7 and Violin Memory

vs.

Oracle/Exadata

Optimized for Transactional Workloads

Operational Workloads (OLTP)

HP Converged Infrastructure servers

OLTP Application Servers

Examples:
- Oracle EBS
- PeopleSoft
- Other ISVs

HP ProLiant DL980 G7

Violin Memory 3200 Flash Memory Arrays

HP High-Performance Database Solution

Options:
- Oracle 10g, 11g
- Other DBs

HP StorageWorks

HP Storage Solutions

Examples:
- Off-line store
- High Availability
- Disaster Recovery

Built on the HP ProLiant DL980 G7

All new scale-up x86 server for the largest and most demanding enterprise-class workloads

Processor	• 4p or 8p four, six, or eight core Intel Xeon 7500/6500 series processors • Four proc SKUs ranging from 1.86GHz to 2.26GHz • Up to 24 MB cache memory per socket
Memory	• 128 DDR3 RDIMM slots • Max memory: 2TB (using 16 GB DIMMs)
Internal	• 8 SFF SAS hot swap bays standard • Embedded RAID support • 1 DVD removable drive bay
Networking	• Quad-Port 1GbE embedded NIC upgradable to Dual Port 10GbE
I/O	• Up to 16 available I/O slots • 5 PCI-e Gen 2 I/O slots standard (2 x8 and 3 x4) • Optional I/O expanders for up to 11 additional slots • One full-length option with 6 slots • One low-profile option with 5 slots
Management	• iLO3
Form Factor	• 8U rack-mount server
OS	• Linux, Windows

Industry-Standard and Mission-Critical Design

Delivering more scalability and resiliency for 8-socket systems

PREMA Architecture – Node Controller chipset design

- Building on top of Intel's latest Nehalem-EX processors with QPI with features not previously available in an x86 environment
- Smart CPU caching
  - Minimized inter-processor communication — reduces overhead
  - Accelerated local memory access — frees up memory bandwidth
  - Dynamic routing of traffic — eliminates performance bottlenecks
- Resilient system fabric
  - Redundant data paths — 50% more interconnect links improve system availability and minimize down time
  - Dynamic routing — improved system reliability and performance
  - Rapid recovery — improved error logging and diagnostics information
- HP ProLiant innovations
  - iLO3, Insight software, Thermal Logic, Sea of Sensors, and Dynamic Power Capping

Storage performance that trumps everything currently available

A 3U package offering scalability up to 500 TB in a single rack

Violin Memory

- Price competitive with enterprise hard disk drive (HDD) based arrays on a cost-per-GB basis
- Based on a systems approach to the aggregation of NAND flash providing:
  - High density and scalability
  - Sustained performance (7x24x365)
  - Serviceability
- Achieved #1 TPC-E server blade performance price/performance benchmarks with HP ProLiant BL685c G7 (June 2010)*

*TPC-E publication on HP ProLiant BL685c G7: 1464.12 tpsE, $302.49 USD/tpsE. System available 06/21/10. TPC-E is a trademark of the Transaction Processing Performance Council. Benchmark results as of June 21, 2010. Please see http://www.tpc.org/results/individual_results/HP/HP.BL685cG7.100621.01.es.pdf

Unmatched Modularity and Scale

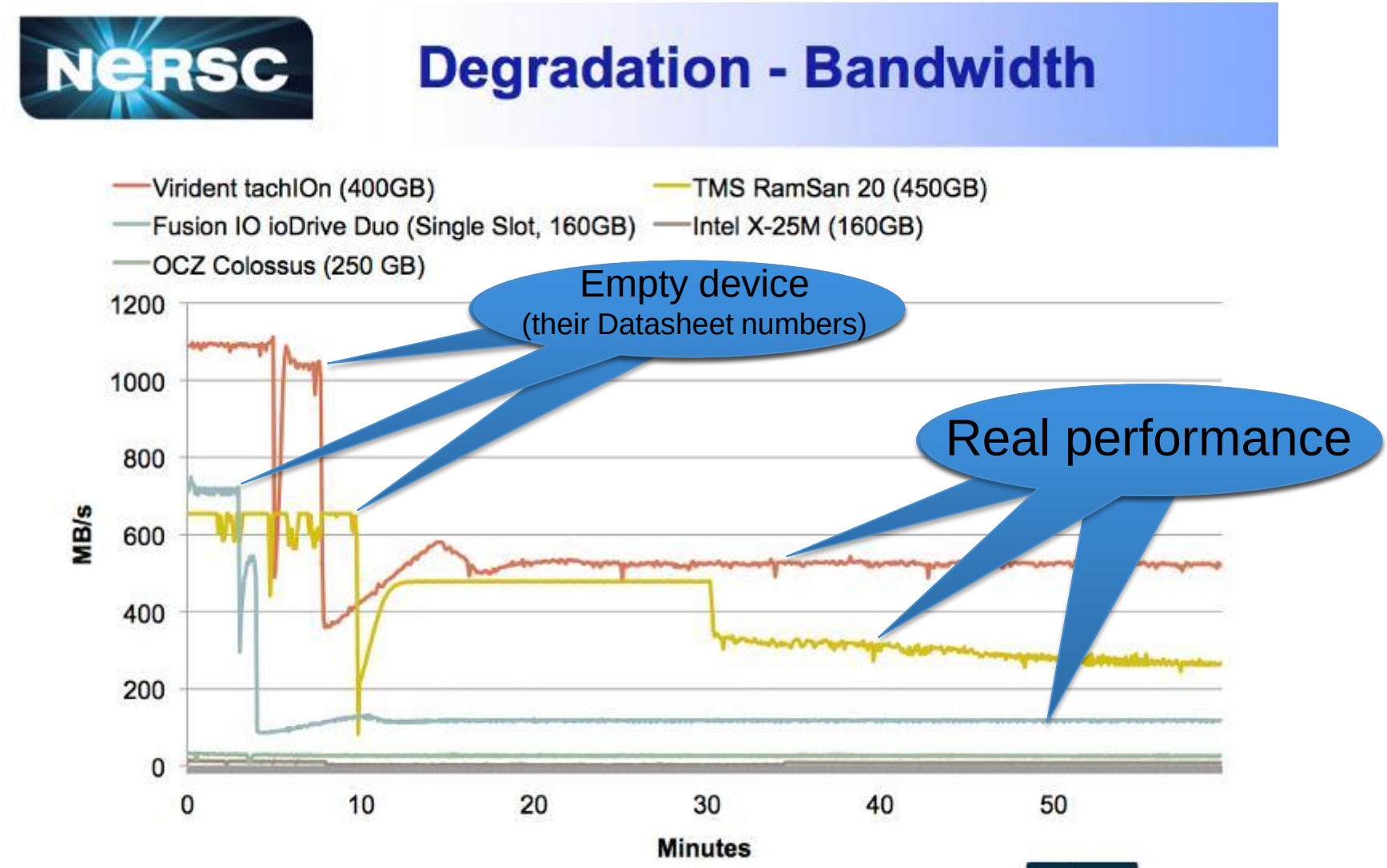
The industry's most scalable flash memory array

Violin Memory

- Flash VIMMs — aggregation
  - 10TB – Single-Level Cell (SLC) density in 3U (3200)
  - 40TB – Multilevel cell (MLC) based capacity flash (3140)
  - Sustained-write IOPS
  - **Auto-failover with full hot-swap capability for five 9s reliability**
- Flash vRAID — data protection
  - Spike-free latency
  - 80% flash efficient (vs. 50% for RAID-1)
  - Fail-in-place
  - 99.999% availability
- Performance
  - 250,000 IOPS
  - Sub 100μsec latency
  - 1.4GB/s throughput

The Infamous SSD "Write Cliff"

The elephant in the room everyone (else) tries to ignore



U.S. DEPARTMENT OF ENERGY | Office of Science

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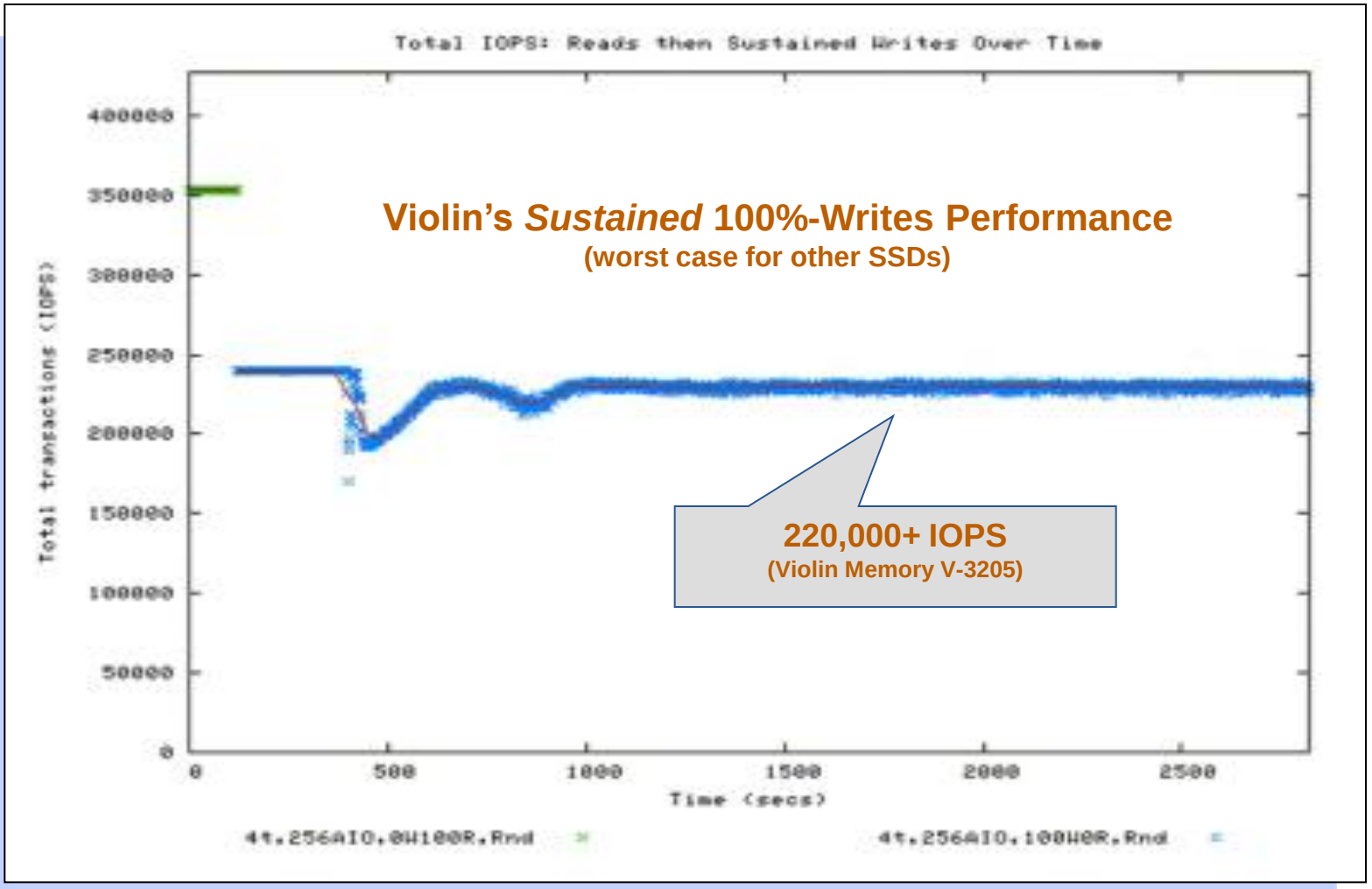
Source: SC2010

BERKELEY LAB Lawrence Berkeley National Laboratory

Violin – Sustained performance…*for years*



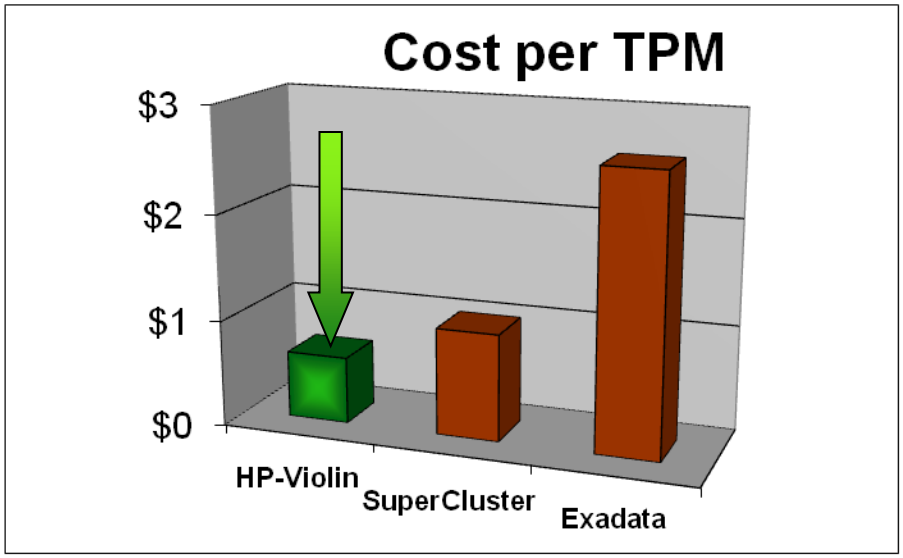
Exadata 2 Comparison

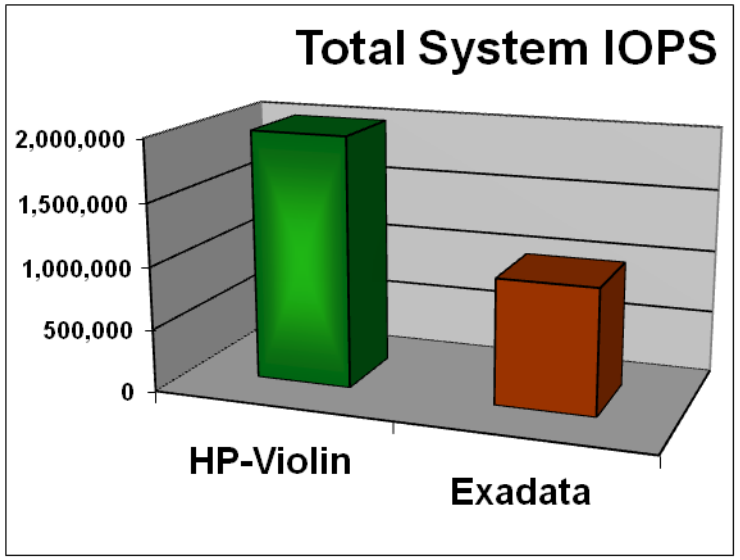
Critical Metrics	Oracle Exadata 2	HP/Fusion-io	HPDBS
Single Drive Failure	Zero downtime	Requires Reboot	**Zero downtime**
24x7 Mission-Critical	Yes	No	**Yes**
TPC-C Qualified	No	No	**Yes**
Requires over 1GB of host memory for every 80GB of flash storage	No	Yes	**No**
Requires Oracle RAC	Yes	No	**No**
Supports Oracle RAC 11g, 10g, 9i	No	No	**Yes**
10-15x Improvement over spindles (Oracle 11g RAC Queries)	No	NA	**Yes**

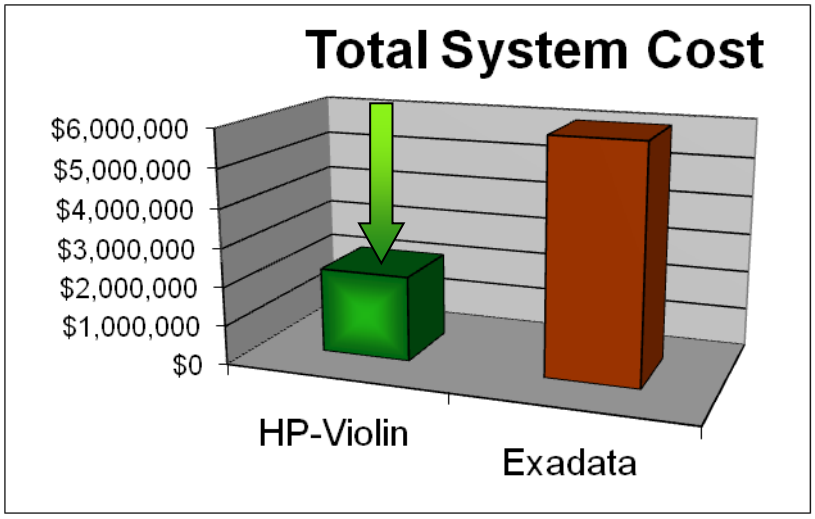
Advantages: Violin vs. PCIe Flash Card

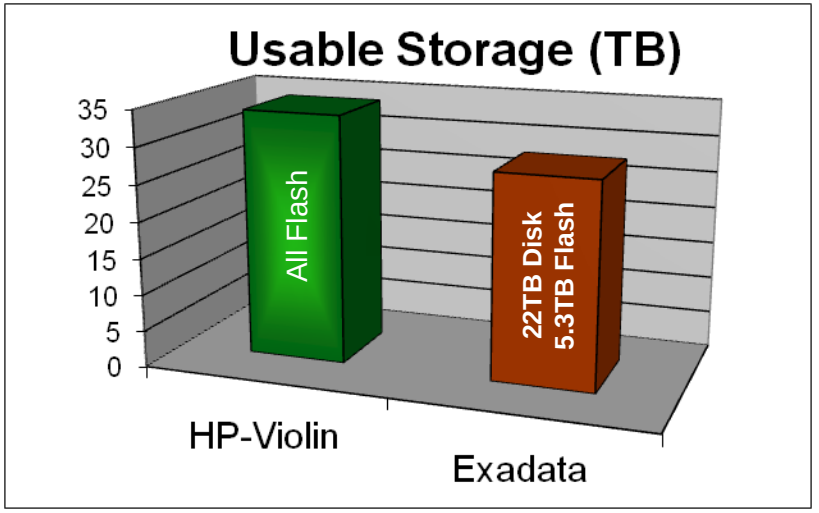
Characteristic/Metric	Violin Memory	PCIe Card	Violin Memory Advantage
Architecture	Open Insulates, hides Flash failures	Closed Failures may trash node	Reduction in failures related to outages
Aggregation Technology	Built-in, 20 GB/sec	None Requires external resources	Integrated system, lower TCO/GB
Driver	Open source, lightweight	Proprietary, bloated	Stability
RAID	Built-in, 20 GB/sec	None Requires external resources	Reduction in failures related to outages, enables simpler, more advanced options
Card Latency under load	500 microseconds	3 to 10 milliseconds	Scalable to billions of users
System latency under load	500 to 2000 microseconds	2 to 8 cards, 2 to 10 milliseconds	Lowest consistent latency
Reliability	Five 9s 4+1 RAID across system Hot spare VIMMs Hot swap VIMMs Failures transparent, no data loss Lightweight driver "just works" Used as Storage	Two to three 9s No RAID No hot swap Failures might lose data Controller failures may crash node Card used only as a cache	Reduction in failures related to outages Lower TCO/GB, no latency hit State of the art true fail in place Failures do not interrupt service No labor to remedy Failures do not interrupt service Set it, forget it
Scalability	Independent of computer resource	Must install inside server	Pools 100s of TB for shared access
Write Memory Cliff	Minor, deterministic latency	HUGE, inconsistent latency	Deterministic behavior, predictable scaling
Network Access Options	PCIe, 4/8 Gb FC, iSCSI, FCoE, I/B	None Server resident	Flexibility of deployment

HP/Violin vs. Exadata



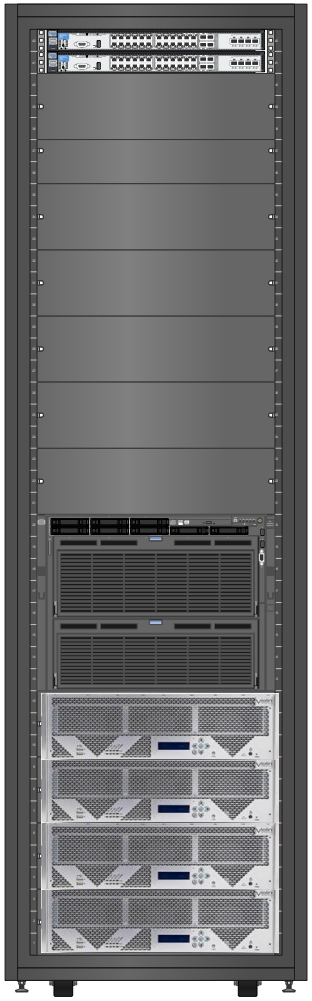






Reference Configurations with Outstanding Capability and Price Performance

HP-Violin 10K and 20K User Foundations



Foundation Configurations

- Exadata X2-2 Half Rack
  - Exadata HW:
    - Exadata server/storage rack
  - Exadata SW:
    - Spindle licenses (84)
    - Oracle DB licenses (24)
    - RAC licenses (24)
    - Partition licenses (24)
- HP DL980 with Violin
  - HW:
    - 32-core DL980 w/ .5TB RAM
    - 4 Violin 3210 10TB units
  - SW
    - RHEL 6
    - Oracle DB licenses (16)
    - Partition licenses (16)

Medium Configuration – 10,000 users

HP High Performance Database Solution for Oracle OLTP

Architecture view
4s/32c
512GB memory
15 TB max DB size
100M OLTP trans/hr

HP StorageWorks 4400 EVA
Development Database Volume
Archive logs, RMAN Backups, and Flashback Recovery Volume
(28.8TB)

Production Database
(4) Violin-3210 Chassis
PCIe 20 Gb/s Interface
10TB Flash Memory Each
(40TB RAW / 32TB Useable)

2 x 10GbE Switches

Production Server
DL980 G7 4P Database Server
Running Linux

Test/Dev Server
DL980 G7 4P Database Server
Running Linux

Software
Oracle 11g R2 Database
Linux (RHEL, SLES, OEL)
HP Insight Control for Linux
HP Storage Essentials

Foundation Configurations

- Exadata X2-2 Full Rack
  - Exadata HW:
    - Exadata server/storage rack
  - Exadata SW:
    - Spindle licenses (168)
    - Oracle DB licenses (48)
    - RAC licenses (48)
    - Partition licenses (48)
- HP DL980 with Violin
  - HW:
    - 64-core DL980 w/ 1TB RAM
    - 8 Violin 3210 10TB units
  - SW
    - RHEL 6
    - Oracle DB licenses (32)
    - Partition licenses (32)

3-year TCO: Exadata X2-2 Large Full Rack vs. HP DL980 with Violin Flash Memory (at List)

TCO Comparison Cumulative 3 Year	Solution A: Exadata X2-2	Solution B: HP 64-core DL980 1TB RAM with 8 Violin 3210 Flash Memory arrays	Difference (A - B)	Difference (A - B)%
IT Costs				
Server Hardware	$1,021,335	$2,502,095	($1,480,760)	-145.0%
Server Software	$5,616,000	$1,901,692	$3,714,308	66.1%
IT Operations and Administration Staff	$1,140,480	$950,400	$190,080	16.7%
Facilities	$82,758	$68,094	$14,664	17.7%
Hardware and Software Support and Maintenance	$4,386,182	$1,272,307	$3,113,875	71.0%
Total IT Costs	**$12,246,755**	**$6,694,588**	**$5,552,167**	**45.3%**

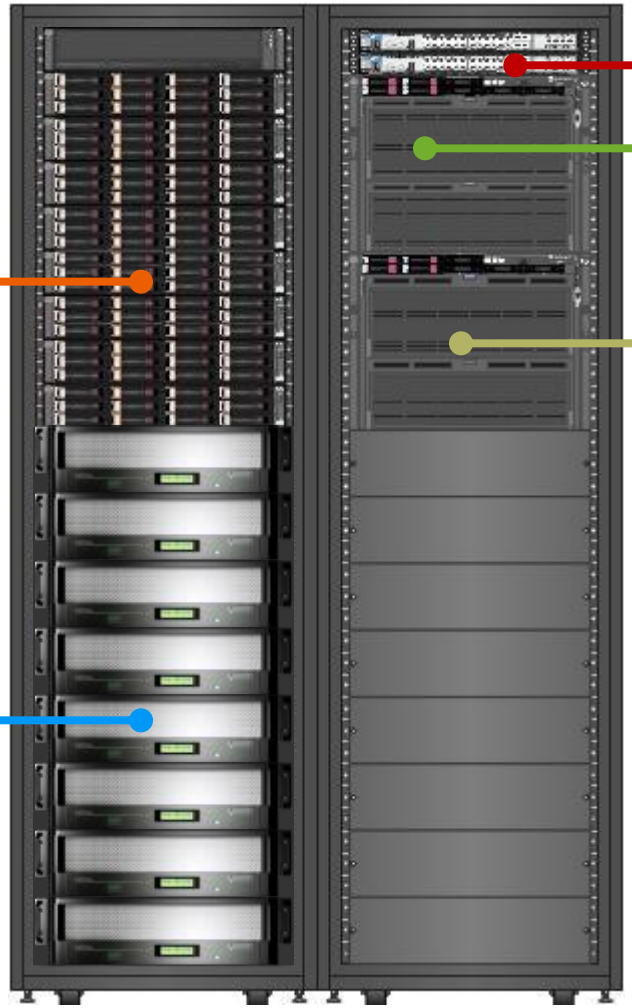
Large Configuration – 20,000 users

HP High Performance Database Solution for Oracle OLTP

Architecture view
8s/64c
1024GB memory
25 TB max DB size
200M OLTP trans/hr

HP StorageWorks 4400 EVA
Development Database Volume
Archive logs, RMAN Backups, and Flashback Recovery Volume
(28.8TB)

Production Database
(8) Violin-3210 Chassis
PCIe 20 Gb/s Interface
10TB Flash Memory Each
(80TB RAW / 64TB Useable)



2 x 10GbE Switches

Production Server
DL980 G7 8P Database Server
Running Linux

Test/Dev Server
DL980 G7 4P Database Server
Running Linux

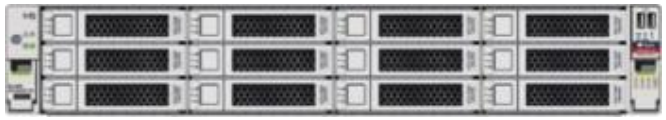
Software
Oracle 11g R2 Database
Linux (RHEL, SLES, OEL)
HP Insight Control for Linux
HP Storage Essentials

How to Sell Against Oracle/Exadata

The Truth About Exadata 2

- Exadata Database Machine is a custom configuration of server, storage, and network resources designed to only run one version of the Oracle database
- It is packaged and sold as a Database Appliance to mask the Total Cost of Acquisition – a way sell Oracle software on SUN hardware at a premium
- Oracle is focused on using PCIe flash cards as cache to accelerate their implementation of RAC

Storage Server (Exadata Cell)



Database Server (Node)

Infiniband Switch

Exadata X2 Product Analysis

- Exadata is Oracle's version of a mainframe -this is part of Larry Ellison's strategy for the future Oracle
- Oracle has invested significant R&D, marketing and support dollars to make this product successful
- Exadata is a proprietary and a siloed solution - serves the interests of Oracle first

Exadata X2 Product Analysis

- "Key Oracle technologies" are only made available to Exadata (partner lockout)
- Exadata is expensive to acquire, expensive to support
- Exadata is marketed as an "appliance" but it's very complex to manage
- Exadata does not / cannot fit all customer needs
- Exadata delivers huge margins to Oracle – the customer pays dearly (selling price elasticity to win new business)

Recommended Sales Approach to Oracle/Exadata

Points to consider when competing against Exadata

- Can the customer afford to be locked into a totally Oracle controlled solution? [this is an effective argument that IBM uses with Sun customers]
- Exadata is a siloed solution - How will this "appliance" integrate into existing system management and backup networks?
- Does an expensive Exadata solution really address the customer needs?
  - Are they paying for more of a solution than what is really needed?
- Will the customer get investment protection or forklift upgrades [point to Exadata V1]?
- How reliable and manageable will the solution be?
- Will current applications really scale with RAC without extensive rework?
- Oracle Exadata X2 with Smart Scan Software is an innovative solution, but is it worth a $2.5M higher price tag when compared to an HP industry standard solution, that delivers similar performance?
- Is the customer able to tolerate the failure of a shared resource model?

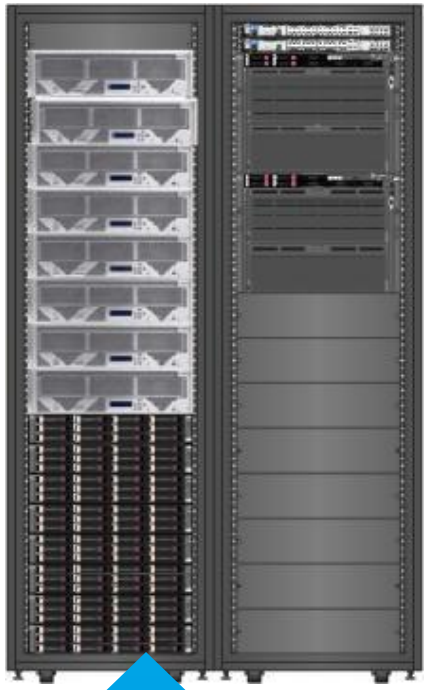
If Raw Performance is the Key Criteria

Oracle Database increased IOPS

- The DL980 with Violin flash storage
  - Supercharged performance
  - Simplified management (no RAC complexity)
  - Excellent TCO

- Why HP/Violin Wins
  - Excellent transaction performance and price/performance
  - Comparable performance to Exadata at less then half the price!
  - Simpler management with fewer nodes
  - Open environment for multiple ISV applications & DB vendors
  - Massive performance with "open" components

- Also consider non-Oracle alternatives when possible – Microsoft or Sybase
  - Great performance
  - Much lower cost
  - Standards base



Leading 8 socket performance
2.75M IOPS in a single rack
12.1GB/s sequential read

Where are the Exadata results?

Proof Points – Published, audited performance

The facts speak for themselves – what is Oracle afraid of?

- TPC-C Non-clustered Price/Performance Benchmarks
  - HP: 6 of top 10; top 2 overall results
  - Oracle/Sun: zero

- TPC-H Non-clustered Benchmarks
  - 100 GB category - performance
    - HP: 6 of top 10;
    - Oracle: one
  - 300 GB category - performance
    - HP: 5 of top 10;
    - Oracle/Sun: 2 top 10 result (both with x86)
  - 1000 GB category - performance
    - HP: 5 of top 10; top #2 overall result with RAC
    - Oracle/Sun: 2 top 10 result
  - 3000 GB category – price/performance
    - HP: #2 price/performance result – ½ the price
    - Oracle: #3 price/performance result – with Sybase database!
  - 10,000 GB category - performance
    - HP: 5 of top 9 results; #2
    - Oracle/Sun: 1 of top 9 results (#5)
  - 30,000 GB category – performance & price/performance
    - HP: Only published result – leadership in the large DW category
    - Oracle/Sun: zero

Sales Summary

HP/Violin Open DB Solution
Where do we stand with Violin?

- Our master agreement is in process – how soon?
- When will Violin products be on the price file?
- Who provides support to the customer?
- Can we get Violin products for a POC?
- Is HP growing Violin expertise?
- Who can assist me with Oracle Database knowledge?

Recommended Sales Approach:

Lead, don't react. Be confident in HP solutions

- Acquaint yourself with the material found in the URL's in this deck
- Assess every account you have with Oracle as the DB
  - Is Oracle/Exadata their or being discussed?
  - What are the customers true needs and/or pain points?
  - What are there current database constraints?

  (See some sample questions on a slide in this deck!)
- One can acknowledge that Exadata has value … but point out that it's far from perfect or even a good solution for most customers ….
- Work to understand **ALL** of the customer's needs and decision making criteria to recommend the right answer
- Change the nature of the sales engagement from Oracle's 'hot box' that solves all problems to a consultative/solution sale

Recommended Sales Approach (cont'd):

- This is not just an IT sale – the LOB managers and DBA's play an important part in decision making
- Contact your resource's on the following slide
  - State the situation and business case
  - Provide a Siebel number
  - We will pull in resources from HP and Violin to assist
  - Violin has sales managers throughout the country to assist with a F2F meeting
  - Use the Reference Architectures and TCO analyses as your selling tool

  Do a Proof of Concept! 94% win rate!!
- We can and do win against Exadata!!

HP/Violin Open DB Solution

Questions to ask your customer

- Are they doing OLTP or analytics or both?
- What do they have currently – are they replacing or adding to current?
  - What is their objective/goal?
- What is their opinion of the current system?
  - What works well for them?
  - What is not working well?
  - What are their concerns for the future?
- How would they prioritize their top requirements?
  - Price?
  - Performance?
  - Familiarity? (same as what they have now?)
  - Scalability
  - Ease of use?
  - Etc.
- What are their storage requirements?

HP/Violin Open DB Solution

Questions to ask your customer (cont'd)

- What are their performance requirements?
- Is an HA configuration required?
- Is a DR component required?
- Is a test and development component required with the same or lesser configuration as the production configuration?
- What are their annual growth expectations?
- For you the sales rep – what is the Siebel number?

Your HP/Violin First-Stop Team

At the first sign of an opportunity – contact us!

HP/Violin Support:

Jim Satko

- jim.satko@hp.com
- 978 692 7057

Bob Iwicki

- bob.iwicki@hp.com
- 603 521 7034

Violin/Oracle/HP Support:

Casey Roche

- casey@vmem.com
- 650-740-6724

Matt Morris

- oracle@vmem.com
- 630 715 2841

The Exa-terminator's creed

There are only two types of accounts….

- Those plagued by Exadata
- Those that are going to be plagued by Exadata

HP/Violin URL Resources

HP/Violin Site – updated weekly:

http://intranet.hp.com/tsg/WW2/hpcompetition/sun/Pages/exadata2.aspx

- Customer deck, white paper, Battlecard, etc.
- Reference Configuration Guide
- Reference architectures and TCO analyses
- BCS sizing tools and resource people
- Replay's of training Webinars

Violin Sites:

www.violin-memory.com

Violin Memory Launches First NFS Multi-TB Cache Storage System http://tiny.cc/3l3y4

AOL installs 50TB of Violin Memory SSD http://tiny.cc/4yzfy

Violin Memory, Microsoft and HP Post a Leadership TPC-E Result http://tiny.cc/5krfz

Violin Memory Enters into a Strategic Relationship with Toshiba http://tiny.cc/xy759

Q&A

Back-up Slides

Outstanding Transactional Capability

HP High-Performance Database Solution for Oracle OLTP

For the largest and most demanding enterprise-class workloads

- Recommended configuration metrics
  - For the given workload, CPU utilization is around 70%
  - Memory is based on the database size and achieves a 98% cache hit ratio
  - Read/Write ratio is approximately 70/30
  - Users are concurrent and generate approximately 1.5 transactions/second
- Potential yield
  - Over 200,000,000 transactions/hour
  - Over 2,700,000 IOPS
  - Bandwidth exceeding 12.1GB/s sequential read
  - Outstanding price/performance

Mission Critical for Oracle Database

– Sell Superdome2/P9500 Option
  - Mission critical heritage and roadmap
  - Balanced / proven performance
  - Ultimate manageability
  - Flexible, easy to scale

– Why HP Wins
  - Customer may already have investments in Superdome infrastructure
  - Proven HP-UX reliability – Exadata X2 can't match
  - Integrity mission critical platform and features
    – Exadata extreme patching & excessive component failure downtime
    Serviceguard portfolio (DR & HA) – Exadata has no equivalent
  - Much simpler administration – no RAC complexity, 1 system vs. MANY!
  - Field proven and well understood - Customer references across every industry
  - Matrix Operating Environment – well rounded & complete

Integrity SD2
1TB TPC-H
140,181 QphH

Where are the audited Exadata results?

Price/performance for Oracle Database

Clustering optional

– Sell DL580/DL980/P2000 Option
  - Industry leading performance & IO throughput
  - High Availability options
  - Reliability built in
  - Total Cost of Ownership

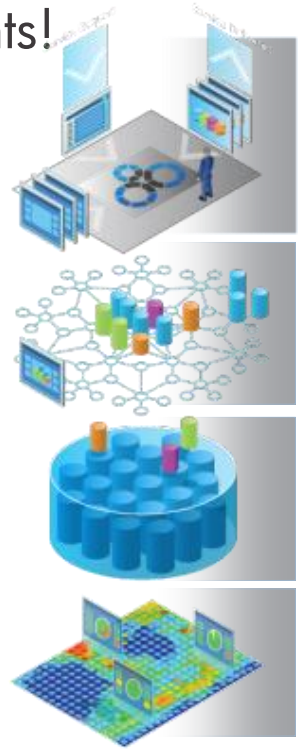
– Why HP Wins
  - **Excellent performance at ¼ the price*!** (*DL980, no RAC tax)
  - Performance scalable solution
  - Complete solution flexibility
  - Simpler management – one (or two) sever vs. many with Exadata
  - Open standards for easier integration and management
  - Factory Express for appliance-like deployment

ProLiant flexibility and industry leadership

Demonstrate to the customer Flexible & Open Solutions

Understand the real customer pain points and requirements!

- Mission critical is key?
  - Sell HP-UX, Superdome and P9500
- Price/Performance the driving consideration?
  - Sell DL580 / DL980 and P2000
- Absolute raw performance is demanded?
  - Sell DL980 with Flash Storage
- All of the Above?



The answer is almost always

"All of the above"

Sell the HP Converged Infrastructure

The Exadata Killer

and Violin MEMORY

Win on *every* dimension:

- *Performance*
- *Capacity*
- *Availability*
- *COST*

*…with an **Open Architecture***

Exadata Advanced Services

Premier Support

Advanced Technology Services (ATS)

Advanced Customer Services (ACS)

Advise & Plan	Design & Implement	Deployment	Support & Operate
Oracle Exadata Blueprint and Architecture Services	Oracle Exadata Enterprise Architecture Service		Oracle Exadata Managed Services, Run and Maintain
	Oracle Exadata Transition Services	Oracle Exadata OLTP Architecture Services	
	Oracle Exadata Data Migration Implementation Service	Oracle Exadata Consolidation Services	
	Oracle Exadata Business Continuity and HA Service	Oracle Exadata Pre-Production Assessment	
	Oracle Exadata 11g Readiness Implementation Service	Oracle Exadata BI/DW Architecture Services	
	Premier Support for Oracle Exadata		
	Oracle Exadata Production Readiness Support Service		
		Oracle Exadata Installation & Configuration Service	Oracle Exadata Upgrade Service
	Oracle Exadata Enterprise Security Services	Solutions Support Center for Oracle Exadata	
	Oracle Exadata Enterprise Manager Services		Operations Management for Oracle Exadata

Source: Oracle

HP Solution Value for Your Oracle Database

- Performance
  - Intel's newest high-performance Xeon processors
  - HP NUMA strategies for x86 scale-up
  - Flash Memory Arrays for extremely high IOPS
- Cost
  - Delivering an enterprise solution based on industry-standard economics
  - Scale-up solution drives lower cost in OS, DB licensing, and data center management
- Simplicity
  - Single server, with a single OS image
  - Single Oracle database instance — no requirement for RAC, multi-node management
  - Optimized for the OLTP workload — supports Oracle and other ISV operational systems
- Scalability
  - Configurations from small to very large (tens of Terabytes,) from midmarket/emerging to enterprise Oracle database deployments

Oracle Database 11g on HP High-Performance Database Solution

More performance, lower TCO, and unmatched scalability

Benefits at a glance

- Supports large-scale database workloads for OLTP applications with headroom for growth
- Efficiently expands Oracle database capacity by scaling up within single system without adding the complexity and overhead of a scaled-out database cluster
- Reduces costs by using less energy, floor space, and data center resources
- Decreases solution design time and accelerates deployment with HP reference configurations

HP/Violin vs. Exadata - Storage

Exadata Storage Cell

- 12 Disk Drives
  - 600GB SAS
- Dual 6-Core Xeon L5640 Proc
- 24GB of RAM
- Dual Port Infiniband QDR
- 384GB of Flash
  - Four 96GB PCIe Cards
- 2U of Rack space consumed.
- **No storage redundancy**

"...In short, there is *no magic* in Exadata that makes 6 12-disk storage cells (72 drives) more I/O capable than 768 drives attached via 128 dual-port 4GFC HBAs." – *Kevin Closson*- **Oracle**

Violin 3200
Flash Memory Array

- 10TB raw - ***7 TBs usable***
- 84 VIMMs
  - **4 spare VIMMs (fail in place)**
  - **Hot swappable**
- Redundant power
- PCIe connectors
- **250K *sustained* IOPS** per shelf

HP/Violin vs. Exadata - Performance

Exadata X2-2 Full Rack

- 14 Storage Nodes
- 3 Infiniband Switches
- 96 Cores (12 Cores/Database node)
- 168 Cores (12 Cores/Storage node)
- 768GB RAM (96GB/Database node)
- 336 GB RAM (24GB/Storage node)
- **5.3TB of Flash** (384GB/Storage node)
- **1.5 Million IOPS (est., read-only)**
- 2,000 lbs
- 14 kVA

$6+ Million Dollars!
(List Price)

Audited HP/Violin System

HP DL980 G7
- 8S/64C/128Threads
- 2 TB RAM

8 Violin Memory Arrays
- 3.4 Million TPM
- ***2 Million IOPS***
- Single System Image
- No RAC
- *Open Architecture*
- *Scalable*

$2.7 Million
(List Price)

+

HP/Violin vs. Exadata - Capacity

Exadata X2-2 Full Rack

- 14 Storage Nodes
  - 168 Disk Drives
  - **100 TBs RAW capacity**

- Available to the User (DBA)
  - **45 TBs Usable**

- Data Growth options
  - Add more storage shelves
  - Unbalancing the appliance

…and still a

Proprietary System and $6+ Million!

HP/Violin:

7 X V-3205 (35 TB raw)

- **27 TB usable**

1 X V-3210 (10 TB raw) quantity 1

- **7 TB usable**

= **34 TBs usable**

Data Growth Options:

Add Additional Storage

- Upgrade 3205 –> 3210
- Add 3140 (MLC Storage)

Open Architecture

$2.1 Million

HP/Violin Memory Summary

HP and Violin Memory Deliver

- ✓ #1 in Price/Performance
- ✓ Enterprise-Level Reliability
- ✓ HP's Proliant Architecture
- ✓ An Open Architecture System
  - Oracle 8i,9i,10g,11g
  - DB2, Sybase, MS SQL, MySQL, Postgres
  - Oracle EBS, PeopleSoft, JD Edwards.
  - Oracle BI (Hyperion), SAP BW, Cognos
  - Other…

Outcomes that matter.