Rich Niemiec, Rolta TUSC
(Thanks: Jim Viscusi, Milton Wan, Damon Grube, Mike Messina, Sri Avantsa, & Shyam Varan Nath + Oracle Learning Library for Examples)
Rich’s Overview
(rich@tusc.com)

- Advisor to Rolta International Board
- Former President of TUSC
  - Inc. 500 Company (Fastest Growing 500 Private Companies)
  - 10 Offices in the United States (U.S.); Based in Chicago
  - Oracle Advantage Partner in Tech & Applications
- Former President Rolta TUSC & President Rolta EICT International
- Author (3 Oracle Best Sellers – #1 Oracle Tuning Book for a Decade):
  - Oracle Performing Tips & Techniques (Covers Oracle7 & 8i)
  - Oracle9i Performance Tips & Techniques
  - Oracle Database 10g Performance Tips & Techniques
- Former President of the International Oracle Users Group
- Current President of the Midwest Oracle Users Group
- Chicago Entrepreneur Hall of Fame - 1998
- E&Y Entrepreneur of the Year & National Hall of Fame - 2001
- MOUG Top Speaker Twelve Times
- National Trio Achiever award - 2006
- Oracle Certified Master & Oracle Ace Director
- Purdue Outstanding Electrical & Computer Engineer - 2007
Overview

- Terminology & the Basics about Exadata
- Flash Cache
- Storage Index
- Smart Scans
- Hybrid Columnar Compression (HCC)
- Enterprise Manager & Grid Control
- Enterprise Manager Exadata Simulation
- I/O Resource Manager
- Security
- Utilities
- Best Practices
- Summary
Goals …

- Goals
  - Overview of Exadata - Easy

- Non-Goals
  - Making you the Expert
Audience Knowledge

Exadata V1?

X2-8?

10x faster than any Oracle DW

Exadata V2-2?

5x faster than V1
Big Difference... Much Improved!

Exadata Version 1?

Exadata Version 2?
Audience Knowledge

Full RACK?  Half or Quarter

RACK?
Terminology & The Basics
Some Terms

- **SATA Disk (337T)** - Big & Slow – Like a 33 1/3 < 7200 RPM
- **SATA** = Serial Advanced Technology Attachment

- **SAS Disk (100T)** – Small & Fast – Like a 45 < 15K RPM
- **SAS** = Serial Attached SCSI (Small Attached SCSI)
WHAT is it?

- A prebuilt 8-Node RAC cluster with Super SAN
- All the CPU power you need (64 cores)
- Mega DRAM Server Memory (576G)
- Super-Mega Flash Memory (5.3T)
- Super fast interconnect (40Gb/s)
- 100T of SAS disk (28T useable)
- Database could be MUCH larger with compression!

If you need it & can afford it - You want it!!
Introduction to RAC - Shared Data Model

Exadata puts it back into One Machine

Shared Disk Database
How BIG is it?

- 64 Cores (16 quad core CPUs) on compute server + 112 cores on storage servers (+28 quad core) = **176 cores** total-full rack
- 576G server & 400G of useable server **DRAM** (100G/sec)
- 5.3T of **flash cache** (50G/sec)
- 100T SAS disk (28T useable) – 15K RPM (21G/s; 50K IO/s)

**OR**

- 336T disk space (100T useable) – **SATA 7.2K RPM**

*SATA = Serial Advanced Technology Attachment
SAS = Serial Attached SCSI (Small Computer System Interface)*
How FAST can it be?

- **ALL Disks Combined:**
  - SAS – 21G/s (50,000 IOPS = 300 IOPS x 12 disk x 14)
  - SATA – 12 G/s (20,000 IOPS)

- **ALL Flash Cache Combined (3.6G/s per cell):**
  - 50G/s (1,000,000 IOPS); <20x more random I/O; 2x seq

- **Max Data Bandwidth with Disk + Cache + Compress:**
  - 500G/s (10x compression)

- **Data Load Rate:**
How FAST is it?

Compared to the competition:
- 5 – 100x for Data Warehousing
- 20x faster for OLTP

Also - Miscellaneous:
- Hot Swappable Redundant Power
- Each Database Server - Dual Port InfiniBand 40Gb/s card
- Database Servers have Disk Controller HBA (Host Bus Adapter) has 512M battery backed up cache
- Each DB Server has 4 x 1GbE interfaces & ILOM (Integrated Lights Out Management – Remote power on)
What’s Making it FAST?

- Fast Hardware!
- Many CPUs
- Flash Cache
- Lot’s of DRAM (Parallel Query in DRAM in 11.2)
- Compression (save 10x-70x)
- Partition Pruning (save 10x-100x)
- Storage Indexes (save 5x-10x)
- Smart Scan (save 4x-10x)
- Turn a 1T search into a 500M search or even 50M
How they got these NUMBERS?

- 8 compute servers (x4170’s)
  - 8 servers x 2 CPU sockets x 4 cores = 64 cores (E5540 2.53 GHz)
- 8 servers x 72G DRAM = 576G DRAM (400G useable)
- 14 Storage Servers total 336G DRAM = 912G Total DRAM
- 3 InfiniBand Switches x 36 ports = 108 ports
- 14 Storage Servers (100-336T) with Flash Cache (5T+)
  - 96G x 4 banks = 394G flash cache per storage server
  - 14 storage servers x 394G = 5.376T Flash Cache
  - 12 disks per storage server x 14 servers = 168 disks
  - 168 disks x 600G SAS = 101T SAS
  - 168 disks x 2T SATA = 336T SATA
  - Additional total storage of 4.672T on Database Servers (146G drives)
Compute Servers – Like 8 Node RAC!

- 8 compute servers (x4170’s)
  - 8 servers x 2 CPU sockets x 4 cores = 64 cores
- 8 compute servers x 72G (18x4G) DRAM = 576G DRAM
- 4 x 146G drives x 8 = 4.67T (in addition to storage servers)
14 Storage Servers (x4275’s) with Flash Cache
- 96G x 4 cards = 394G per storage server of flash cache
- 24Gx14 = 336G of DRAM (in addition to database servers)
- 14 storage servers x 394G = 5.376T Flash Cache
- 12 disks per storage server x 14 servers = 168 disks
- 168 disks x 600G SAS = 101T SAS
- 168 disks x 2T SATA = 336T SAS
InfiniBand - 40G/s Each way

- 3 InfiniBand Switches x 36 ports = 108 ports
- Leaf and spine switches wired at factory depending on needs and how many Racks you’ll have – careful!
Put it all together – Oracle’s picture of the Sun Oracle Database Machine

8 Compute Servers
- 8 x 2 sockets x 4 cores = 64 cores
- 576 GB DRAM

InfiniBand Network
- 40 Gb/sec each direction
- Fault Tolerant

14 Storage Servers
- 14x12=168 Disks
- 100T SAS or
- 336T SATA
- 5TB+ flash storage!
One more time…
How they got these NUMBERS?

- **8 compute servers (x4170’s)**
  - 8 servers x 2 CPU sockets x 4 cores = 64 cores
- **8 compute servers x 72G DRAM = 576G DRAM**
- **3 InfiniBand Switches x 36 ports = 108 ports**
- **14 Storage Servers with 112 CPU cores & Flash Cache**
  - 96G x 4 banks = **394G DRAM** per storage server
  - 14 storage servers x 394G = **5.376T Flash Cache**
  - 12 disks per storage server x 14 servers = 168 disks
  - 168 disks x 600G SAS = **101T SAS**
  - 168 disks x 2T SATA = **336T SATA**
How will the X2-8 change these ... How they got these NUMBERS?

- 2 compute servers (7560 CPU at 2.26 GHz & 5T SAS)
  - 2 servers (x4800’s) x 8 CPU sockets x 8 cores = 128 cores
- 2 compute servers x 1T DRAM = 2T DRAM
- 3 InfiniBand Switches x 36 ports = 108 ports
- 14 Storage Servers with 112 CPU cores & Flash Cache
  - 96G x 4 banks = 394G DRAM per storage server
  - 14 storage servers x 394G = 5.376T Flash Cache
  - 12 disks per storage server x 14 servers = 168 disks
Where did all my disk space go?

- **Lost Space:**
  - 100T SAS = 28T usable
  - 336T SATA = 100T usable

- **Apply some compression & get it back:**
  - 28T usable x 10 = 280T SAS
  - 100T usable x 10 = 1P SATA
**Full Rack or start with ½ or ¼**

<table>
<thead>
<tr>
<th>Service</th>
<th>Full</th>
<th>Half</th>
<th>Quarter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compute Servers/cores</td>
<td>8/64</td>
<td>4/32</td>
<td>2/16</td>
</tr>
<tr>
<td>Storage Servers/disks*</td>
<td>14/168</td>
<td>7/84</td>
<td>3/36</td>
</tr>
<tr>
<td>Storage SAS /IOPs</td>
<td>100T</td>
<td>50T</td>
<td></td>
</tr>
<tr>
<td>Storage SATA</td>
<td>336T</td>
<td>168T</td>
<td>72T</td>
</tr>
<tr>
<td>Flash IOPs (max)</td>
<td>1,000,000</td>
<td>500,000</td>
<td>225,000</td>
</tr>
<tr>
<td>InfiniBand Switches</td>
<td>3</td>
<td>2**</td>
<td>2</td>
</tr>
<tr>
<td>Data Load Rates</td>
<td>5T/hr</td>
<td>2.5T/hr</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1T/hr</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Benefits Multiply*

10 TB of user data
Requires 10 TB of IO

1 TB with compression

20 GB with Storage Indexes

5 GB with Smart Scans

100 GB with partition pruning

Sub second
On Database Machine

Data is 10x Smaller, Scans are 2000x faster

*Oracle Slide – Thanks!
Smart Scans
Smart Scans – 10x savings common

- HARDWARE Scans with **NO Code Change**:
  - Filters based on WHERE clause (predicates)
  - Filters on row / column / join condition
  - Incremental Backup Filtering

- Works with:
  - Uncommitted data
  - Locked rows
  - Chained rows
  - Compressed Data
  - Encrypted Data (11.2)

- You can SEE the benefit with Grid Control (OEM)
Bloom Filters used for Join Filtering

- A way to quickly search for matches (simplistic meaning)
- Saves space & is transparent to the user
- Makes things faster – hardware level filtering
- Tests if elements to search for are in a set
- Many types out there including Bloomier filters
- False positives are possible (rechecks to be perfect – addl. disk)
- Google BigTable uses Bloom filters to reduce disk lookups

Join Filtering is a perfect application for this!!
Oracle performance test...

- **Without Smart Scan** (Push whole table via network)
  - 5T Table Scan
  - 5T Table Scan
  - Network bandwidth (40Gb/s) slows things
    - 40Gb/s = 5GB/s; with 14 storage cells = 0.357GB/s each
    - 16 minutes, 40 seconds (5T/5GB/s)

- **With Smart Scan** (Limit first at hardware level)
  - 5T Table Scan
  - Limit result BEFORE it hits the network
    - Effectively scan 21GB/s (1.5G/storage cell * 14 cells)
    - 3 minutes, 58 seconds (5T/21G/s)
The SMART Flash Cache

ALL Flash Cache Combined (3.6G/s per cell): 50G/s (1,000,000 IOPS)
20x more random I/O; 2x more sequential I/O (vs. disk)
Flash Cache – 20x-50x faster than disk

- Caches HOT Data – Does as LAST step!
- PCIe based Flash cards (PCI = Peripheral Component Interconnect express)
- Knows which objects NOT to cache (FTS)
- Can specify WHAT you want to cache
  - STORAGE (CELL_FLASH_CACHE KEEP)
  - Table/Partition level with CREATE or ALTER
- Write through caches is used to accelerate reads – Data written to disk also written to cache for future reads.
Flash Cache

- Caches
  - Hot Data/Index Blocks
  - Control File reads/writes
  - File header reads/writes
- Does NOT cache
  - Mirror copies / Backups / Data Pump
  - Tablespace Formatting
  - Table Scans (rare)

$24G \times 4 \text{ doms} = 96G$ (dom = disk on module – “solid state”)

$96G \times 4 \text{ flash cards} = 394G$ per storage server of flash cache
Flash Cache LRU

- **CELL_FLASH_CACHE** storage clause
  - **DEFAULT** (normal – large I/O’s not cached)
  - **KEEP** (use flash cache more aggressive / May not occupy > 80%)
  - **NONE** (flash cache not used)

- **CACHE (NOCACHE)** Hint
  - I/O cached/not-cached in the flash cache
  - `SELECT /*+ CACHE */ ...`

- **EVICT** Hint – Data removed from the flash cache
- ASM rebalance data is evicted from cache when done
- Large I/O (Full Table Scans) on objects with **CELL_FLASH CACHE** set to DEFAULT are not
Using the KEEP cache

```
ALTER TABLE CUSTOMER
STORAGE (CELL_FLASH_CACHE KEEP);

Table Altered.
```

```
SELECT TABLE_NAME, TABLESPACE_NAME, CELL_FLASH_CACHE
FROM USER_TABLES
WHERE TABLE_NAME = 'CUSTOMER';
```

<table>
<thead>
<tr>
<th>TABLE_NAME</th>
<th>TABLESPACE_NAME</th>
<th>CELL_FLASH_CACHE</th>
</tr>
</thead>
<tbody>
<tr>
<td>CUSTOMER</td>
<td>R_TEST</td>
<td>KEEP</td>
</tr>
</tbody>
</table>
How it works...

- DB Request comes to **CELLSRV (Cell storage server)**
- **CELLSRV (first time) gets data from disk**
  - Data cached based on settings, hints ... etc.
  - Data to WRITE may also be cached after written if it is deemed that it may be needed again.
- **CELLSRV (next time) checks:**
  - In Memory Hash Table that lists what is cached
  - If cached – goes to flash cache
  - In not cached ... may cache based on settings...etc.

- **CELLCLI> list flashcache detail** (allows you to monitor)
- **CELLCLI> list flashcachecontent where ObjectNumber=62340 detail**
  
  (Select DATAOBJ# = from obj$ where name = ‘CUSTOMER’;)
### Is it working for me...

```sql
SELECT NAME, VALUE
FROM V$SYSSTAT
WHERE NAME IN ('physical read total IO requests', 'physical read requests optimized');
```

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>physical read total IO requests</td>
<td>36240</td>
</tr>
<tr>
<td>physical read requests optimized</td>
<td>23954</td>
</tr>
</tbody>
</table>

*(this second line (*8192) is flash cache used)*
It IS working ... 4G query

```sql
SELECT NAME, VALUE, VALUE*8192 VALUE2
FROM V$SYSSTAT
WHERE NAME IN ('physical read total IO requests', 'physical read requests optimized');
```

<table>
<thead>
<tr>
<th>NAME</th>
<th>VALUE</th>
<th>VALUE2</th>
</tr>
</thead>
<tbody>
<tr>
<td>physical read total IO requests</td>
<td>10,862,844</td>
<td>88,988,418,048</td>
</tr>
<tr>
<td>physical read requests optimized</td>
<td>2,805,003</td>
<td>22,978,584,576</td>
</tr>
<tr>
<td>run2....</td>
<td></td>
<td></td>
</tr>
<tr>
<td>physical read total IO requests</td>
<td>11,320,185</td>
<td>92,734,955,520</td>
</tr>
<tr>
<td>physical read requests optimized</td>
<td>3,203,224</td>
<td>26,240,811,008</td>
</tr>
<tr>
<td>run4 .....</td>
<td></td>
<td></td>
</tr>
<tr>
<td>physical read total IO requests</td>
<td>11,993,845</td>
<td>98,253,578,240</td>
</tr>
<tr>
<td>physical read requests optimized</td>
<td>3,793,000</td>
<td>31,072,256,000</td>
</tr>
</tbody>
</table>

It IS working ... V$SQL

```sql
SELECT sql_text, optimized_phy_read_requests, physical_read_requests, io_cell_offload_eligible_bytes
FROM v$sql
WHERE sql_text like '%FIND YOUR SQL%'
```

<table>
<thead>
<tr>
<th>SQL_TEXT</th>
<th>OPTIMIZED_PHY_READ_REQUESTS</th>
<th>PHYSICAL_READ_REQUESTS</th>
<th>IO_CELL_OFFLOAD_ELIGIBLE_BYTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>SELECT...</td>
<td>567790</td>
<td>688309</td>
<td></td>
</tr>
<tr>
<td>4.2501E+10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Run 2.....</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SELECT...</td>
<td>762747</td>
<td>906729</td>
<td></td>
</tr>
<tr>
<td>4.9069E+10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>run 4 ....</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SELECT...</td>
<td>1352166</td>
<td>1566537</td>
<td></td>
</tr>
<tr>
<td>6.8772E+10</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
FYI... NOT DB Flash Cache

- **Note:** Exadata PCIe card Smart Flash Cache (Exadata hardware PCIe Card Cache stored) is NOT the same as 11gR2 Database Flash Cache (file stored) that can be used with Oracle Enterprise Linux (OEL) and Solaris. In Database Flash Cache, a file can be used as data is aged out of SGA.

- To learn more about the 11gR2 Database Flash Cache, see the initialization parameters `db_flash_cache_size` & `db_flash_cache_size`.
** Thanks Oracle for this image

Storage Indexes (11.2)

<table>
<thead>
<tr>
<th>Table</th>
<th>Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

Min B = 1
Max B = 5

Min B = 3
Max B = 8
• Storage Indexes maintain summary information about the data—*(like Meta Data in a way)*
• A CELL LEVEL (storage) Memory Structure
• Groups things into Min/Max for various columns
• Eliminates I/Os where there is no match
• Transparent to the user
• Done at the hardware level
• Typically one index for every 1M of disk
• NOT like a B-Tree Index...more like partition elimination to skip data NOT meeting conditions
• 100% done by Oracle – *NO COMMANDS NEEDED!!*
Is it working for me...

```sql
SELECT NAME, VALUE 
FROM V$SYSSTAT 
WHERE NAME LIKE ('%storage%');
```

<table>
<thead>
<tr>
<th>NAME</th>
<th>VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>cell physical IO bytes saved by storage index</td>
<td>25604736</td>
</tr>
<tr>
<td>(actual savings from Exadata built storage index)</td>
<td></td>
</tr>
</tbody>
</table>
Check BOTH servers...

```sql
SELECT  NAME, VALUE
FROM     GV$SYSSTAT
WHERE    NAME LIKE ('%storage%');
```

<table>
<thead>
<tr>
<th>NAME</th>
<th>VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>cell physical IO bytes saved by storage index</td>
<td>19693854720</td>
</tr>
<tr>
<td>cell physical IO bytes saved by storage index</td>
<td>0</td>
</tr>
</tbody>
</table>

*(actual savings from Exadata built storage index)*
Hybrid Columnar Compression
(11.2)
Exadata Hybrid Columnar Compression (EHCC) – 4-10x & 30x is common

- What is it (a HYBRID of column & row storage)?
  - Data organized by column and compressed vs. row
  - Tables organized in Compression Units (CU)-1000 rows?
  - CU’s span many blocks (32K)
  - Good for data bulk loaded (not for OLTP – single block)

- What’s it for?
  - Query Data / DWHS (NOT frequently Updated)

- How much does it compress (old OLTP was 2-3x)?
  - 10x in a typical data warehouse compression; \(\text{we got } 4-11\)
  - 15x to 70x in archive compression (cold data); \(\text{we got 32}\)
Hybrid Columnar Compression

1. Column Data Compressed

2. Stored in Compression Units
   (Better compression when column data stored together)

** Thanks Oracle for these images **
Hybrid Columnar Compression

• Faster Operations: Query runs without decompression
  – Compressed/Processed in **FLASH CACHE**; lower I/O!
  – Compressed when sent over InfiniBand!
  – Cloned compressed!
  – Backed Up compressed!
  – Scans MUCH less (compressed) data

• Worth Noting:
  – **Use standard table compression for OLTP**
  – Single block lookup EASTER than other columnar...
Hybrid Columnar Compression

- Fully supported:
  - B-Tree Indexes
  - Bitmap Indexes
  - Text Index
  - Materialized Views
  - Partitioning
  - Parallel Query
  - Data Guard Physical Standby
  - *Logical Standby and Streams (FUTURE release)*
  - *Smart Scans of HCC tables!*
Other Oracle Compression

- Data Pump Compression
  - Compression = \{ALL | DATA_ONLY | NONE\}
- RMAN Backup Compression
  - Compression Level LOW/HIGH (New in 11.2)
- Secure File Compression
  - LOW/MEDIUM/HIGH (2-3x compression)
  - Deduplication & Encryption
- Normal OLTP Table Compression (since 9.2)
  - 11g now supports INSERT/UPDATE
  - FASTER Algorithm
- Data Guard Redo Transport Compression
Enterprise Manager & Grid Control for Exadata
11gR2 Exadata
Monitor Targets
(Next slides – Some are coming soon)
Cluster Charts – Shows Performance (showing 2 DB Servers on same graph)
Cluster Admin – Shows Issues

System: dscbas_cluster

Job Activity

Job executions scheduled to start no more than 7 days ago, directly on the target, or on any of its members.

<table>
<thead>
<tr>
<th>Status</th>
<th>Submitted to the System</th>
<th>Submitted to any member</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problems</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Action Required</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Suspended</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Scheduled</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Running</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Compare Target and Template Settings

The current user does not have enough privileges to perform this operation.

Host Operations

Execute Host Command

Listener Operations

Start
View Configuration

Stop

Database Operations

Execute SQL
Alert Log Contents

Configuration Searches

Database Feature Usage

Deployments Summary

View Database Installations

<table>
<thead>
<tr>
<th>Database Installations</th>
<th>Targets</th>
<th>Installations</th>
<th>Patches Applied</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oracle Database 11g 11.1.0.7.0</td>
<td>2</td>
<td>4</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Related Links

Access Reports

Configuration Changes Target Properties

Edit System
Cluster Topology
# Targets – CLUSTER Components

## System: dscbas_cluster

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Status</th>
<th>Alerts</th>
<th>Policy Violations</th>
<th>CPU Utilization (%)</th>
<th>CPU Load (5min)</th>
<th>Memory Utilization (%)</th>
<th>Avg Celldisk S</th>
<th>Avg Celldisk S</th>
<th>Respons</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ASM1 dscbas01.us.oracle.com</td>
<td>Automatic Storage Management</td>
<td><img src="up" alt="Up" /></td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>+ASM2 dscbas02.us.oracle.com</td>
<td>Automatic Storage Management</td>
<td><img src="up" alt="Up" /></td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>dscbas01.us.oracle.com</td>
<td>Host</td>
<td><img src="up" alt="Up" /></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>dscbas01.us.oracle.com:3872</td>
<td>Agent</td>
<td><img src="up" alt="Up" /></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>dscbas01s</td>
<td>Oracle Beadata Storage Server</td>
<td><img src="up" alt="Up" /></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>dscbas02.us.oracle.com</td>
<td>Host</td>
<td><img src="up" alt="Up" /></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>dscbas02.us.oracle.com:3872</td>
<td>Agent</td>
<td><img src="up" alt="Up" /></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>dscbas02s</td>
<td>Oracle Beadata Storage Server</td>
<td><img src="up" alt="Up" /></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>dscbas03s</td>
<td>Oracle Beadata Storage Server</td>
<td><img src="up" alt="Up" /></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>dscbas_cisco_switch</td>
<td>Cisco Switch</td>
<td><img src="up" alt="Up" /></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>dscbas_cluster1</td>
<td>Cluster</td>
<td><img src="up" alt="Up" /></td>
<td>1</td>
<td>1</td>
<td>21</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>infSwitch</td>
<td>Beadata V2 Infiniband Switch</td>
<td><img src="up" alt="Up" /></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>LISTENER</td>
<td>Listeners</td>
<td><img src="up" alt="Up" /></td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
## Hosts

### Related Links
- [Customize Table Columns](#)
- [Execute Host Command](#)

### Select Name
- dbchase01.us.oracle.com
- dbchase02.us.oracle.com
- dbchase03.us.oracle.com

<table>
<thead>
<tr>
<th>Select Name</th>
<th>Status</th>
<th>Alerts</th>
<th>Policy Violations</th>
<th>Compliance Score (%)</th>
<th>CPU Util %</th>
<th>Mem Util %</th>
<th>Total IO/sec</th>
</tr>
</thead>
<tbody>
<tr>
<td>dbchase01.us.oracle.com</td>
<td><img src="image" alt="Status" /></td>
<td>0 2</td>
<td>0 0</td>
<td>0 0</td>
<td>0 0</td>
<td>2 0</td>
<td>0 0</td>
</tr>
<tr>
<td>dbchase02.us.oracle.com</td>
<td><img src="image" alt="Status" /></td>
<td>0 0</td>
<td>0 0</td>
<td>0 0</td>
<td>0 0</td>
<td>0 0</td>
<td>0 0</td>
</tr>
<tr>
<td>dbchase03.us.oracle.com</td>
<td><img src="image" alt="Status" /></td>
<td>1 2</td>
<td>0 0</td>
<td>0 0</td>
<td>0 0</td>
<td>2 0</td>
<td>2 0</td>
</tr>
</tbody>
</table>

**TIP** For an explanation of the icons and symbols used in this page, see the [Icon Key](#).

Copyright © 1996, 2010, Oracle and/or its affiliates. All rights reserved.
Oracle is a registered trademark of Oracle Corporation and/or its affiliates.
Other names may be trademarks of their respective owners.

[About Oracle Enterprise Manager](#)
ASM

Automatic Storage Management: ASM1_dscbas01.us.oracle.com

General
- Current Status: Up
- Up Since: Aug 25, 2010 7:12:21 AM PDT
- Availability (%): 100%
- Last 24 hours
- Instance Name: ASM1
- Version: 11.1.0.7.0
- Host: dscbas01.us.oracle.com
- Oracle Home: /u01/app/oracle/product/11.1.0/asm_1

Diagnostic Summary
- Alert Log: No ORA- errors
- Active Incidents: 0

Disk Group Usage (GiB)
- RECO
- DATA

Serviced Databases

<table>
<thead>
<tr>
<th>Name</th>
<th>Disk Groups</th>
<th>Failure Groups</th>
<th>Allocated Space (GB)</th>
<th>Availability</th>
<th>Alerts</th>
</tr>
</thead>
<tbody>
<tr>
<td>ord_erp1</td>
<td>DATA, RECO</td>
<td>0 (0 down)</td>
<td>632.06</td>
<td></td>
<td>1 0</td>
</tr>
<tr>
<td>STREAMS11G</td>
<td>RECO</td>
<td>0 (0 down)</td>
<td>0.15</td>
<td></td>
<td>Not Monitored</td>
</tr>
<tr>
<td>ORCLSTBY</td>
<td>DATA, RECO</td>
<td>0 (0 down)</td>
<td>507.55</td>
<td></td>
<td>Not Monitored</td>
</tr>
<tr>
<td>STREAMS11G</td>
<td>RECO</td>
<td>0 (0 down)</td>
<td>328.84</td>
<td></td>
<td>Not Monitored</td>
</tr>
</tbody>
</table>

Alerts

<table>
<thead>
<tr>
<th>Severity</th>
<th>Category</th>
<th>Name</th>
<th>Message</th>
<th>Alert Triggered</th>
</tr>
</thead>
<tbody>
<tr>
<td>!</td>
<td>Failure Group Imbalance</td>
<td>Disk Group RECO has failure groups with disk size of different size which may lead to suboptimal space usage.</td>
<td>May 25, 2010 12:16:18 PM</td>
<td></td>
</tr>
</tbody>
</table>

Host Alerts

<table>
<thead>
<tr>
<th>Severity</th>
<th>Category</th>
<th>Name</th>
<th>Message</th>
<th>Alert Triggered</th>
</tr>
</thead>
<tbody>
<tr>
<td>(No alerts)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Database Instance Monitoring

Database Instance: orcl

Storage
- Control Files
- Tablespaces
- Temporary Tablespace Groups
- Datafiles
- Rollback Segments
- Redo Log Groups
- Archive Log
- Disk Groups
- Migrate to ASM
- Create Tablespace Locally Managed

Statistics Management
- Automatic Workload Repository
- AWB Baselines

Database Configuration
- Memory Advisor
- Automatic Undo Management
- Initialization Parameters
- View Database Feature Usage

Resource Manager
- Getting Started
- Consumer Groups
- Consumer Group Mappings
- Plans
- Settings
- Statistics

Oracle Scheduler
- Jobs
- Chains
- Schedules
- Programs
- Jobs Classes
- Windows
- Job Window Groups
- Global Attributes
- Automated Maintenance Tasks

Query Optimizer
- Manage Optimizer Statistics
- SQL Plan Control
- SQL Tuning Sets

Related Links
- Access
- Alert Log Contents
- Archive/Purge Alert Log
- Deployments
- Jobs
- Monitoring Configuration
- Scheduler Central

Change Database
- Add Instance
- Delete Instance

Advisor Central
- All Metrics
- Baseline Metric Thresholds
- EM SQL History
- Metric and Policy Settings
- Monitor in Memory Access Mode
- SQL Worksheet

Alert History
- Apply Patch
- Blackouts
- Execute SQL
- Metric Collection Errors
- Reports
- Target Properties
Cisco Switch & InfiniBand Switch

### Metric and Policy Settings

#### Metric Thresholds

<table>
<thead>
<tr>
<th>Metric</th>
<th>Comparison Operator</th>
<th>Warning Threshold</th>
<th>Critical Threshold</th>
<th>Corrective Actions</th>
<th>Collection Schedule</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aggregate Sensor Condition</td>
<td>=</td>
<td>2</td>
<td>None</td>
<td>Every 1 Minute</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Management interface response time</td>
<td>&gt;</td>
<td>75</td>
<td>100</td>
<td>None</td>
<td>Every 1 Minute</td>
<td></td>
</tr>
<tr>
<td>Status</td>
<td></td>
<td>Down</td>
<td>None</td>
<td>Every 1 Minute</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TIP:** Empty Thresholds will disable alerts for that metric.

Related Links

- Metric Thresholds
- Policies

---

---
Configuration History

Enterprise Manager automatically generates configuration information for targets such as hosts and databases. Changes to these configurations are recorded and may be viewed from this page.

**Category:** Oracle Exadata Storage Server

**Change Discovered after:**
- Date: 12/15/2023
- Time: 01:00 AM

**Change Discovered before:**
- Date: 12/15/2023
- Time: 01:00 AM

**View History Records**
- **Grouped**

<table>
<thead>
<tr>
<th>Change Discovered</th>
<th>Target Name</th>
<th>On Host</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jun 4, 2010 9:00:27 AM PDT</td>
<td>dcbas02s</td>
<td>dcbas02slus.oracle.com</td>
<td>Oracle Exadata Storage Server: Oracle Cell Configuration</td>
</tr>
<tr>
<td>May 26, 2010 12:01:58 PM PDT</td>
<td>dcbas02s</td>
<td>dcbas02slus.oracle.com</td>
<td>Oracle Exadata Storage Server: Cell Griddisk Configuration</td>
</tr>
<tr>
<td>May 26, 2010 12:01:58 PM PDT</td>
<td>dcbas02s</td>
<td>dcbas02slus.oracle.com</td>
<td>Oracle Exadata Storage Server: Cell Griddisk Configuration</td>
</tr>
<tr>
<td>May 21, 2010 1:00:26 PM PDT</td>
<td>dcbas02s</td>
<td>dcbas02slus.oracle.com</td>
<td>Oracle Exadata Storage Server: Cell Griddisk Configuration</td>
</tr>
<tr>
<td>May 21, 2010 1:00:26 PM PDT</td>
<td>dcbas02s</td>
<td>dcbas02slus.oracle.com</td>
<td>Oracle Exadata Storage Server: Cell Griddisk Configuration</td>
</tr>
<tr>
<td>May 21, 2010 1:00:26 PM PDT</td>
<td>dcbas02s</td>
<td>dcbas02slus.oracle.com</td>
<td>Oracle Exadata Storage Server: Cell Griddisk Configuration</td>
</tr>
<tr>
<td>May 21, 2010 1:00:26 PM PDT</td>
<td>dcbas02s</td>
<td>dcbas02slus.oracle.com</td>
<td>Oracle Exadata Storage Server: Cell Griddisk Configuration</td>
</tr>
<tr>
<td>May 21, 2010 1:00:26 PM PDT</td>
<td>dcbas02s</td>
<td>dcbas02slus.oracle.com</td>
<td>Oracle Exadata Storage Server: Cell Griddisk Configuration</td>
</tr>
<tr>
<td>May 21, 2010 1:00:26 PM PDT</td>
<td>dcbas02s</td>
<td>dcbas02slus.oracle.com</td>
<td>Oracle Exadata Storage Server: Cell Griddisk Configuration</td>
</tr>
<tr>
<td>May 21, 2010 1:00:26 PM PDT</td>
<td>dcbas02s</td>
<td>dcbas02slus.oracle.com</td>
<td>Oracle Exadata Storage Server: Cell Griddisk Configuration</td>
</tr>
<tr>
<td>May 21, 2010 1:00:26 PM PDT</td>
<td>dcbas02s</td>
<td>dcbas02slus.oracle.com</td>
<td>Oracle Exadata Storage Server: Cell Griddisk Configuration</td>
</tr>
<tr>
<td>May 21, 2010 1:00:26 PM PDT</td>
<td>dcbas02s</td>
<td>dcbas02slus.oracle.com</td>
<td>Oracle Exadata Storage Server: Cell Griddisk Configuration</td>
</tr>
<tr>
<td>May 21, 2010 1:00:26 PM PDT</td>
<td>dcbas02s</td>
<td>dcbas02slus.oracle.com</td>
<td>Oracle Exadata Storage Server: Cell Griddisk Configuration</td>
</tr>
<tr>
<td>May 21, 2010 1:00:26 PM PDT</td>
<td>dcbas02s</td>
<td>dcbas02slus.oracle.com</td>
<td>Oracle Exadata Storage Server: Cell Griddisk Configuration</td>
</tr>
<tr>
<td>May 21, 2010 1:00:26 PM PDT</td>
<td>dcbas02s</td>
<td>dcbas02slus.oracle.com</td>
<td>Oracle Exadata Storage Server: Cell Griddisk Configuration</td>
</tr>
<tr>
<td>May 21, 2010 1:00:26 PM PDT</td>
<td>dcbas02s</td>
<td>dcbas02slus.oracle.com</td>
<td>Oracle Exadata Storage Server: Cell Griddisk Configuration</td>
</tr>
<tr>
<td>May 21, 2010 1:00:26 PM PDT</td>
<td>dcbas02s</td>
<td>dcbas02slus.oracle.com</td>
<td>Oracle Exadata Storage Server: Cell Griddisk Configuration</td>
</tr>
<tr>
<td>May 21, 2010 1:00:26 PM PDT</td>
<td>dcbas02s</td>
<td>dcbas02slus.oracle.com</td>
<td>Oracle Exadata Storage Server: Cell Griddisk Configuration</td>
</tr>
<tr>
<td>May 21, 2010 1:00:26 PM PDT</td>
<td>dcbas02s</td>
<td>dcbas02slus.oracle.com</td>
<td>Oracle Exadata Storage Server: Cell Griddisk Configuration</td>
</tr>
<tr>
<td>May 21, 2010 1:00:26 PM PDT</td>
<td>dcbas02s</td>
<td>dcbas02slus.oracle.com</td>
<td>Oracle Exadata Storage Server: Cell Griddisk Configuration</td>
</tr>
<tr>
<td>May 21, 2010 1:00:26 PM PDT</td>
<td>dcbas02s</td>
<td>dcbas02slus.oracle.com</td>
<td>Oracle Exadata Storage Server: Cell Griddisk Configuration</td>
</tr>
</tbody>
</table>

**History Records**
- 1
- 12
- 24
- 24
- 24
- 24
- 24
- 24
- 24
- 24
- 24
- 24
- 24
- 24
- 24
- 24
- 24
- 24
- 24
- 24
Enterprise Manager
Exadata Simulation

“11g R1/R2 Best Features” (more on this)
Upgrade Options

SQL Performance Analyzer 11gR2 - Options
SQL Performance Analyzer
11gR2 – Exadata Simulation

Test a Tuning Set that I’ve used in the past
SQL Performance Analyzer
11gR2 – Exadata Simulation

Job is running
SQL Performance Analyzer
11gR2 - Exadata Simulation

New!
View
PL/SQL
SQL Performance Analyzer
11gR2 – Exadata Simulation

Click on Job after complete

View Report
Simple Job so no benefit
Resource Management (IORM) (FYI Only)
Set I/O resources for different instance
- Instance A = 50%
- Instance B = 30%
- Instance C = 20%

Further set I/O based on users and tasks
- Instance A Interactive = 50%
- Instance A Reporting = 25%
- Instance A Batch = 15%
- Instance A ETL = 15%

Best Solution for MIXED workloads & many instances
DBRM – Database Resource Manager

- Enhanced for Exadata
- Allows management of inter and intra DB I/O
- Inter-DB – Managed via IORM & Exadata storage software
- Intra-DB - Managed via Consumer Group
- CPU
- Undo
- DOP (Degree of Parallelism)
- Active Sessions
Security – FYI Only
Oracle Database Security

Built over MANY years...

- Oracle Audit Vault
- Oracle Database Vault
- DB Security Evaluation #19
- Transparent Data Encryption
- EM Configuration Scanning
- Fine Grained Auditing (9i)
- Secure application roles
- Client Identifier / Identity propagation
- Proxy authentication
- Enterprise User Security
- Global roles
- Virtual Private Database (8i)
- Database Encryption API
- Strong authentication (PKI, Kerberos, RADIUS)
- Native Network Encryption (Oracle7)

1977 Government customer

2007+

*Oracle Slide – Thanks!
Security

- Audit Vault
- Total Recall / Flashback
- Database Vault
- Label Security
- Advanced Security
- Secure encrypted backup (also available: incremental backup with Change Tracking File – much faster)
- Data Masking
- Data Guard
- Failure Groups – (automatic-for storage cell failure)
Utilities - FYI Only...
(Screen Shots - Oracle Learning Library)
Utilities You’ll need to Use - FYI

- **CELLCLI** – Cell Command Line Interface (CLI)
- **DCLI** – Run the same command on multiple cells at the same time

From Oracle:

*Oracle Exadata Storage Server includes the DCLI utility on each cell. You can use the DCLI utility to execute commands or scripts in parallel across a defined set of cells. The DCLI tool simplifies any operations that must be run across a subset or all cells. Configuration of SSH user equivalency across all cells is an important prerequisite for optimizing the use of DCLI commands. DCLI provides the -k option to automate the distribution of SSH private keys into the AUTHORIZED_KEYS file.*

- **ADRCI** – Automatic Diagnostic Repository Command line Interface; Quickly get diagnostics reports to send to Oracle
Sun Fire X4270/X4275 Server       CPU Power (TDP Limit) = 80 Watts
Product Serial Number: 0937XFG036
CPU : Intel(R) Xeon(R) CPU E5540 @ 2.53GHz
Speed : 2.53 GHz        Count : 16

Press F2 to run Setup (CTRL+E on Remote Keyboard)
Press F12 if you want to boot from the network (CTRL+N on Remote Keyboard)
Press F8 for BBS POPUP (CTRL+P on Remote Keyboard)
QPI Operational Speed at : 5.8GT/s
BMC Firmware Revision: 3.0.3.35 r45111
Initializing USB Controllers .. Done.
2456MB OK
USB Device(s): 2 Keyboards, 2 Mice, 1 Hub, 1 Storage Device
Auto-detecting USB Mass Storage Devices ..
Device #01 : Unigen PSA4000 *HiSpeed*
01 USB mass storage devices found and configured.

BMC Responding
Checking NVRAM ..
Checks continue...

Starting console mouse services: [OK]
Starting crond: [OK]
Starting xfs: [OK]
Starting anacron: [OK]
Starting atd: [OK]
Starting exachkcfg: [FAILED]
Starting HAL daemon: [OK]
Starting celld:
Starting the RS, CELLSRV, and MS services...
Getting the state of RS services...
running
Starting CELLSRV services...
The STARTUP of CELLSRV services was not successful. Error: Start Failed
Starting MS services...
The STARTUP of MS services was successful. [OK]

Logging started to /var/log/cellos/validations.log
Run validation biosbootorder - PASSED
Run validation misceachboot - PASSED
Run validation createcell - RDS/IB: connected to 192.168.0.111 version 3.
RDS/IB: connected to 192.168.0.111 version 3.1
CELLCLI – Commands

- CellCLI> list cell detail
- CellCLI> list lun
- CellCLI> list physicaldisk
- CellCLI> list flashcache detail
- CellCLI> list celldisk
- CellCLI> calibrate force
- CellCLI> create celldisk all
- CellCLI> create griddisk all harddisk prefix=‘data’ ,size=100g
- CellCLI> create griddisk all harddisk prefix=‘data’ ,size=100g
- CellCLI> list griddisk
- CellCLI> list griddisk attributes name,size
Run CELLCLI - Cell Detail

```
[root@sgsas1 ~]# cellcli
CellCLI: Release 11.2.1.2.0 - Production on Fri Nov 06 09:31:15 PST 2009

Copyright (c) 2007, 2009, Oracle. All rights reserved.
Cell Efficiency Ratio: 1

CellCLI> list cell detail
name: sgsas1
bmcType: IPMI
cpuCount: 16
fanCount: 12/12
fanStatus: normal
id: f59022f8-969d-4c20-bed0-ed54ba0d2079
interconnectCount: 3
interconnect1: bond0
iormBoost: 0.0
ipaddress1: 192.168.214.193/22
makeModel: SUN MICROSYSTEMS SUN FIRE X4275 SERVER SAS
metricHistoryDays: 7
offloadEfficiency: 1.0
powerCount: 2/2
powerStatus: normal
status: online
temperatureReading: 29.0
temperatureStatus: normal
upTime: 7 days, 9:32
cellsrvStatus: running
msStatus: running
rsStatus: running
```
One Storage Server – 12 Disks + Flash

12 Physical Disks

16 Flash Modules
4 – flash cards
4 – flash modules ea. card
CALIBRATE – check performance

```plaintext
CellCLI> calibrate force
Calibration will take a few minutes...
Aggregate random read throughput across all hard disk luns: 1597 MBPS
Aggregate random read throughput across all flash disk luns: 4212.28 MBPS
Aggregate random read IOPS per second (IOPS) across all hard disk luns: 4930
Aggregate random read IOPS per second (IOPS) across all flash disk luns: 149690
Controller read throughput: 1683.11 MBPS
Calibrating hard disks (read only) ...
Lun 0.0 on drive [20:0] random read throughput: 152.93 MBPS, and 421 IOPS
Lun 0.1 on drive [20:1] random read throughput: 156.59 MBPS, and 410 IOPS
Lun 0.10 on drive [20:10] random read throughput: 157.07 MBPS, and 426 IOPS
Lun 0.11 on drive [20:11] random read throughput: 150.99 MBPS, and 408 IOPS
Lun 0.2 on drive [20:2] random read throughput: 151.67 MBPS, and 425 IOPS
Lun 0.3 on drive [20:3] random read throughput: 155.05 MBPS, and 424 IOPS
Lun 0.4 on drive [20:4] random read throughput: 154.51 MBPS, and 425 IOPS
Lun 0.5 on drive [20:5] random read throughput: 152.84 MBPS, and 420 IOPS
Lun 0.6 on drive [20:6] random read throughput: 149.28 MBPS, and 414 IOPS
Lun 0.7 on drive [20:7] random read throughput: 155.20 MBPS, and 427 IOPS
Lun 0.8 on drive [20:8] random read throughput: 154.13 MBPS, and 425 IOPS
Lun 0.9 on drive [20:9] random read throughput: 159.88 MBPS, and 423 IOPS
Calibrating flash disks (read only, note that writes will be significantly slower) ...
Lun 1.0 on drive [10:0:0:0] random read throughput: 269.03 MBPS, and 19650 IOPS
Lun 1.1 on drive [10:0:1:0] random read throughput: 268.72 MBPS, and 19635 IOPS
Lun 1.2 on drive [10:0:2:0] random read throughput: 268.54 MBPS, and 19635 IOPS
Lun 1.3 on drive [10:0:3:0] random read throughput: 268.96 MBPS, and 19635 IOPS
Lun 2.0 on drive [12:0:0:0] random read throughput: 269.86 MBPS, and 20441 IOPS
Lun 2.1 on drive [12:0:1:0] random read throughput: 270.08 MBPS, and 20397 IOPS
Lun 2.2 on drive [12:0:2:0] random read throughput: 269.19 MBPS, and 20437 IOPS
Lun 2.3 on drive [12:0:3:0] random read throughput: 269.49 MBPS, and 20418 IOPS
Lun 4.0 on drive [9:0:0:0] random read throughput: 268.54 MBPS, and 19674 IOPS
Lun 4.1 on drive [9:0:1:0] random read throughput: 268.31 MBPS, and 19703 IOPS
Lun 4.2 on drive [9:0:2:0] random read throughput: 268.10 MBPS, and 19698 IOPS
Lun 4.3 on drive [9:0:3:0] random read throughput: 268.74 MBPS, and 19683 IOPS
Lun 5.0 on drive [11:0:0:0] random read throughput: 268.82 MBPS, and 19690 IOPS
Lun 5.1 on drive [11:0:1:0] random read throughput: 268.27 MBPS, and 19697 IOPS
Lun 5.2 on drive [11:0:2:0] random read throughput: 268.57 MBPS, and 19704 IOPS
Lun 5.3 on drive [11:0:3:0] random read throughput: 268.36 MBPS, and 19689 IOPS
CALIBRATE results are within an acceptable range.

CALIBRATE stress test is now running...
Calibration has finished.
```
Create Celldisks

We have Celldisks & Flash Disks now
Create Griddisks

Create griddisk (first 100G – fast part) DATA

Create griddisk (the rest of the disk) RECO
Check griddisk size

First Part
(first 100G)

Second 458G
(the rest of the disk)
Quick Disk Basics Overview

- Start with a **Physical Disk or LUN** (Logical Unit Number)
- Create a **Cell Disk** on a single LUN
- Create two **Grid Disk slices** on the Cell Disk – One Hot (first – outer ring) & One Cold
- Create **2 ASM Disk Groups** (Hot/Cold – Data/Reco) across many Grid Disks to distribute the I/O across Grid Disks
- Add **mirroring, DG, Flashback; Failure Groups** (auto) ensure mirrored ASM extents are placed on different exadata cells.
- First 2 cells need 29G SYSTEM Area x 12 disks (coldest**90**
  
**90**

---

**Physical Disk or LUN**

**Logical Unit Number**

**Cell Disk**

**Grid Disk slices**

**ASM Disk Groups**

**Mirroring, DG, Flashback; Failure Groups**

**SYSTEM Area**

**Coldest**
Best Practices
MUST haves & DON’T do!

- Must have **Bundle Patch 5** (See note: 888828.1 for latest)
- Must have **ASM**
- Must have the correct data center **COOLING**!
  - 3 tiles with holes for full rack (400 CFM/tile) – don’t melt it!
- Must have the **correct power needs**
- Must use **Oracle Linux 5.3 (x86_64)** & **Oracle DB 11.2**
- Must use **RMAN** for backups
- Consider **StorageTek SL500 Tape backup**
- Use an **ASM allocation unit (AU) size of 4M**

- Don’t add any foreign hardware or – No Support!
- Don’t change BIOS/Firmware — No Support!
Best Practices

- Create **ALL** celldisk and griddisks
- Use DCLI to run on ALL Storage Servers at once
- Use IORM
- Decide Fast Recovery Area (FRA) & MAA Needs
- Database 11.2.0.1+ (11.2.1.3.1) and ASM 11.2.0.1+
- COMPATIBLE 11.2.0.1+
- Logfile size at 32G (Whoa!)
- LMT (Locally Managed Tablespaces) with at 4M uniform extents
- Move Data with Data Pump (or use INSERT /*+ APPEND */
It’s the Real Deal!!

• Fast Hardware!
• Many CPUs!
• Fast Flash Cache!
• Lot’s of DRAM on Database Servers and Storage
• Compression (save 10x-70x)
• Partition Pruning (save 10-100x)
• Storage Indexes (save 5-10x)
• Smart Scan (save 4-10x)
• Turn a 1T search into a 500M search or even 50M
Exadata = Paradigm Shift!
What’s Next – Exalogic Elastic Cloud!

- WebLogic Server
- Coherence
- JRockit and HotSpot
- Exalogic Elastic Cloud Software
- Oracle Linux or Solaris
- Exalogic Elastic Cloud Hardware

Some points here – Leveraging those acquisitions!
- Coherence is a great product / NEW Linux – **Unbreakable Enterprise Kernel!**
- 360 CPUs, 2.8T DRAM, 980G FlashFire SSD, 40T SAS – Will help Fusion Apps Smoke!
- **1M HTTP/sec** – could fit Facebook on 2 of these even thought there are 500M people on Facebook.
What’s Next – Exadata X2-8

- 2 compute servers (7560 CPU at 2.26 GHz & 5T SAS)
  - 2 servers x 8 CPU sockets x 8 cores = 128 cores
- 2 compute servers x 1T DRAM = 2T DRAM
- Same storage numbers...

(FUTURE?? 8 servers = 512 CPUs & 8T of DRAM)
Summary – We Covered...

- Terminology & the Basics about Exadata
- Flash Cache
- Storage Index
- Smart Scans
- Hybrid Columnar Compression (HCC)
- Enterprise Manager & Grid Control
- Enterprise Manager Exadata Simulation
- I/O Resource Manager
- Security
- Utilities
- Best Practices
“We make a Living by what we get; We make a Life by what we give.”
For More Information

- www.tusc.com
- Oracle9i Performance Tuning Tips & Techniques; Richard J. Niemiec; Oracle Press (May 2003)
- Oracle 10g Tuning (June 11, 2007)

“If you are going through hell, keep going” - Churchill
更多信息

- www.tusc.com
- Oracle9i Performance Tuning Tips & Techniques; Richard J. Niemiec; Oracle Press (May 2003)
- Oracle 10g Tuning (June 11, 2007)

“成功只访问那些没空追求它的人。”

- Henry David Thoreau
References

- Exadata V2 – Sun Oracle Database Machine, Oracle
- Oracle Exadata Implementation Workshop, Oracle Corporation, McLean, Virginia - Multiple Exadata sessions
- Oracle Learning Library – multiple sessions/topics
- Oracle 11g R1/R2 Best Features, Rich Niemiec
- Oracle Enterprise Manager Deployment and High Availability Best Practices, Jim Viscusi (Oracle Corporation), Jim Bulloch (Oracle Corporation), Steve Colebrook-Taylor (Barclays Global Investors)
- Advanced Compression with Oracle Database 11g Release 2, Oracle Corporation, Steven Lu
- Tech Crunch
Rolta TUSC - Your Partner .... Accomplished in Oracle!

2010 Oracle Partner of the Year (7 Titans Total)


*Won 2 Awards
Rolta TUSC Services

• **Oracle**
  - E-Business Suite implementation, R12 upgrades, migration & support
  - Fusion Middleware and Open Systems development
  - Business Intelligence (OBIEE) development
  - Hyperion Financial Performance Management
  - DBA and Database tactical services
  - Strategic Global Sourcing

• **IT Infrastructure**
  - IT Roadmap - Security & Compliance - Infrastructure Management
  - Enterprise Integration / SOA - High Availability and Disaster Planning

• **Profitability & Cost Management**
  - Financial Consolidation - Budgeting & Forecasting
  - Profitability & Risk Analysis - Enterprise Performance Management
  - Operational, Financial & Management Reporting

• **Rolta Software Solutions**
  - *iPerspective™* - rapid data & systems integration
  - *Geospatial Fusion™* - spatial integration & visualization
  - *OneView™* - business & operational intelligence
Rich’s Overview
(rich@tusc.com)

• Advisor to Rolta International Board
• Former President of TUSC
  – Inc. 500 Company (Fastest Growing 500 Private Companies)
  – 10 Offices in the United States (U.S.); Based in Chicago
  – Oracle Advantage Partner in Tech & Applications
• Former President Rolta TUSC & President Rolta EICT International
• Author (3 Oracle Best Sellers – #1 Oracle Tuning Book for a Decade):
  – Oracle Performing Tips & Techniques (Covers Oracle7 & 8i)
  – Oracle9i Performance Tips & Techniques
  – Oracle Database 10g Performance Tips & Techniques
• Former President of the International Oracle Users Group
• Current President of the Midwest Oracle Users Group
• Chicago Entrepreneur Hall of Fame - 1998
• E&Y Entrepreneur of the Year & National Hall of Fame - 2001
• MOUG Top Speaker Twelve Times
• National Trio Achiever award - 2006
• Oracle Certified Master & Oracle Ace Director
• Purdue Outstanding Electrical & Computer and Engineer - 2007
Copyright Information

• Neither Rolta TUSC nor the author guarantee this document to be error-free. Please provide comments/questions to rich@tusc.com. I am always looking to improve!

• Rich Niemiec/ Rolta TUSC © 2011. This document cannot be reproduced without expressed written consent from Rich Niemiec or an officer of Rolta TUSC, but may be reproduced or copied for presentation/conference use.

Contact Information
Rich Niemiec: rich@tusc.com
www.tusc.com