Statspack & AWR Tuning Oracle9i & 10^g New York Oracle Users Group – 2007



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Audience Knowledge

- Oracle8*i* Experience ?
- Oracle9*i* Experience ?
- Oracle9*i* RAC Experience?
- Oracle10^g Experience?
- Goals
 - Overview of Tuning Statspack/AWR
 - Focus on a few nice features of Oracle 10^g
- Non-Goals
 - Learn ALL aspects of Tuning Oracle



Overview

- Statspack, Tools & Scripts that you can still use
 - Top Waits
 - Load Profile
 - Latch Waits
 - Top SQL
 - Instance Activity
 - File I/O
- The Future OEM & ADDM
- Helpful V\$/X\$
- Summary



Tuning in General

- Both an Art and a Science
- Exceptions often rule the day...Not a "one size fits all"
- Hardware & Architecture must be right for your application or difficult to succeed.
- Statspack & Enterprise Manager (also 3rd party products) are best for simple tuning and ongoing maintenance.
- V\$/X\$ are best for drilling deep into problems
- Enterprise Manager 10g will radically change things.

Statspack - Still nice; Some new 10g features

Statspack – Check Regularly

- 1. Top 5 wait events
- 2. Load Profile
- 3. Instance Efficiency Hit Ratios
- 4. Wait Events / Wait Event Histograms
- 5. Latch Waits
- 6. Top SQL
- 7. Instance Activity / Time Model Stats / O/S Stats
- 8. File I/O / File Read Histogram / Undo Stats
- 9. Memory Allocation
- 10. Undo

Statspack – Miscellaneous notes

- SQL>@spcreate (system/manager as SYSDBA) <1m
- SQL> alter user PERFSTAT account lock; (also unlock)
- SQL> EXECUTE STATSPACK.MODIFY_STATSPACK_PARAMETER (i_snap_level=>5, i_buffer_gets_th=>100000, - i_modify_parameter=>'true');
- SQL> execute STATSPACK.SNAP; (do this for start/end) PL/SQL procedure successfully completed.
 (spanto.sql Setup a snap on the hour every hour)
- SQL> @ORACLE_HOME/rdbms/admin/spreport (also sprepsql)



Statspack – Header Information

w.							
DB Name	DB Id	Instand	ce In	st Num R	lelease	Cluster	Host
ORA92	968233682	P10		19	.2.0.4.0	NO	RJN1
	Snap Id	Snap 7	Гime	Session	s Curs/Sea	ss Comment	
Begin Snap:	458 28	-Nov-03	00:15:00	81	.4 179.	.1	
End Snap:	505 28	-Nov-03	23:45:00	81	.6 211.	. 4	
Elapsed:	1	,410.00	(mins)				
Cache Sizes	(end)						
~~~~~~	~~~~~						
	Buffer Ca	che:	32,773M	Std	l Block Siz	ze:	8K
	Shared Pool S	ize:	2,048M		Log Buffe	er: <u>1</u> ,	024K



# Statspack – Header Information

DB Name	DB Id	Instance	Inst Num	Release	RAC Host
ORCL	1050469182	orcl	1	10.1.0.2.0	NO RJNMOBILE5
	Snap Id	Snap Time	Sessi	ons Curs/Ses	s Comment
Begin Snap:	1 12-	-Apr-04 11:36	:02	14 5.	4
End Snap:	2 12-	Apr-04 12:25	:32	18 5.	6
Elapsed:		49.50 (mins)	)		
Cache Sizes	(end)				
	Buffer Cac	che: 24	4M S	td Block Siz	e: 8K
	Shared Pool Si	.ze: 80	ЭМ	Log Buffe	r: 256K

### Statspack – Header Information

- Ensure that you're running for the right instance.
- Check the start/end times
- Check the cache sizes
  - Could have been changed during the run
  - Last page will tell you more on starting/ending values of initialization parameters

ORACI



### Statspack – Load Profile

Load Profile

~~~~~~		Per Second	Per Transaction
Redo size:		1,409,245.79	36,596.21
Logical reads:		157,472.47	4,089.35
Block changes:		4,061.85	105.48
Physical reads:		5,965.05	154.90
Physical writes:		587.76	15.26
User calls:		5,922.08	153.79
Parses:		92.11	2.39
Hard parses:		0.17	0.00
Sorts:		93.88	2.44
Logons:		0.25	0.01
Executes:		5,686.76	147.68
Transactions:		38.51	
% Blocks changed per Read:	2.58	Recursive Call %:	
Rollback per transaction %:	1.22	Rows per Sort:	114.10 ¹¹



AWR – Load Profile

Report Summary

Cache Sizes

	Begin	End		
Buffer Cache:	10,240M	10,240M	Std Block Size:	8K
Shared Pool Size:	1,264M	1,264M	Log Buffer:	36,744K

Load Profile

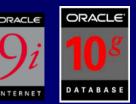
	Per Second	Per Transaction
Redo size:	37,741,608.27	5,236,744.44
Logical reads:	239,964.89	33,295.74
Block changes:	137,275.83	19,047.37
Physical reads:	1.84	0.25
Physical writes:	4,708.71	653.35
User calls:	42.00	5.83
Parses:	24.05	3.34
Hard parses:	0.04	0.01
Sorts:	0.34	0.05
Logons:	0.71	0.10
Executes:	31.85	4.42
Transactions:	7.21	

	% Blocks changed per Read:	57.21 Recursive Call %:	78.22
	Rollback per transaction %:	25.00 Rows per Sort	153 62
1	Dama		



Instance Efficiency Percentages (Target 100%)

Buffer Nowait	%:	99.08	Redo NoWait %:	99.86
Buffer Hit	%:	96.39	In-memory Sort %:	99.95
Library Hit	%:	100.00	Soft Parse %:	99.82
Execute to Parse	%:	98.38	Latch Hit %:	99.64
Parse CPU to Parse Elapsd	%:	85.11	% Non-Parse CPU:	99.86



<u>Buffer NoWait %</u> of less than 99 percent. This is ratio of hits on a request for a specific buffer where the buffer was immediately available in memory. If the ratio is low, then could be a (hot) block(s) being contended for that should be found in the Buffer Wait Section.



- <u>Buffer Hit %</u> of less than 95 percent. This is the ratio of hits on a request for a specific buffer and the buffer was in memory instead of needing to do a physical I/O.
 - When this varies greatly one day to the next, further investigation should be done as to the cause.
 - If you have unselective indexes that are frequently accessed, it will drive your hit ratio higher, which can be misleading indication of good performance.
 - When you effectively tune your SQL and have effective indexes on your entire system, this issue is not encountered as frequently and the hit ratio is a better performance indicator.



- <u>Library Hit %</u> of less than 95 percent. A lower library hit ratio usually indicates that SQL is being pushed out of the shared pool early (could be due to a shared pool that is too small).
 - A lower ratio could also indicate that bind variables are not used or some other issue is causing SQL not to be reused (in which case a smaller shared pool may only be a band-aid that will potentially fix a library latch problem which may result).
 - You must fix the problem (use bind variables or CURSOR_SHARING) and then appropriately size the shared pool. I'll discuss this further when we get to latch issues.



- <u>In-Memory Sort %</u> of less than 95 percent in OLTP. In an OLTP system, you really don't want to do disk sorts. Setting the PGA_AGGREGATE_TARGET (or SORT_AREA_SIZE) initialization parameter effectively will eliminate this problem.
- Latch Hit % of less than 99 percent is usually a big problem. Finding the specific latch will lead you to solving this issue. More in the Latch Wait section.



AWR - Instance Efficiency

Instance Efficiency Percentages (Target 100%)

Buffer Nowait %:	99.31	Redo NoWait %:	99.99
Buffer Hit %:	100.00	In-memory Sort %:	100.00
Library Hit %:	99.94	Soft Parse %:	99.82
Execute to Parse %:	24.50	Latch Hit %:	94.65
Parse CPU to Parse Elapsd %:	91.87	% Non-Parse CPU:	99.96

Shared Pool Statistics

	Begin	End	
Memory Usage %:	68.02	68.20	
% SQL with executions>1:	81.94	81.36	
% Memory for SQL w/exec>1:	77.24	74.72	

Top 5 Timed Events

Event	Waits	Time(s)	Avg Wait(ms)	% Total Call Time	Wait Class
log buffer space	52,521	8,851	169	35.8	Configuration
CPU time		7,636		30.9	
log file sync	7,362	5,122	696	20.7	Commit
buffer busy waits	1,564,508	2,145	1	8.7	Concurrency
log file sequential read	35,171	701	20	2.8	System I/O

E Done

What are you Waiting on?





Top 5 Timed Events

			% Total
Event	Waits	Time (s)	Ela Time
db file sequential read	399,394,399	2,562,115	52.26
CPU time		960 , 825	19.60
buffer busy waits	122,302,412	540,757	11.03
PL/SQL lock timer	4,077	243,056	4.96
log file switch	188,701	187 , 648	3.83
(checkpoint incomplete)			



<u>Wait Problem</u> Sequential Read

Scattered Read

Free Buffer

Buffer Busy

Potential Fix

Indicates many index reads – tune the code (especially joins); Faster I/O Indicates many full table scans – tune the code; cache small tables; Faster I/OIncrease the DB CACHE SIZE; shorten the checkpoint; tune the code to get less dirty blocks, faster I/O, use multiple DBWR's. <u>Segment Header</u> – Add freelists (if inserts) or freelist groups (esp. RAC). Use ASSM.



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Wait Problem Buffer Busy

Buffer Busy

Buffer Busy

Potential Fix <u>Data Block</u> – Separate 'hot' data; potentially use reverse key indexes; fix queries to reduce the blocks popularity, use smaller blocks, I/O, Increase initrans and/or maxtrans (this one's debatable) Reduce records per block. <u>Undo Header</u> – Add rollback segments or increase size of segment area (auto undo) <u>Undo block</u> – Commit more (not too much) Larger rollback segments/area. Try to fix the SQL.



Wait Problem Enqueue - ST Enqueue - HW Enqueue – TX

Enqueue - TM (trans. mgmt.)

Potential Fix

Use LMT's or pre-allocate large extents Pre-allocate extents above HW (high water mark.) Increase initrans and/or maxtrans (TX4) on (transaction) the table or index. Fix locking issues if TX6. Bitmap (TX4) &

Index foreign keys; Check application locking of tables. DML Locks.

Duplicates in Index (TX4).

Why INITRANS Matter!

Transactions Moving through Oracle: ITL & Undo Blocks

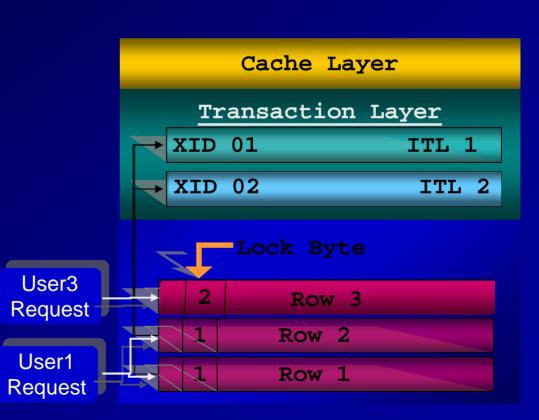




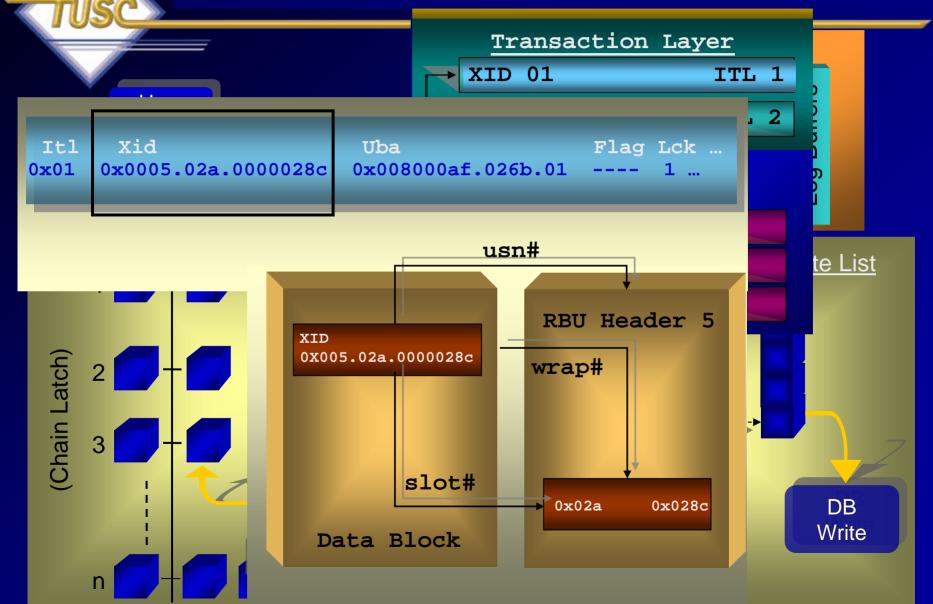


User 1 – Updates Row# 1&2 User 2 updates Row 3

- User1 updates a row with an insert/update/delete – an ITL is opened and xid tracks it in the data block.
- The xid ties to the UNDO header block which ties to the UNDO data block for undo.
- If user2 wants to query the row, they create a clone and rollback the transaction going to the undo header and undo block.
- If user3 wants to update same row (they wait). If user 3 wants to update different row then they open a second ITL with an xid that maps to an undo header that maps to an undo block.



Transaction Identifiers



Block Dumps – Top Section / ITL

 Itl
 Xid
 Uba
 Flag Lck
 Scn/Fsc

 0x01
 0x0004.010.00000fba
 0x0080003d.08b5.10
 --- 4
 fsc 0x009d.00000000

 0x02
 0x0004.016.00000fae
 0x008000cc.08af.34
 C-- 0
 scn 0x0000.003deb5b

ITL – 2 Interested Transaction Lists

> Transaction ID Undo#.slot#.wrap# (Undo#,slot#,seq#)

UBA:

File.block(Undo dba).sequence.record Undo block address where last change is recorded.

Rows Locked: 4 rows deleted for this xid in this block.



AWR – ITL Issues

Segments by ITL Waits

- % of Capture shows % of ITL waits for each top segment compared
- · with total ITL waits for all segments captured by the Snapshot

Owner	Tablespace Name	Object Name	Subobject Name	Obj. Type	ITL Waits	% of Capture
				INDEX PARTITION	126	32.06
1				INDEX PARTITION	112	28.50
1				INDEX PARTITION	66	16.79
1				INDEX PARTITION	65	16.54
				INDEX PARTITION	12	3.05



<u>Wait Problem</u> Latch Free Log Buffer Space Log File Switch Log file sync

Potential Fix

Investigate the detail (Covered later) Increase the Log Buffer; Faster disks for the Redo Logs Archive destination slow or full; Add more or larger Redo Logs Commit more records at a time; Faster Redo Log disks; Raw devices



<u>Wait Problem</u> CBC Latches

LRU Chain Latch

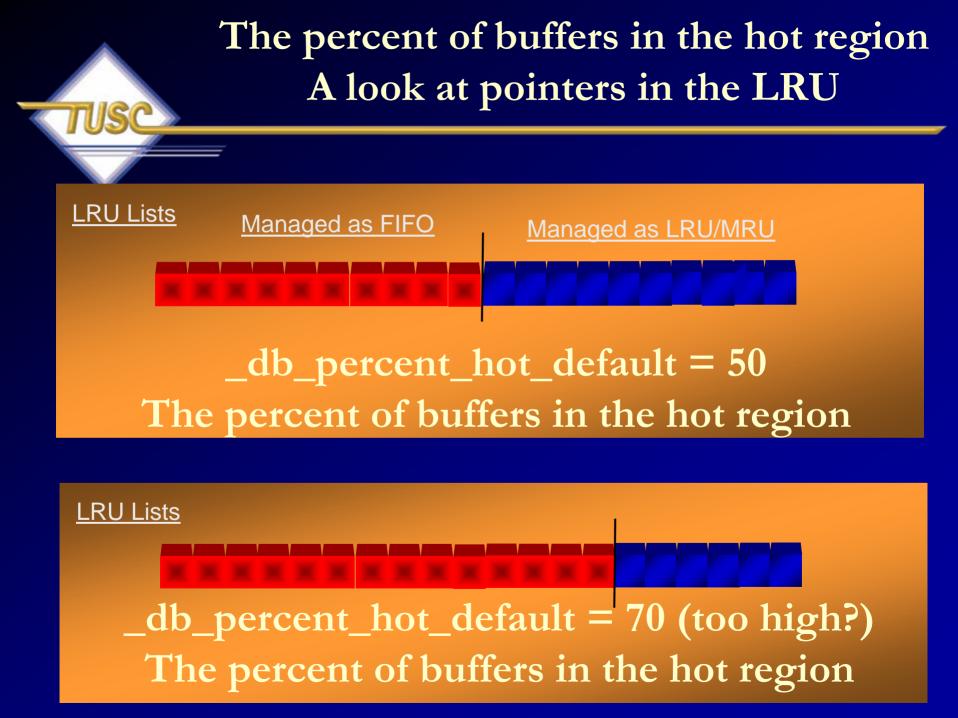
Potential Fix

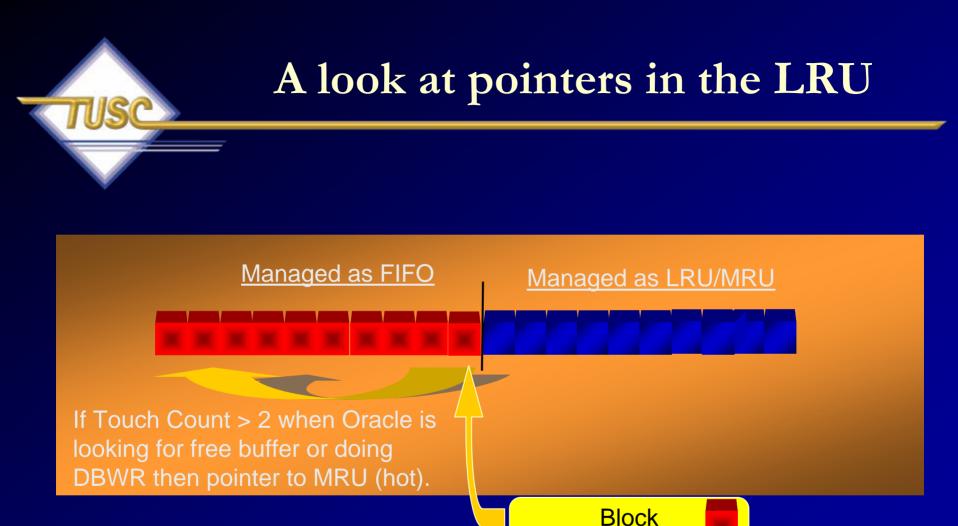
Cache Buffers Chains Latches – Reduce the length of the hash chain (less copies) by reducing block's popularity. Increase the latches by increasing buffers. Use Oracle SQ generator. This latch protects the LRU list when a user needs the latch to scan the LRU chain for a buffer. When a dirty buffer is encountered it is linked to the LRU-W. When adding, moving, or removing a buffer this latch is needed.

Decoding the Hot/Cold Regions (fyi only)

The Indus Script







From Disk

Altering the Hot/Cold LRU Really advanced tuning!



- 1. _db_percent_hot_default (50) The percent of buffers in the hot region.
- 2. <u>db_aging_touch_time* (3)</u> Seconds that must pass to increment touch count again. (Higher less LRU movement)
- 3. <u>db_aging_hot_criteria</u> (2) Threshold to move a buffer to the MRU (hot) end of LRU chain.
- 4. _db_aging_stay_count (0) **Touch count reset to this when moved to MRU (hot) end. Set=0 even if it was 200 previously!
- 5. _db_aging_cool_count (1) Touch count reset to this when moved to LRU (cold) end. Set=1 even if it was 200 previously!

Setting parameter 1 (above) lower, we increase hanging on to older buffers and setting it higher will cause a flush sooner. (*Error in description)³⁴

Altering the Hot/Cold LRU Really advanced tuning!



- db_aging_freeze_cr (FALSE) Setting this to TRUE will make cr (consistent read) buffers too cold to keep in the cache.
- 7. _db_percent_hot_keep (0) Percent of keep buffers considered hot (in hot region). Old LRU algorithm!
- 8. _db_percent_hot_recycle (0) Percent of recycle buffers considered hot (in hot region). Old LRU algorithm!
- ** If _db_aging_stay_count => _db_aging_hot_criteria then touch count is set to 1/2 it's current count instead of setting it to the _db_aging_stay_count when moved to the hot end of LRU. - FTS, FFIS (multi-block) are put on the cold end of the LRU.



- LRU
- LRU-W
- LRU-P
- Main block replacement list
- Old dirty buffers and reco/temp
- Ping Buffer list / RAC
- LRU-XO Buffers to be written for drop/truncate
- LRU-XR Buffers to be written for reuse range
- Thread CKPT Thread Checkpoint Queue
- File CKPT File Checkpoint Queue
- Reco CKPT Reco Checkpoint
- LRU-MAIN & LRU-AUX help LRU

Locally Managed Tablespaces- LMT

ORACLE ORACLE 91
108
DATABASE

- Manage space locally using bitmaps
- Benefits
 - no tablespace fragmentation issues
 - better performance handling on large segments
 - lower contention for central resources, e.g., no ST enqueue contention
 - fewer recursive calls
- Implementation
 - specify "EXTENT MANAGEMENT LOCAL" clause during tablespace creation
 - in-place migration

Automatic Segment Space Management (ASSM)



- Automatic intra-object space management
- Benefits
 - Eliminates Rollback Segment Management
 - simplified administration (no more FREELISTS, FREELIST GROUPS, PCTUSED)
 - improved space utilization & concurrency
 - enhanced performance
- Can set undo retention time
 - If set to longest running query time, no more "Snapshot too old"!
- Implementation
 - specify "SEGMENT SPACE MANAGEMENT AUTO" clause during tablespace creation

10g Only – Wait Event Histogram (Breaks down the wait detail)

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Wait Event Histogram DB/Inst: ORCL/orcl Snaps: 1-2 -> ordered by event (idle events last)

Event

1 - 4 ms	4 - 8 ms	8 - 16 ms	16 - 32 ms	32+ ms
itention				
74	73	60	55	197
itention				
3	0	0	0	61
2	0	0	0	0
ory undo latch	ı			
3	1	1	0	0
buffers chains	3			
7	14	68	1	0
llocation				
56	25	3	0	39 ⁰
	ntention 74 ntention 3 2 nory undo latch 3 buffers chains 7 allocation	Atention 74 73 Atention 3 0 2 0 Aory undo latch 3 1 buffers chains 7 14	Atention 74 73 60 Atention 3 0 0 Acry undo latch 3 1 1 buffers chains 7 14 68 Allocation	7473605530002000Arry undo latch 3110buffers chains 714681

10g-Enqueues Spelled Out

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Enqueue activity DB/Inst: ORCL/orcl Snaps: 1-2

Enqueue Type (Request Reason)

-> Enqueue stats gathered prior to 10g should not be compared with 10g data

Requests	Succ Gets	Failed Gets	Waits	Wt Time (s)	Av Wt Time(ms)
HW-Segment High	Water Mark				
5,264	5,245	19	552	168	304.96
TX-Transaction					
1,330	1,330	0	61	77	1,255.21
CF-Controlfile 1	Fransaction				
4,400	4,298	102	159	43	271.14
CI-Cross-Instanc	ce Call Inv	ocation			
460	460	0	4	1	157.75
US-Undo Segment					
1,021	1,021	0	7	0	60.14
FB-Format Block					
3,655	3,655	0	1	0	60 ₄ 80



Statspack – Top 25

- Tuning the top 25 buffer get and top 25 physical get queries has yielded system performance gains of anywhere from 5 percent to 5000 percent.
- The SQL section of the statspack report tells you which queries to potentially tune first.
- The top 10 of your SQL statements should not be more than 10 percent of your buffer gets or disk reads.



Statspack – Top SQL

Buffer Gets Executions Gets per Exec %Total Time(s) Time (s) Hash Value

627,226,570 117 5,360,910.9 4.7 9627.09 10367.04 Module: JDBC Thin Client SELECT * FROM (select d1.tablespace_name, d1.owner, d1.segment_t ype, d1.segment_name, d1.header_file, d1.extents, d1.bytes, d1.b locks, d1.max_extents , d1.next_extent from sys.dba_segments d1 where d1.segment_type != 'CACHE' and tablespace_name not in (s elect distinct tablespace_name from sys.dba_rollback segs) orde

409,240,446 175,418 2,332.9 3.1 ####### 59430.83 Module: ? @sap10ci (TNS V1-V3) SELECT "TABNAME" , "VARKEY" , "DATALN" , "VARDATA" FROM "KAPOL" WHERE "TABNAME" = :A0 AND "VARKEY" LIKE :A1 ORDER BY "TABNAME" , "VARKEY"

AWR – Top SQL



- · Resources reported for PL/SQL code includes the resources used by all SQL statements called by the code.
- Total Buffer Gets: 225,112,503
- Captured SQL account for 99.9% of Total

Buffer Gets	Executions	Gets per Exec	% Total	CPU Time (s)	Elapsed Time (s)	SQL Id	SQL Module	SQL Text
224,907,873	1,680	133,873.73	99.91	7568.17	19515.02			
31,779	6,881	4.62	0.01	2.61	2.61			
21,515	1,688	12.75	0.01	6.18	14.19			
19,827	1,688	11.75	0.01	2.71	10.71			
15,186	1,685	9.01	0.01	4.94	11.82			
13,501	1,685	8.01	0.01	2.84	9.72			
7,867	1	7,867.00	0.00	7.56	23.36			
4,783	1	4,783.00	0.00	0.76	1.09			
3,906	651	6.00	0.00	0.53	0.53			
2,640	646	4.09	0.00	0.62	1.21			

Back to SQL Statistics Back to Top

SQL ordered by Reads

Done Done





Latch Free – Latches are low-level queueing mechanisms (they're accurately referred to as mutually exclusion mechanisms) used to protect shared memory structures in the System Global Area (SGA).

- Latches are like locks on memory that are very quickly obtained and released.
- Latches are used to prevent concurrent access to a shared memory structure.
- If the latch is not available, a latch free miss is recorded.



<u>Latch Free</u> –

- Most latch problems are related to:
 - The failure to use bind variables (library cache latch)
 - Redo generation issues (redo allocation latch)
 - Buffer cache contention issues (cache buffers lru chain)
 - Hot blocks in the buffer cache (cache buffers chains).
- There are also latch waits related to bugs; check MetaLink for bug reports if you suspect this is the case (oracle.com/support).
- When latch miss ratios are greater than 0.5 percent, you should investigate the issue.



Statspack - Latch Waits

Latch Activity for DB: ORA91 Instance: ora9i Snaps: 1 -2

		Pct	Avg	Wait		Pct
	Get	Get	Slps	Time	NoWait	NoWait
Latch	Requests	Miss	/Miss	(s)	Requests	Miss
KCL freelist latch	4,924	0.0			0	
cache buffer handles	968,992	0.0	0.0		0	
cache buffers chains	761,708,539	0.0	0.4		21,519,841	0.0
cache buffers lru chain	8,111,269	0.1	0.8		19,834,466	0.1
library cache	67,602,665	2.2	2.0		213,590	0.8
redo allocation	12,446,986	0.2	0.0		0	
redo copy	320	0.0			10,335,430	0.1
user lock	1,973	0.3	1.2		0	

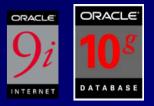


Statspack - Latch Waits

Latch Sleep breakdown for DB: -> ordered by misses desc

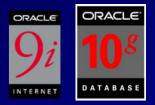
	Get			Spin &
Latch Name	Requests	Misses	Sleeps	Sleeps 1->4
library cache	67,602,665	1,474,032	2,935,368	199143/28003
				6/582413/412
				440/0
cache buffers chains	761,708,539	192,942	83,559	110054/82239
				/628/21/0
redo allocation	12,446,986	25,444	1,135	24310/1133/1
				/0/0
cache buffers lru chain	8,111,269	6,285	4,933	1378/4881/26
				/0/0
process allocation	177	7	7	0/7/0/0/0

• Note that 10g only has "Spin & Sleeps 1-3+"



Latches that are <u>willing to wait</u> try to acquire a latch. If none are available, it will spin and then request the latch again. It will continue to do this up to the _SPIN_COUNT initialization parameter (note that spinning costs CPU).

- If it can't get a latch after spinning up to the _SPIN_COUNT, it will go to sleep. It will wake up after one centisecond (one hundredth of a second). It will do this twice.
- It will then start this process again, spinning up to the ______SPIN_COUNT and then sleeping for twice as long (two centiseconds). After doing this again it will double again. So the pattern is 1,1,2,2,4,4 etc. It will do this until it gets the latch
- Every time the latch sleeps, it will creates a latch sleep wait. An example of a "willing to wait" latch is a library cache latch.

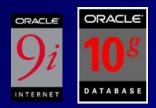


- Some latches are <u>"not willing to wait.</u>" This type of latch does not wait for the latch to become available.
- They immediately time out and retry to obtain the latch.
- A redo copy latch is an example of a "not willing to wait" latch.
- A not willing to wait latch will generate information for the immediate_gets and the immediate_misses columns of the V\$LATCH view and also in the statspack report.
- The hit ratio for these latches should also approach 99% and the misses should never fall below 1 percent misses.



- <u>*Gets*</u> The number of times a willing to wait request for a latch was requested and it was available.
- <u>Misses</u> The number of times a willing to wait request for latch was initially requested but was not available.
- <u>Sleeps</u> The number of a willing to wait request for a latch failed over and over until the spin count was exceeded and the process went to sleep. The number of sleeps may be higher than the misses. Processes may sleep multiple times before obtaining the latch.
- <u>NoWait Misses</u> The number of times immediate (not willing to wait) request for a latch was unsuccessful.

Statspack - Latch Waits Things to look for...



<u>Latch Problem</u> Library Cache

Shared Pool

Redo allocation

Redo copy

Row cache objects

Potential Fix

Use bind variables; adjust the shared_pool_size Use bind variables; adjust the shared_pool_size Minimize redo generation and avoid unnecessary commits Increase the _log_simultaneous_copies Increase the Shared Pool

Use Bind Variables / Latch Issues

- If you don't use bind variables in your application code you usually end up with latch contention with the *shared_pool* and *library cache* latches.
- This latch wait time can be reduced by changing just the top couple of executed statements that were using literal SQL instead of bind variables.
- Oracle 8i Release 2 (8.1.6) has an auto-conversion of literals into bind variables... Oracle9i extends this slightly...

CURSOR_SHARING=FORCE (Default is EXACT; 8iR2)

Cursor Sharing - 8.1.6+

If v\$sqlarea looks like this:

select empno from rich778 where empno =451572 select empno from rich778 where empno =451573 select empno from rich778 where empno =451574 select empno from rich778 where empno =451575 select empno from rich778 where empno =451576

<u>Use cursor sharing=force (sqlarea goes to this):</u> select empno from rich778 where empno =:SYS_B_0

Statspack – Instance Activity Terminology...



Statistic **Consistent** Gets Db block gets Db block changes **Physical Reads**

Description

Session Logical Reads All reads cached in memory. Includes both consistent gets and also the db block gets. These are the reads of a block that are in the cache. They are NOT to be confused with consistent read (cr) version of a block in the buffer cache (usually the current version is read). These are block gotten to be changed. MUST be the CURRENT block and not a cr block. These are the db block gets (above) that were actually changed. Blocks not read from the cache. Either from disk, disk cache or O/S cache; there are also physical reads direct which bypass cache using Parallel Query (not in hit ratios). 54



Statspack – Instance Activity

Statistic	Total	per Second	per Trans
branch node splits	7,162	0.1	0.0
consistent gets	12,931,850,777	152,858.8	3,969.5
current blocks converted for CR	75,709	0.9	0.0
db block changes	343,632,442	4,061.9	105.5
db block gets	390,323,754	4,613.8	119.8
hot buffers moved to head of LRU	197,262,394	2,331.7	60.6
leaf node 90-10 splits	26,429	0.3	0.0
leaf node splits	840,436	9.9	0.3
logons cumulative	21,369	0.3	0.0
physical reads	504,643,275	5,965.1	154.9
physical writes	49,724,268	587.8	15.3
session logical reads	13,322,170,917	157,472.5	4,089.4
sorts (disk)	4,132	0.1	0.0
sorts (memory)	7,938,085	93.8	2.4
sorts (rows)	906,207,041	10,711.7	278.2
table fetch continued row	25,506,365	301.5	7.8
table scans (long tables)	111	0.0	_Q.0
table scans (short tables)	1,543,085	18.2	0.5



Time Model System Stats DB/Inst: ORCL/orcl Snaps: 1-2 -> Total Time in Database calls 5560.5s (or 5560475336us)

Statistic	Time (s)	% of DB Time
DB CPU	119.1	2.1
DB time	5,560.5	
Java execution elapsed time	0.1	.0
PL/SQL compilation elapsed time	0.4	.0
PL/SQL execution elapsed time	0.2	.0
background cpu time	16.4	.3
background elapsed time	2,097.6	37.7
connection management call elapsed	1.2	.0
failed parse elapsed time	0.2	.0
hard parse (sharing criteria) elaps	0.0	.0
hard parse elapsed time	13.3	.2
parse time elapsed	14.1	.3
sql execute elapsed time	5,556.3	99.9 ⁵⁶



Statspack – Time Model Stats

Time Model Statistics

- Total time in database user-calls (DB Time): 24728.7s
- · Statistics including the word "background" measure background process time, and so do not contribute to the DB time statistic
- · Ordered by % or DB time desc, Statistic name

Statistic Name	Time (s)	% of DB Time
sql execute elapsed time	19,563.36	79.11
DB CPU	7,635.77	30.88
PL/SQL execution elapsed time	9.04	0.04
connection management call elapsed time	5.37	0.02
parse time elapsed	3.94	0.02
hard parse elapsed time	0.37	0.00
hard parse (sharing criteria) elapsed time	0.12	0.00
sequence load elapsed time	0.01	0.00
hard parse (bind mismatch) elapsed time	0.00	0.00
repeated bind elapsed time	0.00	0.00
DB time	24,728.66	
background elapsed time	2,773.25	
background cpu time	1,360.81	

Back to Wait Events Statistics

Back to Top

Wait Class

Done



OS	Statistic	s DB/Inst:	ORCL/orcl	Snaps:	1-2
----	-----------	------------	-----------	--------	-----

Statistic	Total	per Second
AVG_IN_BYTES	37,371,904	12,583
AVG_OUT_BYTES	1,179,648	397
IN_BYTES	37,371,904	12,583
OUT_BYTES	1,179,648	397
AVG_BUSY_TICKS	24,326	
AVG_IDLE_TICKS	272,598	
AVG_SYS_TICKS	9,483	
AVG_USER_TICKS	14,843	
BUSY_TICKS	24,326	
IDLE_TICKS	272,598	
SYS_TICKS	9,483	
USER_TICKS	14,843	
NUM_CPUS	1	58



Undo Segment Stats DB/Inst: ORCL/orcl Snaps: 1-2 -> ordered by Time desc

		Undo	Num	Max Qry	Max Tx	Snap	OutOf	uS/uR/uU/
End Time		Blocks	Trans	Len (s)	Concy	TooOld	Space	eS/eR/eU
12-Apr 12	2:19	31,664	243	818	5	0	0	0/0/0/32/28
								0/0
12-Apr 12	2:09	27,248	357	210	5	0	0	0/0/0/55/57
								6/0
12-Apr 11	L:59	16,403	276	171	5	0	0	0/0/0/28/15
								2/0
12-Apr 11	L:49	3,602	327	0	5	0	0	0/0/0/8/16/
								0
12-Apr 11	L:39	469	2,946	0	4	0	0	0/0/0/0/0/0



Statspack – File I/O

Tablespace

Reads	Av Reads/s	Av Rd(ms)	Av Blks/Rd	Writes	Av Writes/s		Av Buf Wt(ms)
PSAPSTABI							
14,441,749	171	7.9	1.0	521,275	6	1,234,608	6.2
PSAPVBAPD							
13,639,443	161	6.2	1.7	10,057	0	2,672,470	4.2
PSAPEDII							
11,992,418	142	5.3	1.0	83 , 757	1	4,115,714	4.4
PSAPEDID							
10,617,042	125	8.1	1.0	64 , 866	1	3,728,009	6.4
PSAPROLL							
998,328	12	13.2	1.0	8,321,252	98	285,060	65.7

<u>Reads should be below 14ms</u>





File IO Stats

· ordered by Tablespace, File

Tablespace	Filename	Reads	Av Reads/s	Av Rd (ms)	Av Blks/Rd	Writes	Av Writes/s	Buffer Waits	Av Buf W (ms)
		7	0	1.43	1.00	480	1	93	19.6
		6	0	0.00	1.00	34	0	34	16.7
		3	0	0.00	1.00	3	0	0	0.
	.dbf	7	0	5.71	1.00	4	0	0	0.
	.dbf	7	0	0.00	1.00	4	0	0	0.
	.dbf	7	0	0.00	1.00	4	0	0	0.
	.dbf	7	0	0.00	1.00	4	0	0	0.
	.dbf	7	0	0.00	1.00	4	0	0	0.
	.dbf	7	0	2.86	1.00	4	0	0	0.
	dbf	7	0	0.00	1.00	4	0	0	0.
	.dbf	7	0	1.43	1.00	4	0	0	0
	dbf	7	0	2.86	1.00	4	0	0	0
	.dbf	7	0	0.00	1.00	4	0	0	0
	.dbf	7	0	0.00	1.00	4	0	0	0
	dbf	8	0	0.00	1.00	3	0	0	0
	.dbf	8	0	0.00	1.00	3	0	0	0
	.dbf	8	0	0.00	1.00	3	0	0	0
	.dbf	8	0	0.00	1.00	3	0	0	0



Statspack – File Read Histogram

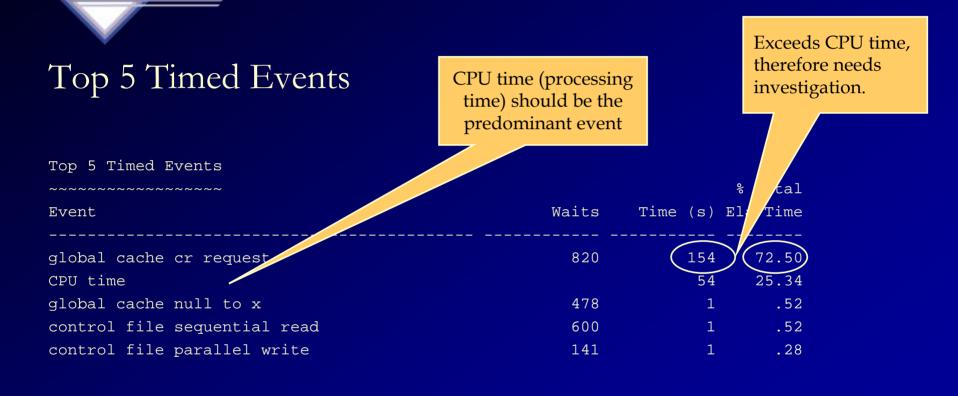
File Read Histogram Stats DB/Inst: ORCL/orcl Snaps: 1-2
->Number of single block reads in each time range
->ordered by Tablespace, File

Tablespa	lCe	Fi	lename		
0 -	4 ms	4 - 8 ms	8 - 16 ms	16 - 32 ms	32+ ms
USERS		C:	\ORACLE\ORAD	ATA\ORCL\USERS	S01.DBF
	560	2,225	1,452	4,089	8,373
SYSAUX		C:	\ORACLE\ORAD	ATA\ORCL\SYSAU	JX01.DBF
	123	40	242	357	405
SYSTEM		C:	\ORACLE\ORAD	ATA\ORCL\SYSTE	EM01.DBF
	100	51	223	207	3627



- 1. Top 5 wait events
- 2. Load Profile
- 3. Instance Efficiency Hit Ratios
- 4. Wait Events / Wait Event Histograms
- 5. Latch Waits
- 6. Top SQL
- 7. Instance Activity / Time Model Stats / O/S Stats
- 8. File I/O / File Read Histogram / Undo Stats
- 9. Memory Allocation
- 10. Undo

- The STATSPACK report shows statistics ONLY for the node or instance on which it was run.
- Run statspack.snap procedure and spreport.sql script on each node you want to monitor to compare to other instances.
- Single-instance tuning should be performed before attempting to tune the processes that communicate via the cluster interconnect.



- Transfer times excessive from other instances in the cluster to this instance.
- Could be due to network problems or buffer cache sizing issues.

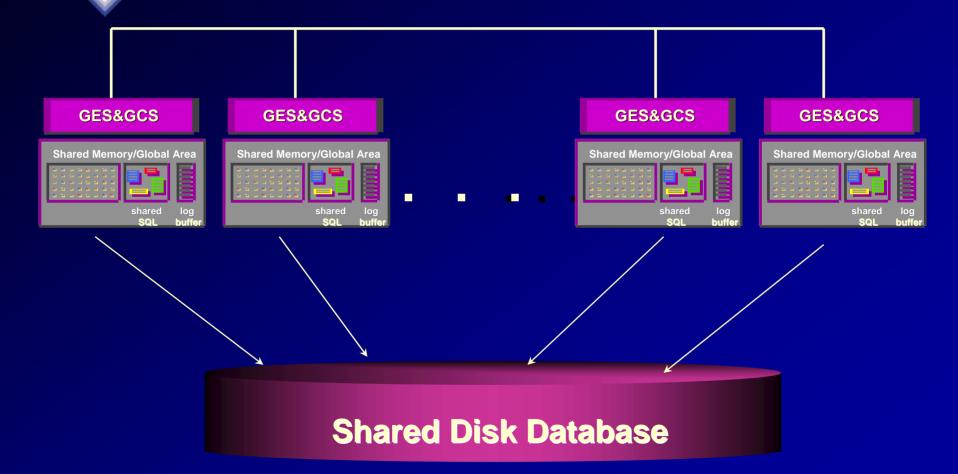
- Network changes were made
- An index was added
- STATSPACK report now looks like this:

CPU time is now the predominant event

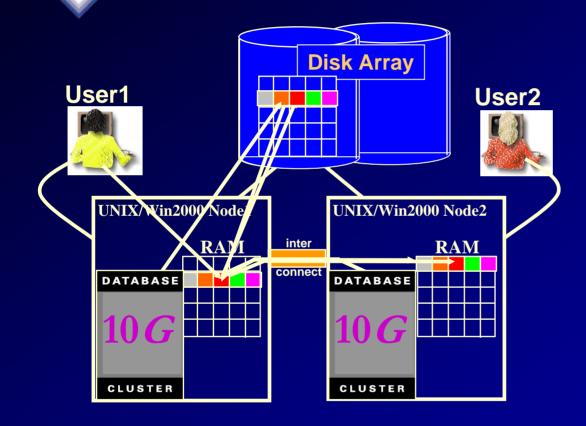
Top 5 Timed Events		P	caominante		
Event	Waits	Time (s)	% Total Ela Time		
CPU time		99	64.87		
global cache null to x	1,655	28	18.43		
enqueue	46	8	5.12		
global cache busy	104	7	4.73		
DFS lock handle	38	2	1.64		

RAC Architecture Shared Data Model





Real Applications Clusters - Cache Fusion



- 1. User1 queries data
- 2. User2 queries same data - via interconnect with no disc I/O
- 3. User1 updates a row of data and commits
- 4. User2 wants to update same block of data – 10g keeps data concurrency via interconnect

- Workload characteristics for this instance:

Cluster Statistics for DB: DB2 Instance: INST1

Global Cache Service - Workload Characteristics

Ave global cache get time (ms):	8.2	3.1
Ave global cache convert time (ms):	16.5	3.2
Ave build time for CR block (ms):	1.5	0.2
Ave flush time for CR block (ms):	6.0	0.0
Ave send time for CR block (ms):	0.9	1.0
Ave time to process CR block request (ms):	8.5	1.3
Ave receive time for CR block (ms):	18.3	17.2
Ave pin time for current block (ms):	13.7	0.2
Ave flush time for current block (ms):	3.9	0.0
Ave send time for current block (ms):	0.8	0.9
Ave time to process current block request (ms):	18.4	1.1
Ave receive time for current block (ms):	17.4	3.1
Global cache hit ratio:	2.5	1.7
Ratio of current block defers:	0.2	0.0
<pre>% of messages sent for buffer gets:</pre>	2.2	1.4
% of remote buffer gets:	1.6	1.1
Ratio of I/O for coherence:	2.9	8.7
Ratio of local vs remote work:	0.5	0.6
Ratio of fusion vs physical writes:	0.0	0.0

Solved after network and index changes.

- Global Enqueue Services (GES) control the interinstance locks in Oracle 9i RAC.
- The STATSPACK report contains a special section for these statistics.

Global Enqueue Service Statistics

Ave global lock get time (ms):

Ave global lock convert time (ms):1.3Ratio of global lock gets vs global lock releases:1.1

0.9

- Guidelines for GES Statistics:

- All times should be < 15ms
- Ratio of global lock gets vs global lock releases should be near 1.0
- High values could indicate possible network or memory problems
- Could also be caused by application locking issues
- May need to review the enqueue section of STATSPACK report for further analysis.

Complete Presentation by Oracle's Rich Niemiec's at: http://www.oracleracsig.org

Global Cache Load Profile

	Per Second	Per Transaction
Global Cache blocks received:	0.38	0.05
Global Cache blocks served:	0.26	0.04
GCS/GES messages received:	766.83	106.40
GCS/GES messages sent:	1,278.25	177.36
DBWR Fusion writes:	0.01	0.00
Estd Interconnect traffic (KB)	404.57	

Global Cache Efficiency Percentages (Target local+remote 100%)

Buffer access - local cache %:	100.00
Buffer access - remote cache %:	0.00
Buffer access - disk %:	0.00

Global Cache and Enqueue Services - Workload Characteristics

Avg global enqueue get time (ms):	1.9
Avg global cache cr block receive time (ms):	1.8
Avg global cache current block receive time (ms):	1.9
Avg global cache cr block build time (ms):	0.0
Avg global cache cr block send time (ms):	0.2
Global cache log flushes for cr blocks served %:	0.0
Avg global cache cr block flush time (ms):	
Avg global cache current block pin time (ms):	0.1



Tuning the RAC Cluster Interconnect Using AWR Reports (FYI Only)

SQL ordered by Cluster Wait Time

uster Wait Time (s)	CWT % of Elapsd Time	Elapsed Time(s)	CPU Time (s)	Executions	SQL Id	SQL Module	SQL Text
75.00	0.38	19,515.02	7,568.17	1,680			
0.85	3.63	23.36	7.56	1			
0.15	13.69	1.09	0.76	1			
0.09	31.73	0.27	0.08	46			
0.06	12.31	0.46	0.30	1			
0.03	0.20	14.19	6.18	1,688			
0.03	0.26	10.71	2.71	1,688			
0.03	83.42	0.03	0.00	1			
0.02	36.30	0.07	0.06	4			
0.02	43.85	0.06	0.01	1			
0.02	1.77	1.12	0.54	10			
0.02	10.23	0.15	0.13	1			
0.02	3.76	0.40	0.02	1			
0.01	12.17	0.11	0.09	1			
0.01	33.26	0.03	0.02	1			
0.01	8.39	0.09	0.09	177			
ne	44.00	0.00	0.00				

The Future... **Enterprise Manager 10g for the Grid** Database Host and Hardware 001 Oracle9iAS 0101 State 1101 Host: abtech9.us.oracle.com Active Sessions Home Performance Targets Configura 83.87 SQL Response Time (%) 🔗 Application Server: ias902.dlsun1641.us.oracle.com /iew Performance Summary 🔳 (G6) (compared to baseline) Home Applications Websites Performance CPU Utilization Memory Utilization Bad SQL 🔞 11 Top SQL Report 238 98.0 4 View Top Applications by Average Servlet/JSP Processing Time Duplicate SQL 738 Latest Alert Log Entry No ORA- errors \bigcirc Total 26 February 2003 CPU Teta Average Processing Servlet/JSP Servlet/JSP Servle Current CPU in I/O Wait (%) 3.51 OC4J Current CPU Load, 5 minutes avg. 3.11 **Time Processing Time** Requests Proce Correct S Name Instance (seconds) (seconds) Processed Time (sec Additional Metrics, All CPUs 167.28 12.69 11 hrapp **Administration** default 562.77 0.17 3.235 Monitoring Network and **Provisioning** Load Balancer **Applications** Security ORACLE Alerts -business My Collab Suit Metric Transaction Severity Enterprise Packets Dropped (%) mail.us.oracle.com ۵ Suite Infrastructure Statu nonent Status Manager E-mail 12/20) Files 12 mail.us.oracle.com ۵ Status Meeting & sil & Fax & (1) 4/15 Related Link Qtrees (ordered by Used (%)) **Storage** Status Nam Volume Total(GB) Used(GB) Used (% 0 slot3 db04 60.0 58.82 Ø edw top appltop04 250.0 231 48 92.50 local backup backup04 250.0 219.68

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db04

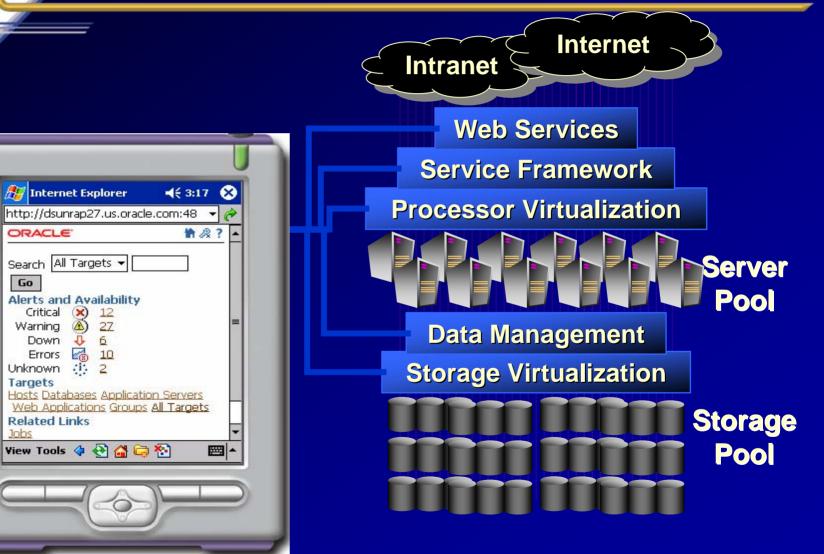
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backup04

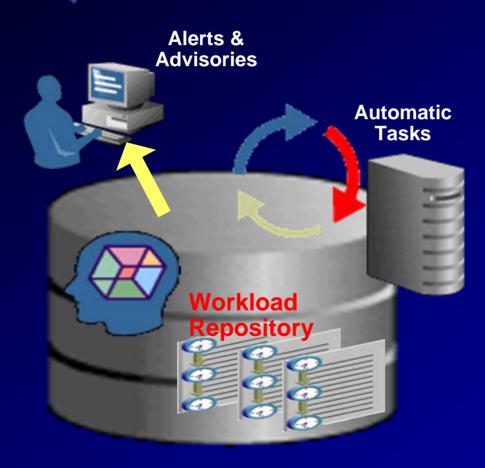
appltopf

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The Future Manage end to end



Oracle 10^g Database Self-Managing Intelligent Infrastructure



- Aware -Self-monitoring
- Proactive

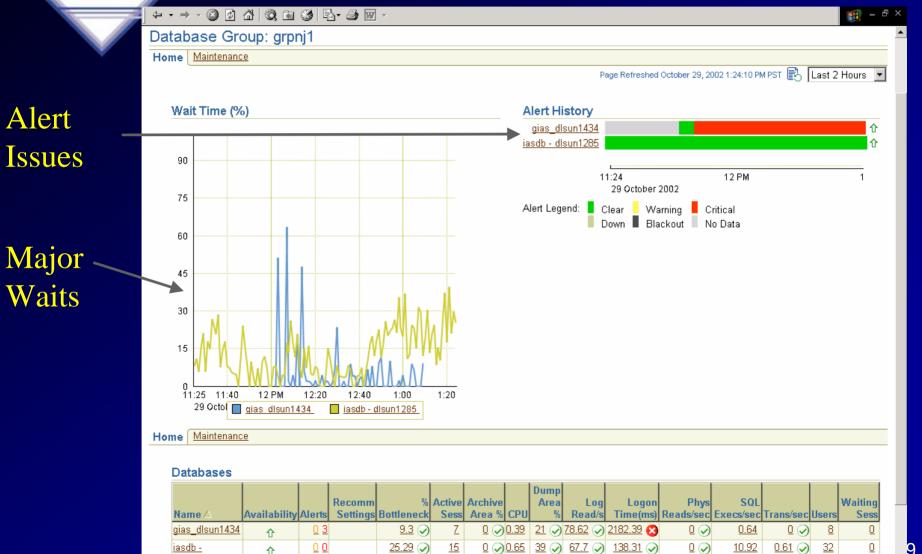
 Automatic tasks
 Proactive alerts
- Intelligent

 Self-diagnosing
 Self-tuning

Monitor All Targets

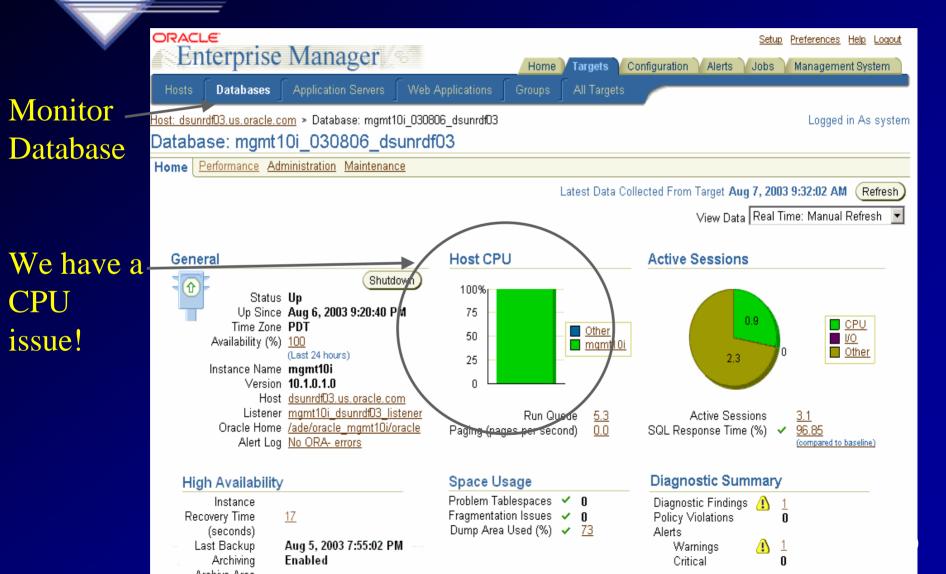
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Home

Targets

All Targets

Configuration

Preferences Help Logout

Management System

Setup

Jobs

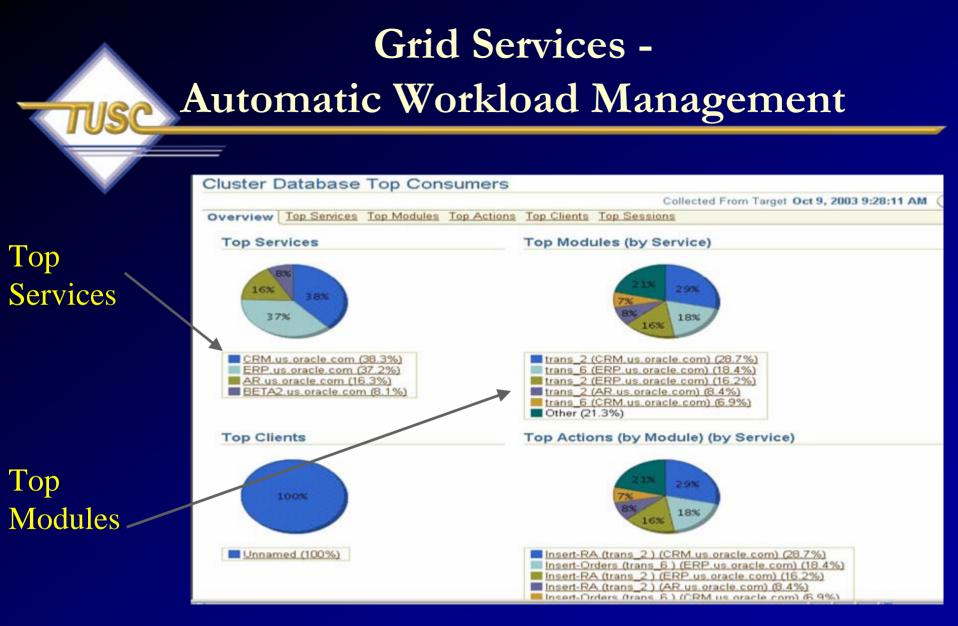
Alerts

Monitor _ Perform.

ORACLE

Enterprise Manager

Host: dsunrdf03.us.oracle.com > Database: mgmt10i 030806 dsunrdf03 Logged in As system Database: mgmt10i 030806 dsunrdf03 Home Performance Administration Maintenance View Data Real Time: 15 Second Refresh 🔻 Click on an area of a graph or legend to get more detail. Host Length Length We have a 📕 Run Queue Length puope 1.0 2.0 0.0 Concurr. Paging Rate a 12:20pm 12:30pm 12:40pm 12:50pm 1:00pm 1:10pm issue! August 7, 2003 Active Sessions: Waiting and Working 2.5 User I/O 2.0 System I/O Scheduler Other 1.5 Session Count 1.0 2.5 Network Configuration Maximum CPU Concurrency Commit Application Administrative CPU Used 0.0 12:30pm 1:00pm 12:20pm 12:40pm 12:50pm 1:10pm August 7, 2003 ið. đ



Complete Presentation by Oracle's Erik Peterson at:http://www.oracleracsig.org

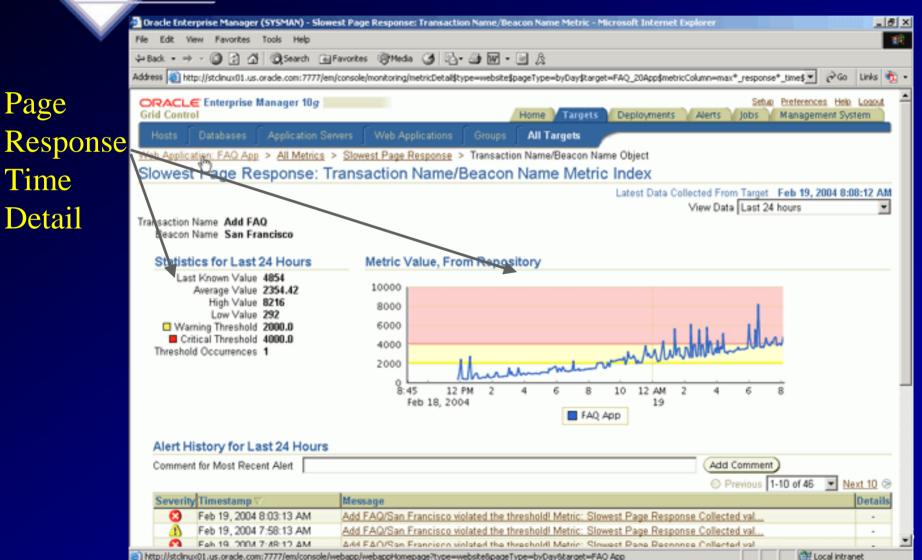
10g RAC Enhancements

- GRID Control
 - Allows for RAC instance startup, shutdown
 - Allows for RAC instance creation
 - Allows for resource reallocation based on SLAs
 - Allows for automatic provisioning when used with RAC, ASM and Linux

App. Server Performance

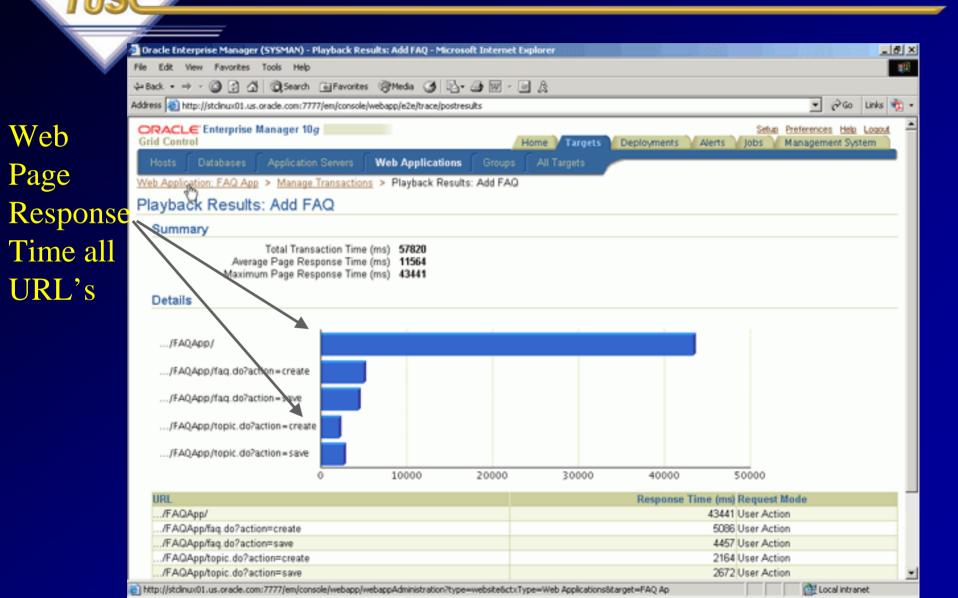
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View the Web Application



http://stclinux01.us.oracle.com:7777/em/console/webapp/webappHomepage?type=website8pageType=byDay8target=FAQ App

URL Response Times



Middle Tier Performance

Splits Time into Parts

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Watch List
e Time

🚰 Local intranet

http://stcinux01.us.oracle.com?7777/em/console/webapp/webappComponents?type=webste8target=FAQ App&ctxType=Web Applications

Host Performance

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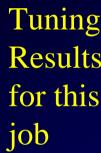
ADDM SQL Tuning Advisor

🚰 Oracle Enterprise Manager (SYS) - Microsoft Internet Explorer File Edit Favorites Tools View Help Media Search 🛛 🐨 Favorites B. A. B. S. B. 👍 Back ഷീ - 63 Address 😹 h=10&twoDUIDataSource%3AselectMode=&refreshChoice=2&type=oracle_database&target=sh6&source=twoDUIDataSource&value=2&size=&state= 🔻 i∂ Go Links 🙆 Network Request 🔞 Customize Links 🧔 Files Online 💰 Free Hotmail 🛞 My Oracle 🏽 🔞 Oracle CRM 🏽 Oracle Email 🖉 SE Software Archive >> Top SQL ٠ Spot SQL Period SQL Spot SQL shows all the sql statements that have been active in a recent 5 minute interval View Data Real Time: 15 Second Refresh 🔻 **Spot Interval Selection** Active Sessions 5. 📕 W ait CPU 4:30pm 3:40pm 3:50pm 4:00pm 4:10pm 4:20pm August 19, 2003 Detail for Selected 5-minute Interval Start Time Aug 19, 2003 4:25:52 PM All SQL Top SQL (ordered by Activity) Run SQL Tuning Advisor Create SQL Tuning Set 1%^{0%0%}1% S Previous 1-10 of 21 🔽 Next 10 😒 Select All Select None SQL Type CPU (%) Wait (%) Select SQL ID Activity (%) / brvu0t8zcz9d6 COMMIT 0.08 0.09 0.0 48% 49% DELETE 0.0 7j7n3tdgbn3vy 0.08 0.09 fixa1vp3vhtmr PL/SQL EXECUTE 0.08 0.09 0.0 8c2xqj2bhkj7j (48.8%) 18f3m2t9w9xkh (0.3%) 3dzutam0j7j0r PL/SQL EXECUTE 0.08 0.09 0.0 g3uyw1n1w1y10 (0.2%) null (48.3%) 3p5zth7qh0b1t PL/SQL EXECUTE 0.08 0.09 0.0 74ddkh8nu4s24 (1%) Other (1.5%) _ ~ ~~ ~ ~~ 🕘 Done 🔠 Local intranet

Drill into Top SQL for worst time period

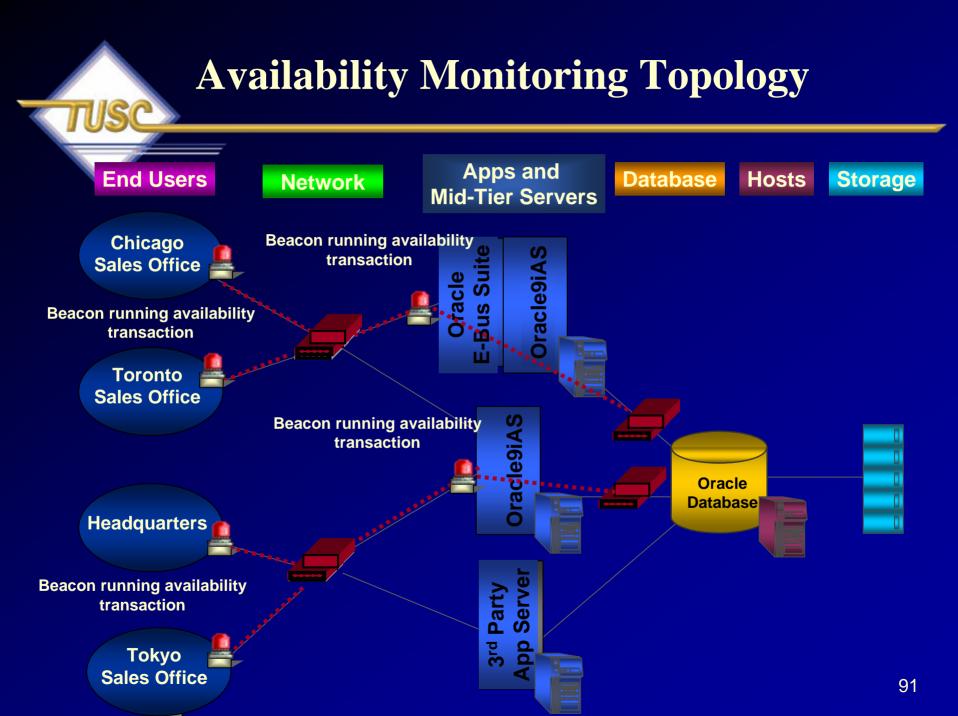
Get Help!

Using SQL Tuning Sets

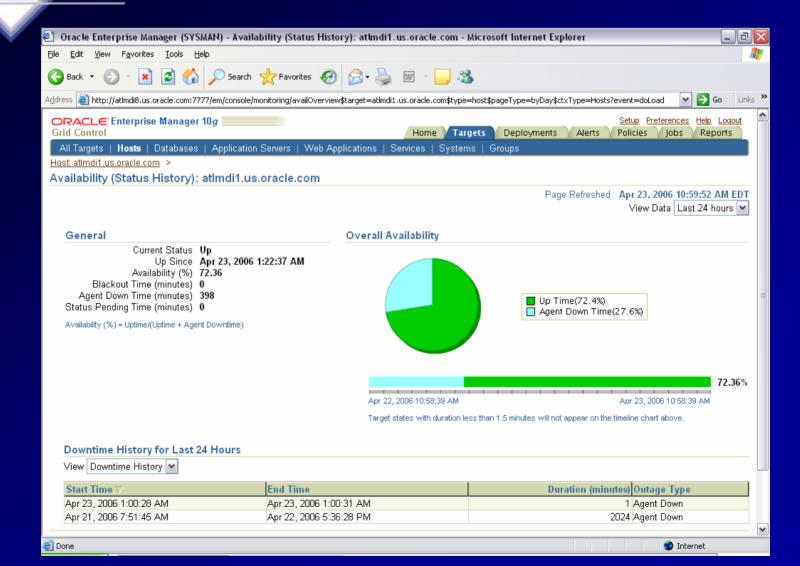


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Grid Control – 10gR2; Host Availability & Quick Looks!



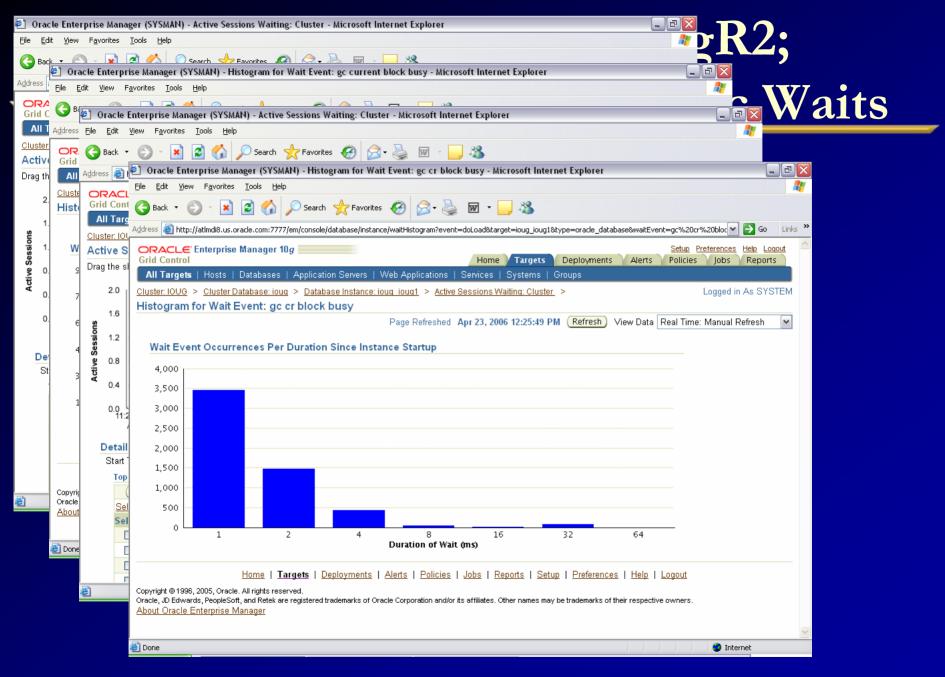
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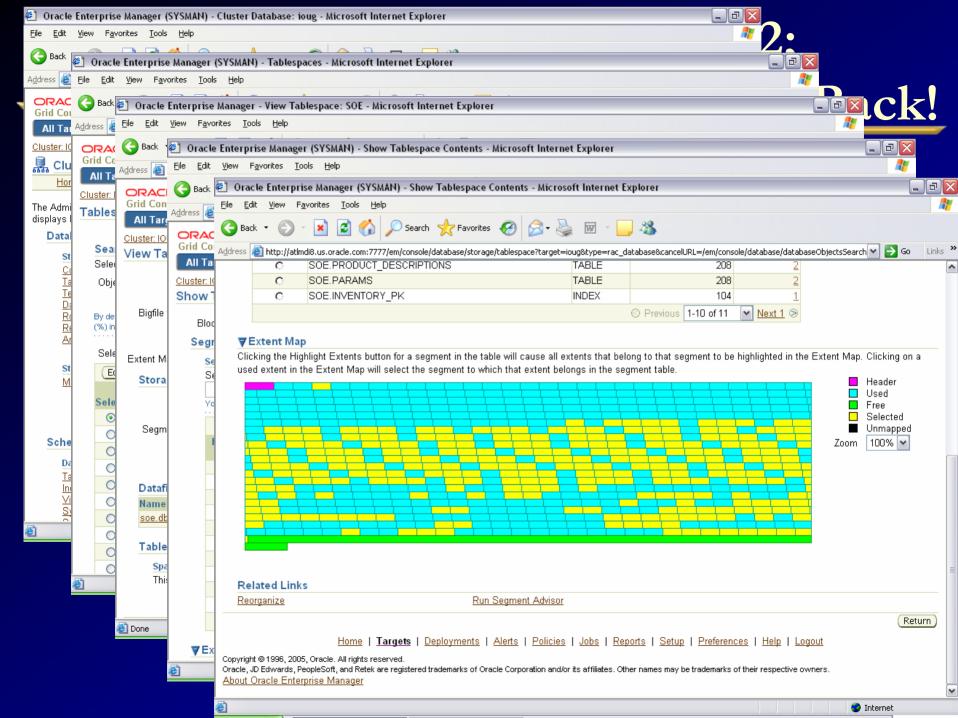
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Investigate Reaction To Changes



All Events Sorted by Timestamp

		Timestamp 🛛 🛡	Change Type	Object	Change Details	
E		Apr 21, 2004 14:07	Execution plan changed		Cost = 33	
	2	Apr 21, 2004 14:05	Statistics changed	Employee	num_rows=375314	
E	2	Apr 18, 2004 17:21	Statistics changed	Employee	num_rows=53211	



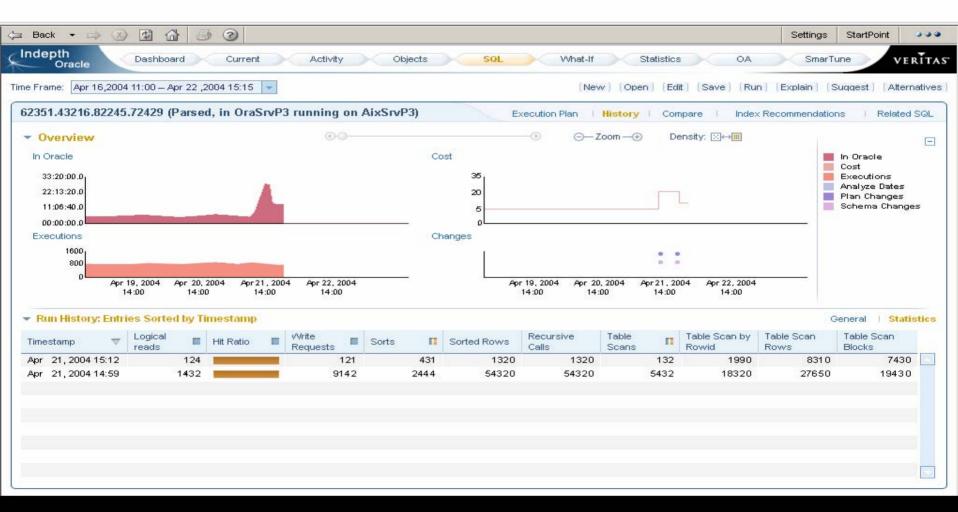


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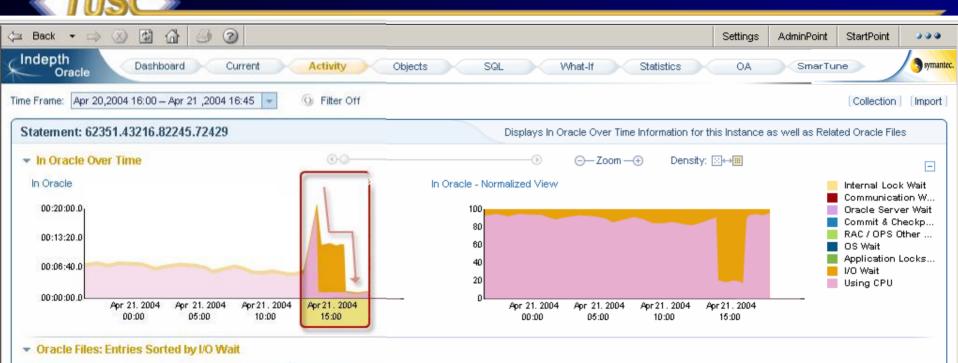
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To examine the original statement's execution plan, click <u>here.</u>	1) 1) 1) 1)	SIGAL.EMPLOYEE SIGAL.PROJECT SIGAL.EMPLOYEE	Create index(Norma Analyze table Analyze table			Original Statement: 62351.43216.82245.72429 Recommendation: Create index(Normal) Table / Index: SIGAL.DEPARTMENT Columns: MGRNO Created: Apr 21, 2004 15:10
						To examine the original statement's execution plan, click <u>here.</u>



Verify Solution



Verify Improvements



Oracle File	I/O VVait	▼ П	I/O Wait - Direct	I/O VVait - Scattered	I/O Wait - Sequential	I/O Wait - Other	
/Ora1_1/oracle8_1_7/dbs/DBProd_A_HR_tab.dbf			00:00:00.0	00:00:00.0	00:22:00.0	01:48:21.6	*
/Ora8_3/oracle8_1_7/dbs/DBProd_E_HR_ind.dbf	1		00:00:00.0	00:00:00.0	00:00:05.0	00:00:25.2	

Rank Findings

🖃 Back 🝷 🖙 🐼 🕼) 🤉			Settings AdminPoint StartPoint				
Indepth Oracle Dashboard	Cur	rrent	Activity	Objects SQL What-If Statistics SmarTune				
ime Frame: Jun 06,2004 12:00 - Jun 07,20	004 12:5	59 💌 In:	stance: OraSrvP	I(HpSrvP1)				
Findings				Changes Instance				
Finding	Rank	Potential Gain (%)	Occurrenc	Shared pool too small or not configured properly				
Shared pool too small or not configured	0	18.15%	307 🔼	Highlights Advice Shared pool waits and statistics Background				
SQL*Net overhead due to application e	0	9.08%	302					
Insufficient shared server processes	0	7.43%	263					
Too many small transactions	×	5.78%	413	Your application is waiting 18.15% of the time for shared pool-related resources, 10.70% out of which				
Extent management contention for obje	×	5.45%	11	are due to reloads.				
Block ITL contention or unique index ke	×	5.23%	12					
Hot block	A	4.24%	1	More Information				
Too many hard parsed statements	A	3.54%	413					
Extent management contention during s	A	2.27%	415	To learn more about the situation and what can be done, click the Advice tab.				
Inefficient cursor caching	A	2.21%	2	For background information about the shared pool and its role in performance tuning, click the <u>Background</u> tab.				
				Quick Links				
				To examine the size of your shared pool, open the <u>Objects workspace.</u> To examine how your application is waiting for shared pool-resources and how this is related to parsing, click the <u>Parse Waits and Statistics tab.</u>				

Provide Expert Advice

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Indepth Oracle Dashboard Current Activity Objects SQL What-If Statistics	SmarTune	2		symantec.
Time Frame: Jun 06,2004 12:00 - Jun 07,2004 12:59 💌 Instance: OraSrvP1(HpSrvP1) 💌				
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Finding	Rank	Potential Gain (%)	Occurrenc	
Shared pool too small or not configured	0	18.15%	307	~
SQL*Net overhead due to application e	0	9.08%	302	
Insufficient shared server processes	0	7.43%	263	
Too many small transactions	×	5.78%	413	
Extent management contention for obje	×	5.45%	11	
Block ITL contention or unique index ke	×	5.23%	12	
Hot block	4	4.24%	1	
Too many hard parsed statements	-	3.54%	413	
Extent management contention during s	4	2.27%	415	
Inefficient cursor caching	-	2.21%	2	

Shared pool too small or not configured properly

Highlights | Advice | Shared pool waits and statistics | Background

To improve performance, choose the approach that best fits your needs. Following is a list of possible solutions:

*

- · Increase your shared pool size by doing one of the following:
 - In Oracle 9i and higher, run the command alter system set shared pool size=XXXXXX.
 - Increase the shared_pool_size init parameter.

Pin heavily used PL/SQL packages by running dbms_shared_pool.keep(`xxxxxx');.
 Note: If you increase the total size of your SGA, make sure not to exceed the available physical memory of the Oracle server, to avoid paging.

Consider also one of the following actions:

- Make sure objects are not analyzed too frequently, unless there is a significant change in their content.
- · Avoid using synonyms. Instead, do one of the following:
 - Use fully qualified names, such as APPS.TAB1, in your SQL statements.
 - Run the following command to make your application change from the current schema to the schema that owns all objects: alter session set current_schema=APPS

See Also

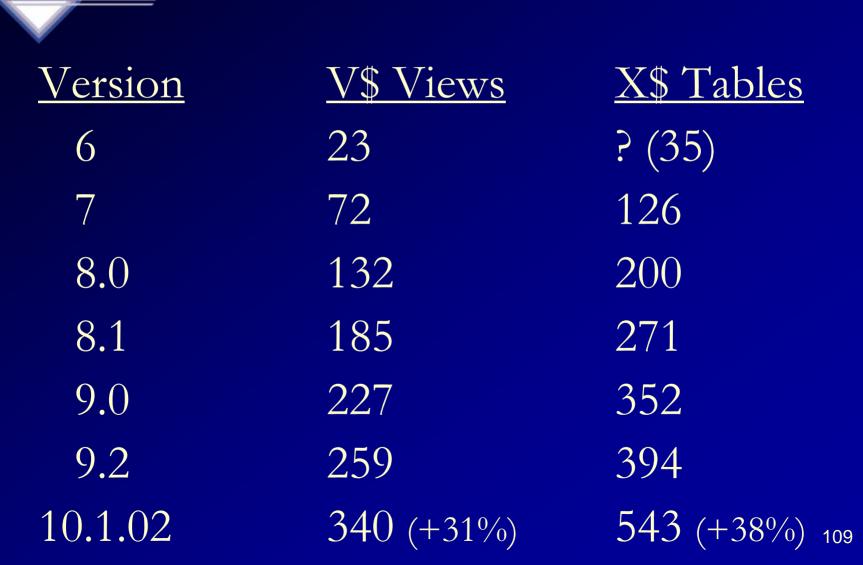
To examine the size of your shared pool, open the Objects workspace.

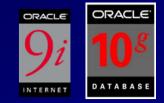
To examine how your application is waiting for shared pool resources and how this is related to parsing, click the Parse Waits and Statistics tab.

Helpful V\$/X\$ Queries (FYI Only)



V\$ Views over the years





select from where order by

name v\$fixed_table name like 'GV%' name;

Listing of V\$ Views

NAME

GV\$ACCESS GV\$ACTIVE_INSTANCES GV\$ACTIVE_SESS_POOL_MTH GV\$AQ1 GV\$ARCHIVE...



select inst_id, (1 - (sum(decode(name, 'physical reads',value,0)) /
 (sum(decode(name, 'db block gets',value,0)) +
 sum(decode(name, 'consistent gets',value,0))))) * 100 'Hit Ratio''
from v\$sysstat;

INST_ID Hit Ratio

1 90.5817699



INST_ID Hit Ratio

1 90.5817699 2 96.2034537

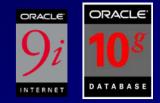


where view_name = 'GV\$INDEXED_FIXED_COLUMN';

<u>VIEW NAME</u> gv\$indexed_fixed_column

VIEW DEFINITION

select c.inst_id, kqftanam, kqfcoidx, kqfconam,kqfcoipo from X\$kqfco c, X\$kqftat where t.indx = c.kqfcotab and kqfcoidx != 0



Listing of X\$ Tables

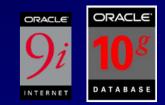
select from where order by

name v\$fixed_table name like 'X%' name;

NAME

X\$ACTIVECKPT X\$BH X\$BUFQM X\$CKPTBUF X\$CLASS_STAT...

Listing of X\$ Indexes (419 in 10g; 326 in 9i)



select

from order by table_name, index_number, column_name
gv\$indexed_fixed_column
table_name, index_number, column_name,
column_position;

 TABLE_NAME
 INDEX_NUMBER COLUMN_NAME

X\$CLASS_STAT X\$CLASS_STAT X\$DUAL X\$DUAL ADDR
 INDX
 ADDR
 INDX ...

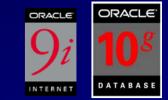
115



SQL> select * from v\$version;

BANNER

Oracle Database 10g Enterprise Edition Release 10.1.0.2.0 – Prod PL/SQL Release 10.1.0.2.0 – Production CORE 10.1.0.2.0 Production TNS for 32-bit Windows: Version 10.1.0.2.0 – Production NLSRTL Version 10.1.0.2.0 – Production







from v\$option;

PARAMETER



PartitioningTRUEObjectsTRUEReal Application ClustersFALSEAdvanced ReplicationTRUEBit-Mapped IndexesTRUE



select event, sum(decode(wait_time,0,1,0)) 'Waiting Now'',
 sum(decode(wait_time,0,0,1)) 'Previous Waits'',
 count(*) 'Total''
from v\$session_wait
group by event
order by count(*);

 $WAIT_TIME = 0$ means that it's waiting $WAIT_TIME > 0$ means that it previously waited this many ms

Great V\$ - V\$SESSION_WAIT

EVENT

Waiting Now Previous Waits Total

db file sequential read	0	1	1
db file scattered read	2	0	2
latch free	0	1	1
enqueue	2	0	2
SQL*Net message from client	0	254	480

V\$SESSION_WAIT Finding Current Specific waits

/*+ ordered */ sid, event, owner, segment_name,

Buffer Busy Waits or Write Complete Waits Events:

SELECT

FROM WHERE AND segment_type,p1,p2,p3
v\$session_wait sw, dba_extents de

HERE de.file_id = sw.p1

Sw.p2 between de.block_id and de.block_id+de.blocks – 1

AND (event = 'buffer busy waits'

OR event = 'write complete waits')

AND p1 IS NOT null

ORDER BY event, sid;

V\$EVENT_NAME Finding P1, P2, P3



- col name for a20
- col p1 for a10
- col p2 for a10
- col p3 for a10
- select event#,name,parameter1 p1,parameter2 p2,parameter3 p3 from v\$event name
- where name in ('buffer busy waits', 'write complete waits')EVENT# NAMEP1P2P3

143 write complete waitsfile#block#145 buffer busy waitsfile#block#id

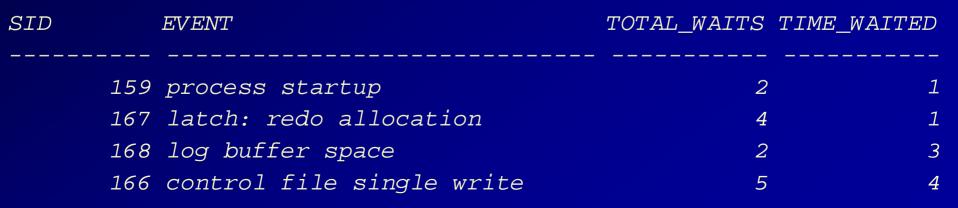
V\$ - V\$SESSION_WAIT_HISTORY (Last 10 waits for session)

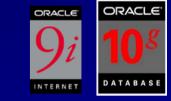
ORACLE

Buffer Busy	Waits or Write Complete Waits Events:	TABASE
SELECT	/*+ ordered */ sid, event, owner, segment_nam	e,
	segment_type,p1,p2,p3	
FROM	v\$session_wait_history sw, dba_extents de	
WHERE	$de.file_id = sw.p1$	
AND	sw.p2 between de.block_id	
	and de.block_id+de.blocks – 1	
AND	(event = 'buffer busy waits'	
	OR event = 'write complete waits')	
AND	p1 IS NOT null	
ORDER BY	event, sid;	22

Great V\$ - V\$SESSION_EVENT (waiting since the session started)

select sid, event, total_waits, time_waited, event_id from v\$session_event where time_waited > 0 order by time_waited;





V\$ - V\$SESSION_WAIT_CLASS
(session waits by WAIT CLASS)

select wait_class, total_waits
from v\$system_wait_class;

SID WAIT_CLASS

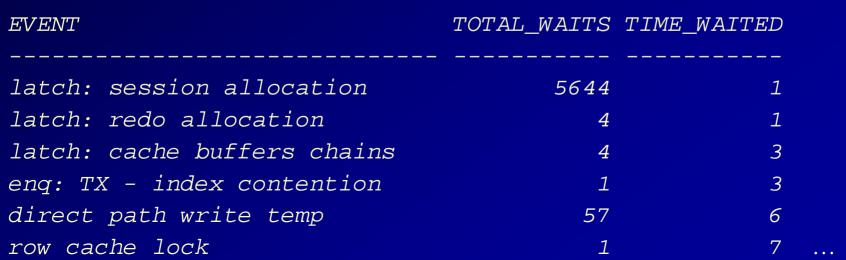
TOTAL_WAITS

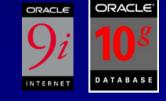
147	Idle	6582
150	Idle	138
153	Application	10
153	Administrative	1
153	Idle	47
153	Network	48
153	User I/O	4
153	System I/O	33



Great V\$ - V\$SYSTEM_EVENT (waits since the instance started)

select sid, event, total_waits, time_waited, event_id from v\$system_event where time_waited > 0 order by time_waited;





V\$ - V\$SYSTEM	_WAIT_	_CLASS
(system waits by	WAIT (CLASS)

select wait_class, total_waits
from v\$system_wait_class;

WAIT_CLASS

TOTAL_WAITS

Other	545472
Application	105
Configuration	92
Administrative	1
Concurrency	30
Commit	793
Idle	186169
Network	385
User I/O	16017
Custom 1/0	<u> Э Г И 7 0</u>

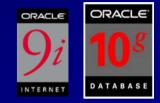


Great V\$ - V\$OPEN_CURSOR (Added sql_id in 10g)

select sid, count(*) from v\$open_cursor group by sid having count(*) > 300order by count(*) desc; SID 1 8

9

select sid, sql_id, count(*)
from v\$open_cursor
group by sid, sql_id
order by count(*);



СО	UNT(*)	SID CO	UNT(*) SQL_ID
1	450	11	2 9tdqgnq7gd5cf
)	320	11	1 a1xgtxssv5rrp
)	301	11	1 attwbvtyu8x5c





select sum(pct_bufgets) percent
from (select rank() over (order by buffer_gets desc) as rank_bufgets,
 to_char(100 * ratio_to_report(buffer_gets) over (), '999.99')
 pct_bufgets
from v\$sqlarea)
where rank_bufgets < 11;
PERCENT</pre>

97.07

Great V\$ - V\$SQLAREA or V\$SQL

<u>User1:</u>



SQL> conn system/manager SQL> create table emp as select * from scott.emp; SQL> lock table emp in exclusive mode;

<u>User 2:</u>

SQL> conn system/manager SQL> lock table emp in exclusive mode;

<u>User 3:</u>

SQL> connect scott/tiger SQL> lock table emp in

Great V\$ - V\$SQLAREA or V\$SQL

select sql_text, users_executing, executions, users_opening
from v\$sqlarea
where sql_text like 'lock table emp%';

SQL_TEXT

USERS_EXEC EXEC USERS_OPEN

2

lock table emp in exclusive mode

1

3

Great V\$ - V\$SQLAREA or V\$SQL

select sql_text, users_executing, executions, users_opening
from v\$sql
where sql_text like 'lock table emp%';

SQL_TEXT

USERS_EXEC EXEC USERS_OPEN

1

lock table emp in exclusive mode lock table emp in exclusive mode



V\$ - What Users are doing...

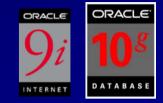
select a.sid, a.username, s.sql_text
from v\$session a, v\$sqltext s
where a.sql_address = s.address
and a.sql_hash_value = s.hash_value
order by a.username, a.sid, s.piece;

SID USERNAME SQL_TEXT

11 PLSQL_USERupdate s_employee set salary = 100009 SYSselect a.sid, a.username, s.sql_text9 SYSfrom v\$session a, v\$sqltext9 SYSwhere a.sql_address = s.address(...partial output listing)

Great V\$ - V\$SEGMENT_STATISTICS

select object_name, statistic_name, value
from v\$segment_statistics
where value > 100000
order by value;



133

OBJECT_NAME STATISTIC_NAME VALUE

ORDERS ORDERS ORDERS ORDER LINES

space allocated96551space allocated134181logical reads140976db block changes183600

AWR – Segments by Buffer Busy Waits



Segments by Buffer Busy Waits

- · % of Capture shows % of Buffer Busy Waits for each top segment compared
- with total Buffer Busy Waits for all segments captured by the Snapshot

Owner	Tablespace Name	Object Name	Subobject Name	Obj. Type	Buffer Busy Waits	% of Capture
				TABLE PARTITION	1,243,890	89.24
				INDEX PARTITION	39,258	2.82
				INDEX PARTITION	33,780	2.42
1				INDEX PARTITION	28,563	2.05
				INDEX PARTITION	26,637	1.91

Back to Segment Statistics Back to Top

Segments by Global Cache Buffer Busy

- · % of Capture shows % of GC Buffer Busy for each top segment compared
- · with GC Buffer Busy for all segments captured by the Snapshot

Owner	Tablespace Name	Object Name	Subobject Name	Obj. Type	GC Buffer Busy	% of Capture
SYS	SYSTEM	UNDO\$		TABLE	21	100.00

AWR – Segments by Logical Reads



Segments by Logical Reads

- Total Logical Reads: 225,112,503
- Captured Segments account for 90.9% of Total

Owner	Tablespace Name	Object Name	Subobject Name	Obj. Type	Logical Reads	%Total
				INDEX PARTITION	59,714,336	26.53
1				INDEX PARTITION	48,936,144	21.74
			1	INDEX PARTITION	40,319,312	17.91
				INDEX PARTITION	23,612,368	10.49
				INDEX PARTITION	20,381,072	9.05

Back to Segment Statistics Back to Top

Segments by Physical Reads

- Total Physical Reads: 1,722
- Captured Segments account for 41.1% of Total

	Owner	Tablespace Name	Object Name	Subobject Name	Obj. Type	Physical Reads	%Total
	1				INDEX PARTITION	275	15.97
					INDEX PARTITION	164	9.52
1					INDEX PARTITION	97	5.63
i		Ten + + + + + + + + + + + + + + + + + + +	1 M 1 C 1 MIL 199 1 199 1 199 1 199				



- SELECTROUND((cpodr_bno/lesiz),2)*100 | |'%'PctCurLogFull
- FROM X\$kcccp a, X\$kccle b
- WHERE a.cpodr_seq = b.leseq;

PCTCURLOGFULL



alter system switch logfile; System altered.

- SELECT ROUND((cpodr_bno/lesiz),2)*100 | |'%' PctCurLogFull
- FROM X\$kcccp a, X\$kccle b
- WHERE a.cpodr_seq = b.leseq;

PCTCURLOGFULL



select * from v\$file_histogram;

FILE# SINGLEBLKRDTIM_MILLI SINGLEBLKRDS

1	1	900
1	2	120
1	4	131
1	8	359
1	16	1072
1	32	1752
•••		
2	1	3
2	2	1
2	4	2
2	8	17

Block Dumps (fyi)

Dec	H	Oct	Cha	r	Dec	Hx	Oct	Html	Chr	Dec	Hx	Oct	Html	Chr	Dec	: Hx	Oct	Html Cl	hr
0	0	000	NUL	(null)	32	20	040	&# 32;	Space	64	40	100	@	0	96	60	140	& #96;	1
1	1	001	SOH	(start of heading)	33	21	041	∉#33;	1.00	65	41	101	A	A	97	61	141	 ∉#97;	a
2	2	002	STX	(start of text)	34	22	042	∝# 34;	**	66	42	102	B	в	98	62	142	 ∉98;	b
3	3	003	ETX	(end of text)	35	23	043	∝# 35;	#	67	43	103	C	С	99	63	143	 ∉#99;	С
4	4	004	EOT	(end of transmission)	36	24	044	 ∉36;	ę.	68	44	104	 4#68;	D	100	64	144	d	d
5	5	005	ENQ	(enquiry)	37	25	045	∉#37;	*	69	45	105	 ‰#69;	Е	101	65	145	e	e
6	6	006	ACK	(acknowledge)	38	26	046	 ∉38;	6	70	46	106	 ∉#70;	F	102	66	146	<i>%#</i> 102;	f
7	7	007	BEL	(bell)	39	27	047	∝# 39;	1.00	71	47	107	G	G	103	67	147	«#103;	g
8	8	010	BS	(backspace)				∝#40;		72	48	110	H	н				¢#104;	
9	9	011	TAB	(horizontal tab)	41	29	051))	73	49	111	«#73;	I	105	69	151	i	i
10	A	012	LF	(NL line feed, new line)	42	2A	052	&#42;</td><td>*</td><td>74</td><td>4A</td><td>112</td><td>J</td><td>J</td><td>106</td><td>6A</td><td>152</td><td>j</td><td>Ĵ.</td></tr><tr><td>11</td><td>В</td><td>013</td><td>VT</td><td>(vertical tab)</td><td>43</td><td>2B</td><td>053</td><td>+</td><td>+</td><td>75</td><td>4B</td><td>113</td><td>∉#75;</td><td>K</td><td>107</td><td>6B</td><td>153</td><td>k</td><td>k</td></tr><tr><td>12</td><td>С</td><td>014</td><td>FF</td><td>(NP form feed, new page)</td><td>44</td><td>2C</td><td>054</td><td>,</td><td>100</td><td>76</td><td>4C</td><td>114</td><td>&#76;</td><td>\mathbf{L}</td><td>108</td><td>6C</td><td>154</td><td>l</td><td>1</td></tr><tr><td>13</td><td>D</td><td>015</td><td>CR</td><td>(carriage return)</td><td>45</td><td>2D</td><td>055</td><td>-</td><td></td><td>77</td><td>4D</td><td>115</td><td>&#77;</td><td>М</td><td>109</td><td>6D</td><td>155</td><td>m</td><td>m</td></tr><tr><td>14</td><td>Ε</td><td>016</td><td>S0 -</td><td>(shift out)</td><td>46</td><td>2E</td><td>056</td><td>.</td><td>1.1</td><td>78</td><td>4E</td><td>116</td><td>&#78;</td><td>N</td><td>110</td><td>6E</td><td>156</td><td>n</td><td>n</td></tr><tr><td>15</td><td>F</td><td>017</td><td>SI</td><td>(shift in)</td><td>47</td><td>2F</td><td>057</td><td>/</td><td>1</td><td>79</td><td>4F</td><td>117</td><td>&#79;</td><td>0</td><td>111</td><td>6F</td><td>157</td><td>o</td><td>0</td></tr><tr><td>16</td><td>10</td><td>020</td><td>DLE</td><td>(data link escape)</td><td>48</td><td>30</td><td>060</td><td>«#48;</td><td>0</td><td>80</td><td>50</td><td>120</td><td><i>‱</i>#80;</td><td>P</td><td>112</td><td>70</td><td>160</td><td>p</td><td>p</td></tr><tr><td>17</td><td>11</td><td>021</td><td>DC1</td><td>(device control 1)</td><td>49</td><td>31</td><td>061</td><td>1</td><td>1</td><td>81</td><td>51</td><td>121</td><td>Q</td><td>Q</td><td>113</td><td>71</td><td>161</td><td>q</td><td>q</td></tr><tr><td>18</td><td>12</td><td>022</td><td>DC2</td><td>(device control 2)</td><td>50</td><td>32</td><td>062</td><td>2</td><td>2</td><td>82</td><td>52</td><td>122</td><td>&#82;</td><td>R</td><td>114</td><td>72</td><td>162</td><td>r</td><td>r</td></tr><tr><td>19</td><td>13</td><td>023</td><td>DC3</td><td>(device control 3)</td><td>51</td><td>33</td><td>063</td><td>3</td><td>3</td><td>83</td><td>53</td><td>123</td><td>S</td><td>S</td><td>115</td><td>73</td><td>163</td><td>s</td><td>s</td></tr><tr><td>20</td><td>14</td><td>024</td><td>DC4</td><td>(device control 4)</td><td>52</td><td>34</td><td>064</td><td>∝#52;</td><td>4</td><td>84</td><td>54</td><td>124</td><td>T</td><td>Т</td><td>116</td><td>74</td><td>164</td><td>t</td><td>t</td></tr><tr><td>21</td><td>15</td><td>025</td><td>NAK</td><td>(negative acknowledge)</td><td>53</td><td>35</td><td>065</td><td>∉#53;</td><td>5</td><td>85</td><td>55</td><td>125</td><td>U</td><td>U</td><td>117</td><td>75</td><td>165</td><td>u</td><td>u</td></tr><tr><td>22</td><td>16</td><td>026</td><td>SYN</td><td>(synchronous idle)</td><td>54</td><td>36</td><td>066</td><td>6</td><td>6</td><td>86</td><td>56</td><td>126</td><td>V</td><td>V</td><td>118</td><td>76</td><td>166</td><td>v</td><td>v</td></tr><tr><td>23</td><td>17</td><td>027</td><td>ETB</td><td>(end of trans. block)</td><td>55</td><td>37</td><td>067</td><td>7</td><td>7</td><td>87</td><td>57</td><td>127</td><td>W</td><td>W</td><td>119</td><td>77</td><td>167</td><td>w</td><td>W</td></tr><tr><td>24</td><td>18</td><td>030</td><td>CAN</td><td>(cancel)</td><td>56</td><td>38</td><td>070</td><td>∝#56;</td><td>8</td><td>88</td><td>58</td><td>130</td><td>X</td><td>Х</td><td>120</td><td>78</td><td>170</td><td>x</td><td>x</td></tr><tr><td>25</td><td>19</td><td>031</td><td>EM</td><td>(end of medium)</td><td>57</td><td>39</td><td>071</td><td>∝#57;</td><td>9</td><td>89</td><td>59</td><td>131</td><td>Y</td><td>Y</td><td>121</td><td>79</td><td>171</td><td>y</td><td>Y</td></tr><tr><td>26</td><td>1A</td><td>032</td><td>SUB</td><td>(substitute)</td><td>58</td><td>ЗA</td><td>072</td><td>∉58;</td><td>1 C</td><td>90</td><td>5A</td><td>132</td><td>Z</td><td>Z</td><td>122</td><td>7A</td><td>172</td><td>z</td><td>z</td></tr><tr><td>27</td><td>1B</td><td>033</td><td>ESC</td><td>(escape)</td><td>59</td><td>ЗB</td><td>073</td><td>∉#59;</td><td>2</td><td>91</td><td>5B</td><td>133</td><td>&#91;</td><td>E</td><td>123</td><td>7B</td><td>173</td><td>{</td><td>- {</td></tr><tr><td>28</td><td>1C</td><td>034</td><td>FS</td><td>(file separator)</td><td>60</td><td>ЗC</td><td>074</td><td>∝#60;</td><td><</td><td>92</td><td>5C</td><td>134</td><td>&#92;</td><td>Λ.</td><td>124</td><td>7C</td><td>174</td><td> </td><td>1</td></tr><tr><td>29</td><td>1D</td><td>035</td><td>GS</td><td>(group separator)</td><td>61</td><td>ЗD</td><td>075</td><td>l;</td><td>=</td><td>93</td><td>5D</td><td>135</td><td>&#93;</td><td>1</td><td>125</td><td>7D</td><td>175</td><td>}</td><td>-}</td></tr><tr><td>30</td><td>1E</td><td>036</td><td>RS</td><td>(record separator)</td><td>62</td><td>ЗE</td><td>076</td><td>></td><td>></td><td>94</td><td>5E</td><td>136</td><td>&#94;</td><td>~</td><td>126</td><td>7E</td><td>176</td><td>~</td><td>~</td></tr><tr><td>31</td><td>lF</td><td>037</td><td>US</td><td>(unit separator)</td><td>63</td><td>ЗF</td><td>077</td><td>?</td><td>2</td><td>95</td><td>5F</td><td>137</td><td>&#95;</td><td>_</td><td>127</td><td>7F</td><td>177</td><td></td><td>DEL</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>۰.</td><td></td><td></td><td></td><td>مامم ا</td><td>un Tables</td><td></td></tr></tbody></table>											

	A	E	I	0	U	A2	02	U2
	Ч	A	뿌	ß	f	C		
D	F	ĥ	i		Ж			
J		χ			∕₽			
к	\oplus	¥	¥	Ŷ	3			
М	Δ	ľ	y					
Ν	Ξ	Ŧ	***		H			
Ρ	+		本	ſ	ų	Ŷ		₩
Q	Ŷ	\odot	٩					
R	٦	Ψ	2	+	မှ	X		
S	Ý	۳	4		C			
Т	C	*	Λ	Ŧ	Φ	Ÿ		
W	Ħ		Æ					
Ζ	Ŷ	Ŀ		Ť	Ð			
	Other s	symbols	3	-	Unclas	sified s	ymbols	;
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Source: www.LookupTables.com

Last Resort - Block Dumps

select file_id, block_id, blocks
from dba_extents
where segment_name = 'EMP'
and owner = 'SCOTT';

FILE_IDBLOCK_IDBLOCKS1504653

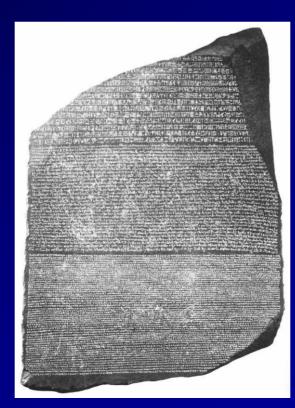
Last Resort - Block Dumps

ALTER SYSTEM DUMP DATAFILE 5 BLOCK 50465 / ALTER SYSTEM DUMP DATAFILE 5 BLOCK 50466 / ALTER SYSTEM DUMP DATAFILE 5 BLOCK 50467 / Or...

ALTER SYSTEM DUMP DATAFILE 5 BLOCK MIN 50465 BLOCK MAX 50467;

(Puts output in user_dump_dest)

Block Dump: Data Section





7934 MILLER CLERK 7782 23-JAN-82 1300 10

Block Dumps – output from udump

```
tab 0, row 13, @0x1b0b
tl: 39 fb: --H-FL-- lb: 0x0 cc: 8
col 0: [3] c2 50 23
col 1: [6] 4d 49 4c 4c 45 52
col 2: [5] 43 4c 45 52 4b
col 3: [3] c2 4e 53
col 4: [7] 77 b6 01 17 01 01 01
col 5: [2] c2 0e
col 6: *NULL*
col 7: [2] c1 0b...
```

Block Dumps – Data Section

DUMP OUTPUT - EMPNO: col 0: [3] c2 50 23

Hex to Decimal:Col0 = EMPNO = 793450 (Hex) = 80 (Decimal) - 1 = 7923 (Hex) = 35 (Decimal) - 1 = 34c2: Number in the thousands (c2 is exponent)

Block Dumps – Data Section

DUMP OUTPUT - ENAME:

- col 1: [6] (4d 49 4c 4c 45 52
- Hex to Character:

Col1 = ENAME = MILLER

- 4d (Hex) = M (Character)
- 49 (Hex) = I (Character)
- 4c (Hex) = L (Character)
- 4c (Hex) = L (Character)
- 45 (Hex) = E (Character)
- 52 (Hex) = R (Character)

Transactions Moving through Oracle: ITL & Undo Blocks







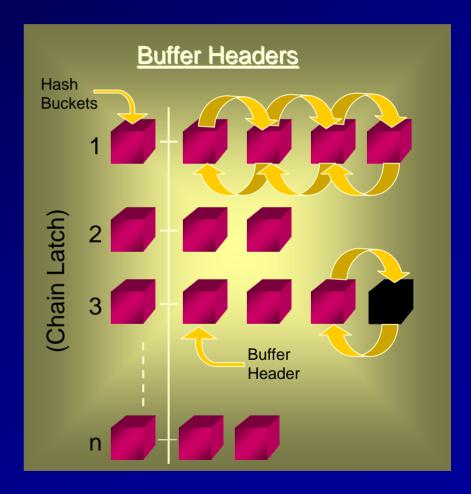
Working with Hash Buckets And Buffer Headers (not buffers)

• Users asks for a specific data block address.

• This is hashed with a hashing algorithm and placed in the hash bucket that it hashes to.

• It walks the hash chain using the cache buffers chain latch to find the block that it needs (curr or cr).

• There can be many versions of each block



_DB_BLOCK_HASH_BUCKETS and hashing data block addresses

Example: _DB_BLOCK_HASH_BUCKETS (shouldn't have to change this in Oracle9i or 10g)

- Buffer hash table (x\$bh) has all buffer headers for all db_block buffers.
- Buffer header ties to memory base address of the buffer.
- Buckets usually set to Prime(2*db_block_buffers)
- A prime number is often used to avoid hashing anomalies
- Objects dba (class) is hashed to a hash bucket on the hash chain
- Get enough hash buckets (_db_block_hash_buckets)
- Blocks assigned to a hash bucket and onto the hash chain
- Could have multiple blocks hashed to same chain (if both hot-issues)
- Can have multiple versions of a block on same chain
- When block is replaced (based on LRU chain) new block comes in and could be (probably will be) hashed to a different hash chain. 149

Query all buffer headers (state):

col status for a6 select state, decode(state, 0, 'FREE', 1, 'XCUR', 2, 'SCUR', *3*, 'CR', 4, 'READ', 5, 'MREC', 6, 'IREC', 7, WRITE', 8, PIN') status, count(*) from x\$bh

group by state;

STATE STATUS COUNT(*) 1 XCUR 2001 3 CR 3 /* not currently is use */
/* held exclusive by this instance */
/* held shared by this instance */
/* only valid for consistent read */
/* is being read from disk */
/* in media recovery mode */
/* in instance(crash) recovery mode */
/* being written */
/* pinned */

EMP1 is Block#: 56650 (all rows are in this block)

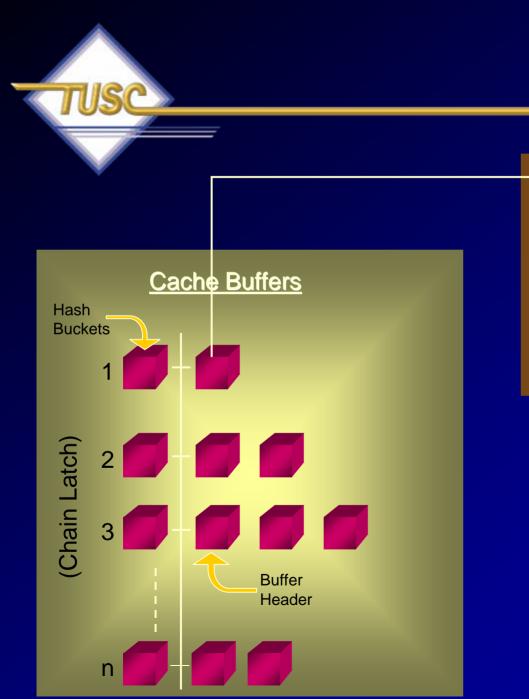
select	<pre>select rowid,empno, dbms_rowid.rowid_relative_fno(rowid) fileno, dbms_rowid.rowid_block_number(rowid) blockno, dbms_rowid.rowid_row_number(rowid) rowno, rownum, rpad(to_char(dbms_rowid.rowid_block_number(rowid), 'FM0xxxxxx') '.' to_char(dbms_rowid.rowid_row_number (rowid), 'FM0xxx') '.' to_char(dbms_rowid.rowid_relative_fno(rowid), 'FM0xxx'), 18) myrid</pre>									
from ROWID	emp1;	EMPNO	FILENO	BLOCKNO	ROWNO	ROWNUM				
MYRID										
	AABAAAN1KAAA 4a.0000.0001	7369	1	56650	0	1				
	AABAAAN1KAAB 4a.0001.0001	7499	1	56650	1	2				
	AABAAAN1KAAN 4a.000d.0001	7934	1	56650	13	14				

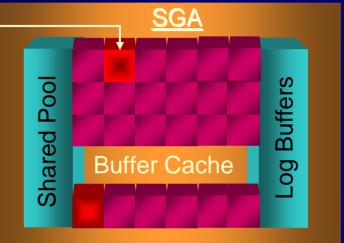
14 rows selected.

Let's watch the EMP1 buffer header (So far it's clean and only 1 copy)

152

LRBA_SEQ	STATE	DBARFIL	DBABLK	TCH	FLAG	HSCN_BAS
CR_SCN_BAS	DTPSDN					
0	<u>1</u>	1	56650	0	35659776	4294967295
0	<u>N N N N N</u>					





Only ONE block. on the Hash Chain!

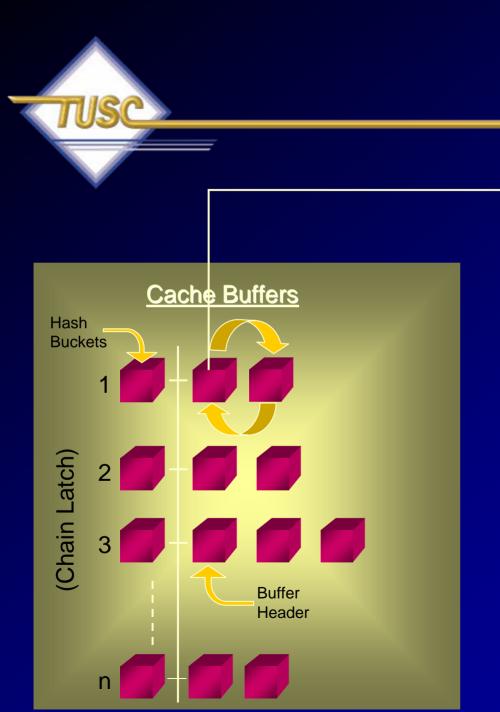
Let's watch the EMP1 buffer header (Delete a row)

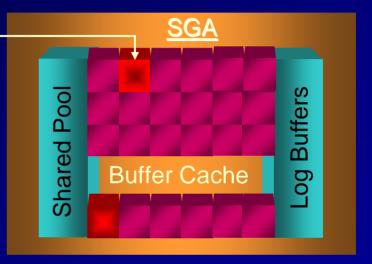
delete from emp1where comm = 0;

one row deleted.

Let's watch the EMP1 buffer header (Make some changes 2 copies)

	HSCN_BAS	FLAG	ТСН	DBABLK	DBARFIL	STATE	LRBA_SEQ
						DTPSDN	CR_SCN_BAS
	4294967295	8200	1	56650	1	1	0
						N N N N N N	0
155	0	524288	2	56650	1	3	0
100	U	524200	4	50050			
						NNNNNN	4347881





Hash Chain is now TWO! One is a CR and the other is Current.

V\$Transaction now has our record (created when transactions have undo)

SELECT t.addr, t.xidusn USN, t.xidslot SLOT, t.xidsqn SQL, t.status, t.used_ublk UBLK, t.used_urec UREC, t.log_io LOG, t.phy_io PHY, t.cr_get, t.cr_change CR_CHA FROM v\$transaction t, v\$session s

WHERE t.addr = s.taddr;

ADDR	USN	SLOT	SQL STAT	'US	UBLK
UREC	LOG	РНҮ	CR_GET	CR_CHA	
69E50E5C 1	 5 3	42 0	652 ACTI 3	IVE 0	1

USN is the Undo Segment Number (rollback segment ID) SLOT is the slot number in the rollback segment's transaction table. SQN (Wrap) is the sequence number for the transaction. USN+SLOT+SQN are the three values that uniquely identifies a transaction XID

Dump the block



<u>Dump the block</u>

 Itl
 Xid
 Uba
 Flag
 Lck
 Scn/Fsc

 0x01
 0x0005.02a.0000028c
 0x008000af.02b6.01
 --- 1
 fsc
 0x0029.00000000

 0x02
 0x0004.016.0000
 0fae
 0x00800
 0cc.08af.34
 C-- 0
 son
 0x0000.003
 deb5b

ITL – 2 Interested Transaction Lists

 $\frac{\text{Transaction ID}}{\text{Undo } 5 = 5 \text{ (decimal)}}$ $\frac{\text{Slot } 2a = 42 \text{ (decimal)}}{\text{SEQ } 28\text{C} = 652}$

Committed Transaction

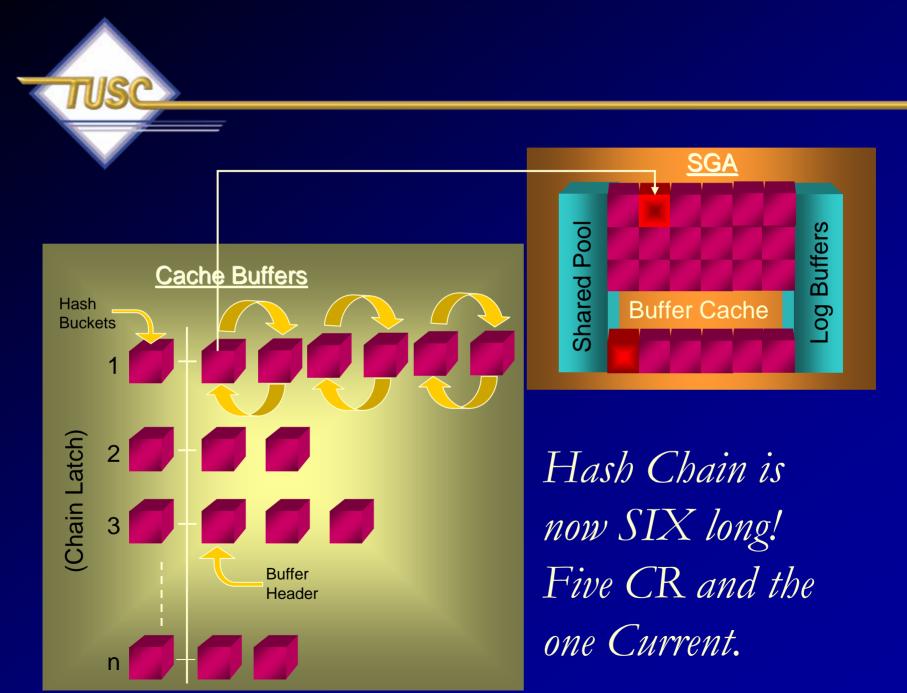
The row I deleted is still locked; fsc is 0x29 = 41 bytes

<u>UBA:</u>

File.block.sequence.record Undo block address where last change is recorded.

Insert in 3 other sessions & drive x\$bh up to the max of 6 versions of block

0
0
4350121
0
0
0



Why only 6 versions of a Block?

select	a.ksppinm, b.ksppstvl, b.ksppstdf, a.ksppdesc
from	x\$ksppi a, x\$ksppcv b
where	a.indx = b.indx
and	$substr(ksppinm, 1, 1) = '_'$
and	ksppinm like '%&1%'
order by	ksppinm;

KSPPSTVL	
KSPPSTDF	
KSPPDESC	
_db_block_max_cr_dba 6	
TRUE Maximum Allowed Number of CR buffers per dba	161

What happens after we roll everything back – x\$bh Still an LRBA:

LRBA_SEQ	STATE	DBARFIL	DBABLK	TCH	FLAG	HSCN_BAS
CR_SCN_BAS	DTPSDN					
0 4350120	 3 N N N N N N	1	56650	1	524416	0
0 4350105	3 N N N N N N	1	56650	1	524416	0
365 0	1 Y N N N N N	1	56650	11	35659777	4350702
0 4350103	3 N N N N N N	1	56650	1	524416	0
0 4350089	3 N N N N N N	1	56650	1	524416	0
0 4350087	3 N N N N N N	1	56650	1	524288	0

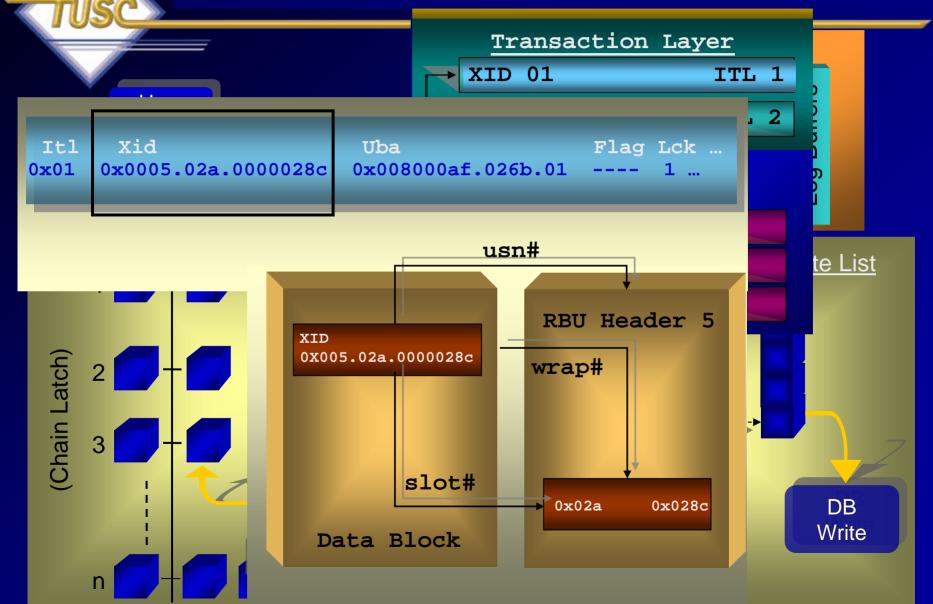
6 rows selected.

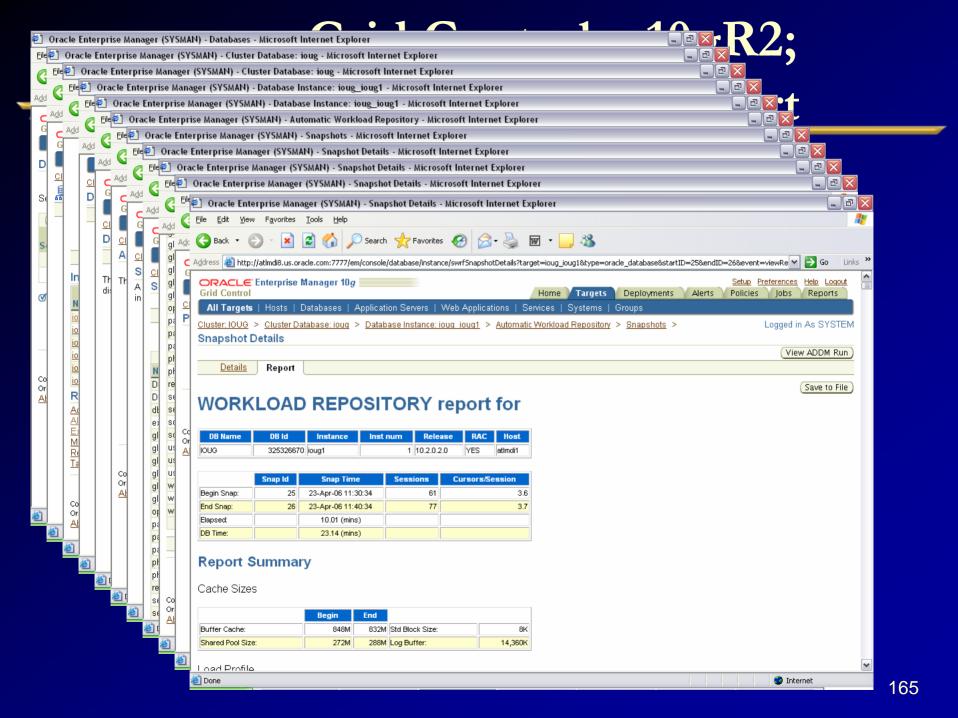
Let's check V\$TRANSACTION & match it up to ITL (no need to dump)

select xidusn, xidslot, xidsqn, ubafil, ubablk, ubasqn, ubarec
from v\$transaction t, v\$session s
where t.ses addr = s.saddr;

XI	DUSN	XIDSLOT	XIDSQN	UBAFII	5 1	UBABLK	UBASQN	UBAREC
	4	42	4863	_	2	851	1 2718	8
	5	14	667		2	1458	3 713	25
4.42.4	4863 =	4.2a.12ff	2.851.27	18.8 =	800353	.a9e.8	}	
5.14.6	667 = 5	.e.29b	2.1458.7	13.25 =	8005b2	.209.1	9	
		1			7			
Itl	/	Xid		Uba	Flag	Lck	Scn/Fsc	
0x02	<i>0x0004</i>	.02a.000012ff	0x008003.	53.0a9e.0	8	2	fsc 0x0003.000	00000
0x03	0x0005	.00e.0000029b	0x008005	<i>b2.02c9.</i>	19	14	fsc 0x0000.000	000000

Transaction Identifiers





If Time Permits... the Future!



64-Bit advancement of Directly addressable memory

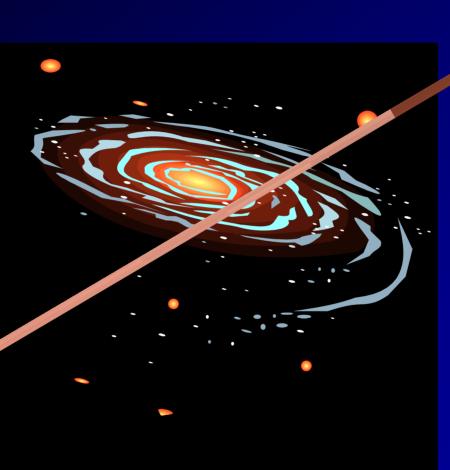
	<u>Address Direct</u>	Indirect/Extended			
• <u>4 Bit:</u>	16	(640)			
• <u>8 Bit:</u>	256	(65,536)			
• <u>16 Bit:</u>	65,536	(1,048,576)			
• <u>32 Bit:</u>	4,294,967,296				
• <u>64 Bit:</u>	18,446,744,073,709,	18,446,744,073,709,551,616			

When the hardware physically implements the theoretical possibilities of 64-Bit, things will dramatically change.... ...moving from 32 bit to 64 bit will be like moving from 4 bit to 32 bit or like moving from 1971 to 2000 overnight.

64bit allows Directly Addressing 16 Exabytes of Memory

Stack single sheets (2K worth of text on each) about 4.8B miles high to get 16E!!





You could stack documents from the Earth so high they would pass Pluto!

Human Brain vs. Computer

Brain

Individual maintains a ~250M capacity

Stores/processes ~ 2G in a lifetime

With over 6.5 Billion people in the world, total memory of world is 1.5P, total processed is 13 Exabytes



Computer

Laptops ~256M in memory capacity

Stores/processes 40G in its lifetime, then buy new one

1.5+ Petabytes can be accessed and managed by one computer with today's technology (internet is 8P)

Human Brain vs. Computer

Brain

10T-1P of operations per second based on retina/neuron synapse speed (Moravec).

Based on Brain power in Watts consumption, the brain performs 100T – 100P operations per second.



Computer

Fastest computer is IBM at 70.2 Teraflops (Blue / Gene L)

Computer is about equal on the low end of the brain and could be 1000 times slower on the high end of brain estimates.

Human Brain vs. Computer

Brain

<u>Problem</u>: We forget a lot of what we see and learn.

<u>Solution</u>: Drugs that improve memory or technology that plugs into the brain.

Problem: Information overload

Solution: Use the computer to aggregate things and use the brain for final decisions.



Computer

<u>Problem</u>: Data Density limits or Superparamagnetic effect (SPE).

<u>Solution</u>: Electron Microscope writing on stainless steel in a vacuum.

Problem: More memory gets farther from the CPU & Limits to CPU speed

Solution: Chip multiplexing & multi-core CPUs

What we covered:

- Statspack, Tools & Scripts that you can still use
 - Top Waits
 - Load Profile
 - Latch Waits
 - Top SQL
 - Instance Activity
 - File I/O
- The Future OEM & ADDM
- Helpful V\$/X\$
- Summary



For More Information

www.tusc.com

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- Oracle 10g Tuning (Early 2007)

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"If you are going through hell, keep going" - Churchill



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ORACLE DATABASE 10 RELEASE :



"The strength of the team is each individual member...the strength of each member is the team."

--Phil ackson

The Oracle User Groups are part of your team!

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- The Self-managing Database: Automatic Performance Diagnosis; Karl Dias & Mark Ramacher, Oracle Corporation
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- Oracle 9i Concepts manual
- http://geocities.com/pulliamrick/
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- Deploying a Highly Manageable Oracle9i Real Applications Database, Bill Kehoe, Oracle
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