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Real World Performance Part I

Andrew Holdsworth
Director of Real World Performance Server Technologies

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Real World Performance Part I

- How to use today's sessions
- Feedback from last year
- Some performance basics
- Gathering data from your systems
- Key Generation
- Shared Servers Revisited

How to Use Today's Sessions

- Part I
  - Focus on the “lower half” below the SQL Interface
  - Debugging and monitoring skills
  - Other system performance updates
- Part II
  - Focus on all SQL related issues
  - Optimizer
  - Schema statistics
  - Debugging SQL Execution Plans
- Part III
  - Advanced Features and Exotics
  - More Time for Questions

Panel Questions

- Please bring questions to stage or Francoise before and during the session
- Please include the following
  - Name, Company
  - Computing environment if relevant
  - Database Version
  - Question !
- Please note we will not be performing debugging operations in the panel sessions. Please focus on the subject matter of Real World Performance and not current issues/war stories.

Some Feedback From Last Year

- User confused what to do when a query does not return immediately ?
- What is a good plan ?
- What is a serialization problem ?

Some Performance Basics

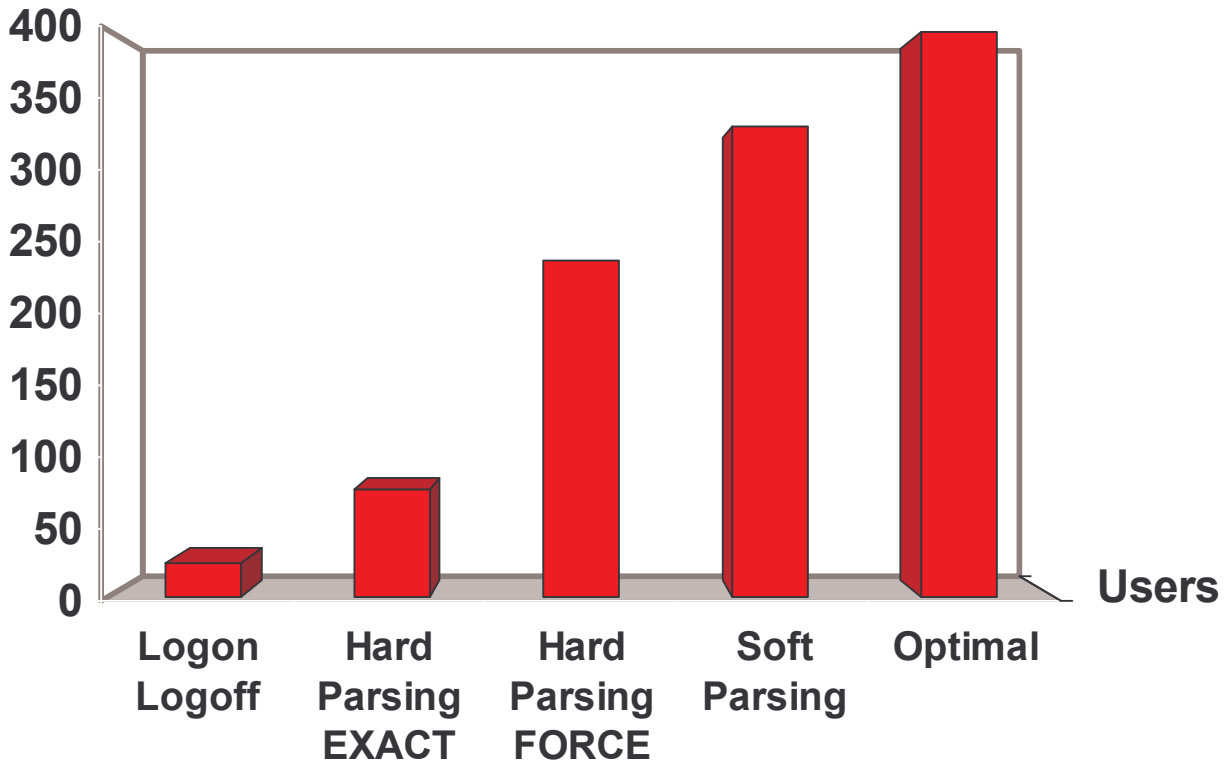
- Definitions
  - Serialization What is It ?
    - One or more processes waiting for shared resources on a system.
  - Process State
    - Hung – Process halted cause unknown
    - Blocked – Process halted waiting for a resource to become free e.g. Transaction lock.
    - Waiting – Process waiting for an event outside the database kernels control e.g. I/O, semaphore
    - Running – Process executing database work
    - Spinning – Process looping out of control burning CPU

Some Performance Basics

- Machine/Process Utilization
  - CPU Bound
    - Time spend in usr/sys/wio/idle
  - Disk Bound
    - Time queued/seeking/transfering
  - Network Bound
    - Time spend waiting for bytes to be sent/received over a network
  - Application Server Bound
    - Middle tier issues preventing more database calls

Some Performance Basics

- Sessions, Cursors, Arrays, SQL, Etc.



Monitoring your System

Graham Wood - Architect

Gathering Database Instance and Operating System Data from your Systems

- What data should we be gathering and keeping
  - Prior to 10g, or 10g without Diagnostic Pack
    - Statspack at hourly intervals (can use spauto.sql)
    - System level performance data (e.g. spooled vmstat, ps)
    - Keep data for time period longer that your business cycle, month, quarter etc. It may require manual purging
  - 10g with Diagnostic Pack
    - AWR data captured and purged automatically
    - One hour capture interval good in most cases
    - Increase retention period to longer than business cycle, month, quarter etc. Default is only 7 days.
    - Although more OS level data in AWR still capture occasional ps output particularly if running Shared Servers or other software on the same machine

Time based approach to Instance Analysis

- With the diagnostic pack ADDM will do the analysis for you
- Otherwise study AWR or Statspack reports
- Manual method:

  Determine is where the time is spent on the database server(s)
  - Waiting for system and shared resources
  - Time executing by SQL statement, Application Module, Service Etc.
- Use this data to determine ultimate bottlenecks

Key Generation Issues

Andrew Holdsworth

Key Generation

- What has made this so important
  - Faster CPUS
  - Increased concurrency
  - More Insert orientated applications
    - Travel bookings
    - Market trades
    - Telco calls, messages, events
  - Memory access speeds and concurrency have not kept pace with CPU processing speeds

Key Generation

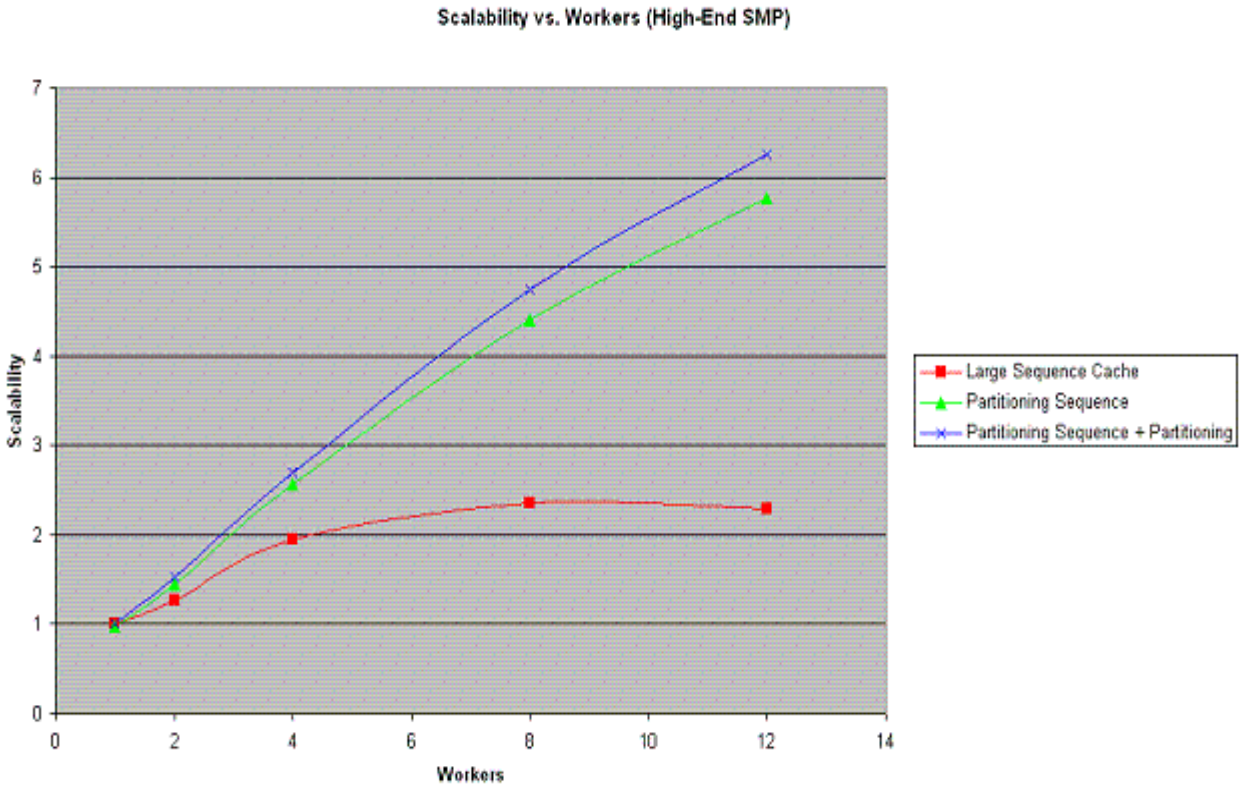
- Contention point description
  - Unique/Primary Key Generation from a sequence yields an increasing key value.
  - This results in a contention point in the right hand side of the B-Tree Unique index used to enforce the uniqueness required for integrity.
  - This problem has been seen more and more as faster CPUs process more rows and compete for the same memory structures.
  - A leaf block goes where a leaf block goes.

Contention Management Methods available

- Hash Partition on the unique key to create a series warm indexes rather than one hot index.
  - Works well for insert workloads
  - This solution does not work well if range scanning on the primary key and multiple local index probes are required.
- Reverse Key Index
  - Works well for Indexes that fit inside the buffer cache.
  - On large indexes greater than the size of the buffer cache this will flood the buffer cache with the index and make insert operations disk bound.
- Design a specific key generation mechanism
  - Ensures uniqueness
  - Localizes Index maintenance to single insert process avoiding memory/block contention
  - Allows index maintenance to remain in memory and avoid I/O

Key Generation

- Lab work tests on custom key generation to avoid contention



More Details on Custom Sequence Generation

- Evaluating a prototype that allows the sequence to be prefixed by either or session id and Instance number automatically.
- This would allow existing applications to run and scale better with no code changes !
- See Bug #5584365 for more details.

Shared Servers Revisited

Sumanta Chatterjee

Gathering Shared Server Performance

- Monitor and collect data every 10-15 seconds
- v$queue – monitor ss and dispatcher queues
  - Aggregate by queue type
  - queued – number of requests currently queued
  - wait – total wait time in hundredths of a second
  - totalq – total requests queued; compute queue rate
- v$shared_server / v$dispatcher
  - status
    - SS – EXEC, COMMON(IDLE), WAIT (ENQ), etc.
    - Dispatcher: WAIT, SEND, CONNECT, etc.
  - messages – total messages processed
  - busy:idle ratio gives indication of %busy

Gathering Shared Server Performance

- v$system_event (Top 5 Timed Events)
  - What are the resources showing contention?
  - Any lock (TX) contention?

Shared Server: Case Study I

- Shared Server required to
  - Reduce number of processes
  - 10-20K sessions meant 10-20K processes if using dedicated
- Problem symptom
  - CPU usage was very high
  - No contention in v$views
- Solution
  - Code path reductions (bug5362897 – 9.2.0.5 one-off patch)
  - Code optimizations (bug5347812 – 9.2.0.5 one-off patch)
- Result
  - CPU reduction from 90-95% to less than 50% on a 24 cpu system

Shared Server: Case Study II

- Shared Server required to
  - reduce number of processes
  - reduce overhead of repeated session logon/logoff
- Problem symptom
  - 2x increase in application workload led to slow performance
  - v$queue showed VCs queued
  - v$shared_server showed idle SS
  - “virtual circuits *” latch contention
  - Application TX enqueue contention
- Solution (bug5150366 - 9.2.0.7 one-off patch)
  - Granularized queues
  - Eliminate hot spots
- Result
  - Accommodated continued increase in application workload

Panel

Juan Loaiza

Graham Wood

Cecilia Gervasio

Sumanta Chatterjee

Andrew Holdsworth

For More Information

http://search.oracle.com

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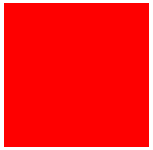
Real-World Performance Roundtable, Part II
The Optimizer, Schema Statistics and SQL Tuning

Andrew Holdsworth, Greg Rahn,
Mohamed Zait, Mohamed Ziauddin, Hermann Baer



Real World Performance Part II

- Optimizer
- Schema statistics
- SQL execution plans

Panel Questions

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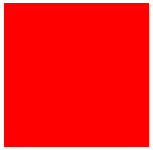


Agenda

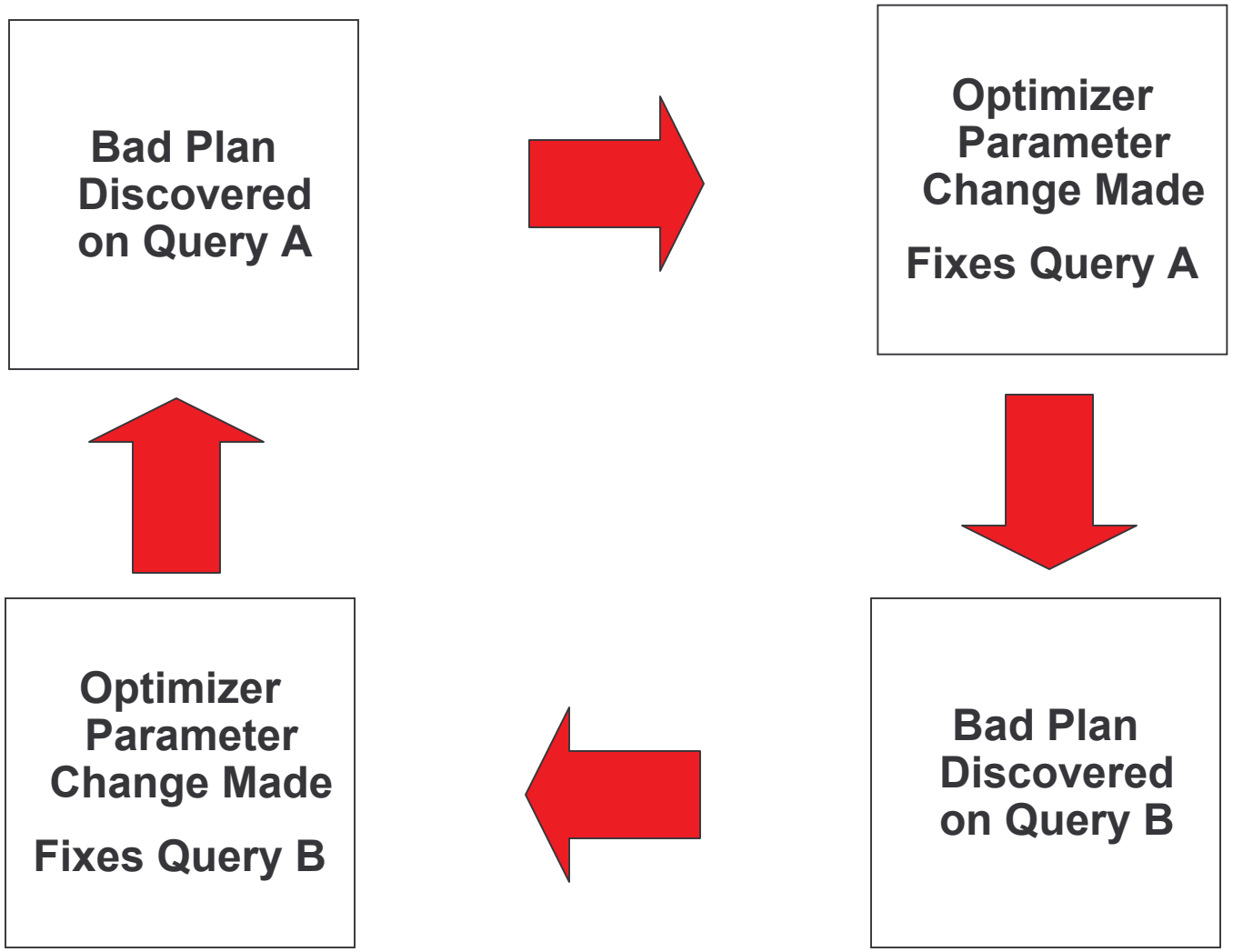
- Optimizer Myths
- 90-9-1 Stats Methodology
  - 90% of the time the default sample works
  - 9% of the time a larger sample works
  - 1% of the time the sample size is irrelevant
- Checking Cardinality

Optimizer Myths

Optimizer Myths

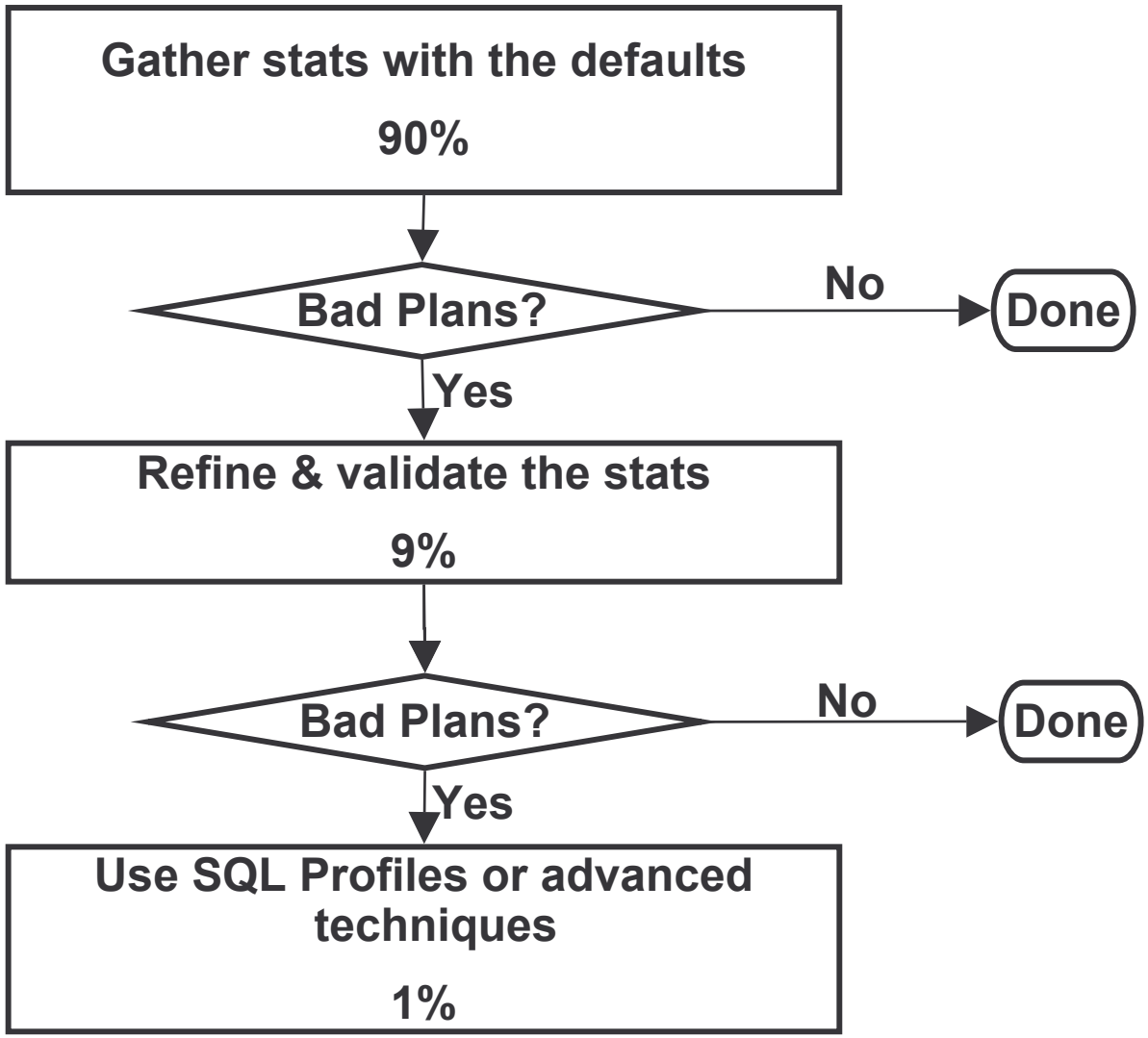
- Need to tune or design for the optimizer
- Order of the predicate can change the plan
- A compute statistics is required to get accurate statistics
- A minimum 10% sample is required to get accurate statistics
- Numerous hidden init.ora parameters needed to yield good plans
- OPTIMIZER_* init.ora parameter need to be tuned
- 10053 trace required to debug bad plans during initial triage

The “Parameter Change” Fan Trap



90 – 9 –1 Stats Methodology

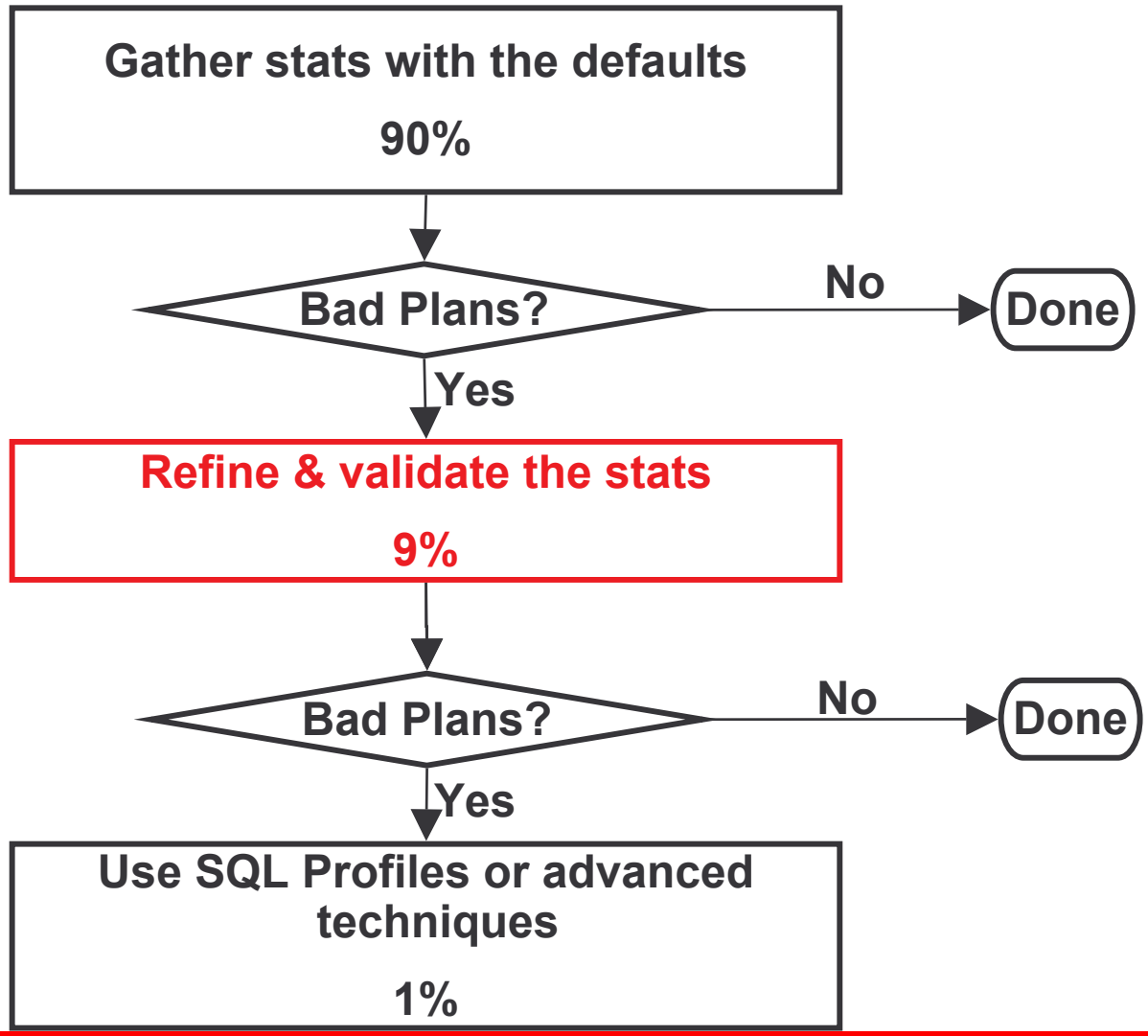
90-9-1 Stats Methodology Flowchart



How the Optimizer Generates Good Plans: The 90%

- Stats collected on schema
- SQL workload run against schema
  - DML information collected (dba_tab_modifications)
  - Predicate information collected (sys.col_usage$)
- Stats regathered on schema
  - Automatically – 10% change & automatic stats gathering job
  - Manually – when the DBA deems fit
- Stats and plans evolve with data change and usage
  - Predicate information collected at run time can result in histograms being created on next execution of dbms_stats.gather_*

90-9-1 Stats Methodology Flowchart



Refining The Stats

- When a new or larger sample may be needed
  - Data skew
  - Out-of-range
- Ways stats can be refined
  - Regather manually on less than 10% change
  - Increase the sample size for a given table or index
  - Compute statistics
  - Create histograms
- Validate the stats
  - Check the cardinality in the explain plan
  - Verify values in the data dictionary views

Refining The Stats Example (1 of 2)

```
SQL> exec dbms_stats.gather_table_stats(user,'SKEW1');
SQL> select column_name, num_distinct, sample_size
     from user_tab_col_statistics where table_name='SKEW1'
```

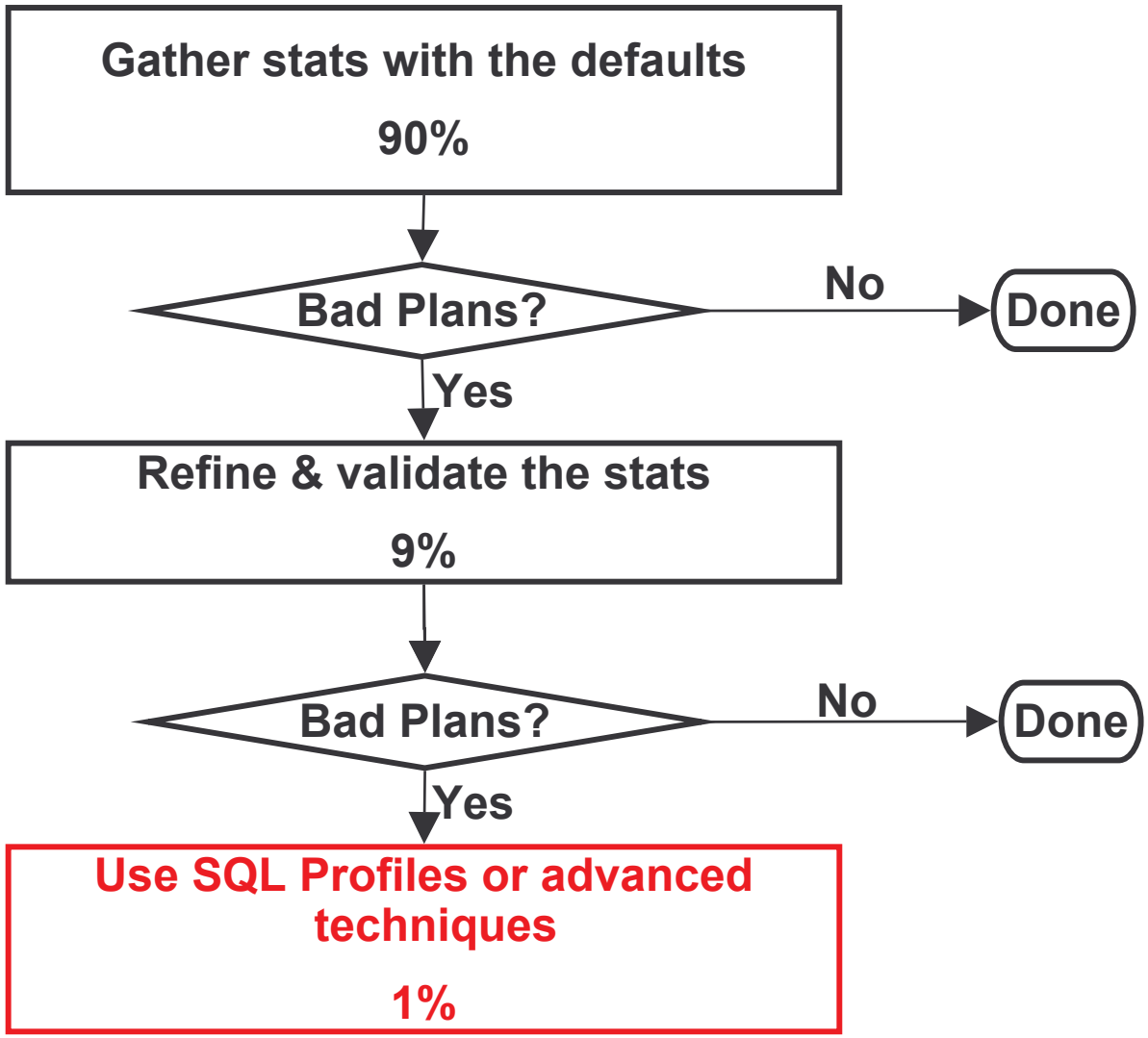
COLUMN_NAME	NUM_DISTINCT	SAMPLE_SIZE
C1	2,092	7,703
C2	410,792	777,038
C3	61,527	77,883
C4	2	7,703
C5	2	7,703

Refining The Stats Example

Column	Auto Sample	1% Sample	10% Sample	30% Sample	50% Sample	Actual
C1	2,092	11,305	31,402	46,890	56,282	60,351
C2	410,792	260,447	607,423	897,853	1,102,326	1,289,760
C3	61,527	103,083	358,233	567,937	685,271	777,942
C4	2	2	2	2	2	2
C5	2	2	2	2	2	2

Statistics need to be representative, not exact

90-9-1 Stats Methodology Flowchart



When Statistics Alone Aren't Enough

- Issues
  - Correlated columns / multi-column predicates
  - Functions
  - Temporary tables
- Options
  - SQL Profiles
  - Hints – cardinalty, dynamic_sampling

Correlated Columns Example: Zodiac Signs (1 of 4)

- Test Case: Table of birthdays & Zodiac signs
  - Approx. 12 million rows [actual: 11,960,320]
  - 32,768 birthdays per day of the month
- How many people have December birthdays?
  - ~1,000,000 (1/12th)

```
select count(*) from zodiac where birth_date between
to_date('2006-DEC-01','yyyy-mon-dd') and to_date('2007-JAN-01','yyyy-mon-dd')

-----------------------------------------------------------
| Id  | Operation           | Name    | E-Rows | A-Rows |
-----------------------------------------------------------
|   1 |  SORT AGGREGATE     |         |      1 |      1 |
|*  2 |   TABLE ACCESS FULL| ZODIAC  |   1018K|   1015K|
-----------------------------------------------------------
```

Correlated Columns Example: Zodiac Signs (2 of 4)

- How many people are of the Zodiac sign Sagittarius?
  - ~1,000,000 (1/12th)

```
select count(*) from zodiac
where zodiac_sign = 'sagittarius'

-----------------------------------------------------
| Id  | Operation           | Name    | E-Rows | A-Rows |
-----------------------------------------------------
|   1 |  SORT AGGREGATE     |         |      1 |      1 |
|*  2 |   TABLE ACCESS FULL| ZODIAC  |   1011K|    983K|
-----------------------------------------------------
```

Correlated Columns Example:
Zodiac Signs (3 of 4)

- Question: How many people are born in December and have the Zodiac sign Sagittarius?
  - Answer: Without knowing anything about the Zodiac we would guess 1/12 * 1/12 = 1/144 or ~83,333.
  - Correct Answer: 720,896

    The reality is that 22 of the 31 days of December are of the sign Sagittarius. The statistical estimate is inaccurate due to data correlation.

Correlated Columns Example:
Zodiac Signs (4 of 4)

```
select count(*) from zodiac where birth_date between
to_date('2006-DEC-01','yyyy-mon-dd') and
to_date('2007-JAN-01','yyyy-mon-dd')
and zodiac_sign = 'sagittarius'

-----------------------------------------------------
| Id  | Operation          | Name    | E-Rows | A-Rows |
-----------------------------------------------------
|   1 |  SORT AGGREGATE    |         |      1 |      1 |
|*  2 |   TABLE ACCESS FULL| ZODIAC  |  83713 |   720K |
-----------------------------------------------------
```

Checking Cardinality

Sample Query

```
select …
from   a, b, c, d
where  a.exloan_id = b.exloan_id and
       a.state = c.state_code and
       c.single_fam_st_code = d.index_code and
       b.reporting_month =
         to_date ('1992-11-01', 'yyyy-mm-dd') and
       d.period =
         to_char (b.reporting_month, 'yyyyq')
```

DBMS_XPLAN.DISPLAY

```
SQL> explain plan for <query>;
SQL> select * from table(dbms_xplan.display);
```

```
-------------------------------------------------------------------------------
| Id  | Operation                    | Name        | Rows  | Pstart| Pstop |
-------------------------------------------------------------------------------
|   0 | SELECT STATEMENT             |             |  4122 |       |       |
|*  1 |  HASH JOIN                   |             |  4122 |       |       |
|*  2 |   HASH JOIN                  |             |  4852 |       |       |
|   3 |    TABLE ACCESS FULL         | C           |    51 |       |       |
|   4 |    PARTITION HASH ALL        |             |  4874 |     1 |    16 |
|*  5 |     HASH JOIN                |             |  4874 |       |       |
|   6 |      PARTITION RANGE SINGLE  |             |  4874 |    35 |    35 |
|*  7 |       TABLE ACCESS FULL      | B           |  4874 |   545 |   560 |
|   8 |      TABLE ACCESS FULL       | A           |  7469K|     1 |    16 |
|   9 |   TABLE ACCESS FULL          | D           |   512K|       |       |
-------------------------------------------------------------------------------
Predicate Information (identified by operation id):
---------------------------------------------------
   1 - access("D"."INDEX_CODE"="C"."SINGLE_FAM_ST_CODE" AND
              "D"."PERIOD"=TO_NUMBER(TO_CHAR(INTERNAL_FUNCTION("B"."REPORTING_MONTH"),'yyyyq')))
   2 - access("A"."STATE"="C"."STATE_CODE")
   5 - access("A"."EXLOAN_ID"="B"."EXLOAN_ID")
   7 - filter("B"."REPORTING_MONTH"=TO_DATE('1992-11-01 00:00:00', 'yyyy-mm-dd hh24:mi:ss'))
```

DBMS_XPLAN.DISPLAY_CURSOR

```
SQL> alter session set statistics_level=all;
SQL> <execute query>
SQL> select * from table(dbms_xplan.display_cursor(null,null,'allstats last'));
```

Id	Operation	Name	Starts	E-Rows	A-Rows
*1	HASH JOIN		1	4122	4874
*2	HASH JOIN		1	4852	4874
3	TABLE ACCESS FULL	C	1	51	51
4	PARTITION HASH ALL		1	4874	4874
*5	HASH JOIN		16	4874	4874
6	PARTITION RANGE SINGLE		16	4874	4874
*7	TABLE ACCESS FULL	B	16	4874	4874
8	TABLE ACCESS FULL	A	16	7469K	7477K
9	TABLE ACCESS FULL	D	1	512K	512K

```
Predicate Information (identified by operation id):
---------------------------------------------------
1 - access("D"."INDEX_CODE"="C"."SINGLE_FAM_ST_CODE" AND
 "D"."PERIOD"=TO_NUMBER(TO_CHAR(INTERNAL_FUNCTION("B"."REPORTING_MONTH"),'yyyyq')))
2 - access("A"."STATE"="C"."STATE_CODE")
5 - access("A"."EXLOAN_ID"="B"."EXLOAN_ID")
7 - filter("B"."REPORTING_MONTH"=TO_DATE('1992-11-01 00:00:00', 'yyyy-mm-dd hh24:mi:ss'))
```

90-9-1 Methodology Recap

- Representative stats generally yield good plans
- There are cases where stats need more granular gathering
- There are cases where stats alone are not enough
- Use cardinality estimates as initial triage

Panel

Hermann Baer

Mohamed Zait

Mohamed Ziauddin

Greg Rahn

Andrew Holdsworth

Questions & Answers

For More Information

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Real World Performance Part III

- New areas of DB functionality not covered in previous years
  - PL/SQL
  - XML
  - Text
  - Streams
- General performance Questions not covered in Parts I, II or III

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PL/SQL

Bryn LLewellyn

PL/SQL Performance Fundamentals

- PL/SQL 10.x is 2 x Fast as PL/SQL 9.2
  - Upgrade is the easiest speedup for PL/SQL intensive programs
- Ask: “Is PL/SQL really the problem?”
  - PL/SQL is often the carrier for SQL statements that dominate the system resources and elapsed time of any executing program. Improving the SQL usually yields the biggest payback.
- Make the extra coding effort to use bulk PL/SQL operations
  - Inserts
  - Fetches
  - Bulk operations performance gains can exceed the gains achieved by upgrade to 10g+.
- Evaluate the use of native compilation
- Dynamic SQL is fine *per se* – but it does give you increased power to code poorly performing approaches!

Streams

Patricia McElroy

Software Updates for Streams

- 10.2.0.2 Recommended Patches:
  - 5563854 Merge patch for Capture
  - 5339787 Required Checkpoint SCN patch
  - 5113125 Merge patch for Apply

Watch OTN Streams website for custom software

- http://otn.oracle.com/products/dataint/content.html

General Configuration Tips

- Separate queue for each capture and apply, also each source database
- Init.ora:

  _job_queue_interval=1

  _spin_count= 5000 (or greater)

  Streams_pool_size=200M

- For WANs: (SQLNET parameters)
  - Increase SDU (sqlnet.ora, tnsnames.ora, listener.ora)
  - Increase send_buf_size, recv_buf_size

10gR2 Streams Process Parameters

Capture: (DBMS_CAPTURE package)

- Set retention time for capture checkpoints as needed
  Alter_capture('captureName', checkpoint_retention_time=>7)
- Reduce the capture checkpoint frequency parameter
  Set_parameter('captureName','_checkpoint_frequency','100')

Propagation

- Use queue_to_queue parameter set to TRUE
  - Source and target must be 10.2 or above

Apply: (DBMS_APPLY package)

- Set_parameter('applyName','parallelism','4')
- Set_parameter('applyName','_dynamic_stmts','Y')
- Set_parameter('applyName','_hash_table_size','10000000')
- Set_parameter('applyName','_txn_buffer_size','10+*parallelism*')
- Set_parameter('applyName','disable_on_error','N')

Apply Performance Tips

- ALTER TABLE SYS.STREAMS$_APPLY_PROGRESS INITRANS 16 PCTFREE 10;

- Batch Processing
  - Frequent commits (txn size < 1000)
  - Consider procedural replication (sample code available)

Apply CLOB Performance

For tables with CLOB columns (10.2 only),

- Register error handler for table UPDATE, DELETE, LOB_UPDATE

```
exec dbms_apply_adm.set_dml_handler
 ('HR.TABLE_ONE','TABLE','UPDATE',true,'STRADM.DML_FUN',
     assemble_lobs=> true);
```

- At minimum, Error Handler should do LCR.EXECUTE

```
create or replace procedure dml_fun(lcr_anydata in sys.anydata)
   authid current_user is
      lcr   sys.lcr$_row_record;
      dummy pls_integer;
   begin
      dummy := lcr_anydata.getObject(lcr);
      lcr.execute(true);
   end;
```

More on Streams….

- Visit Oracle Streams booth in Exhibit Hall, Moscone West D20
- Other Streams presentation:
  - Implementing Replication with Streams (S281220)
    - Moscone South - Room 306 South on **Thursday** 8:00am
- Look for Sample Code for Streams on OTN
- Bookmark OTN page Oracle Information Integration features:
  http://otn.oracle.com/products/dataint/

XML

Nipun Agarwal

Schema Registration & Loading

- For faster update and queries, use xdb:maintainDOM=false if DOM fidelity not required
- Set enable_hierarchy_param to ENABLE_HIERARCHY_NONE if repository usage not required
- Loading large schema based documents through ftp/dav is faster
- Set XDBCORE-LOADABLEUNIT-SIZE=>default 16Kb
- Set XDBCORE-XOBMEM-BOUND=>default 1024Kb

Storage & Query

- If a child element/attribute of a collection needs to be accessed or updated, store the collection as a nested table (xdb:storeVarrayAsTable="true")
- If using nested tables consider using heap tables (default is IOT)
- For efficient query performance, avoid following schema constructs where possible:
  - Recursive type definitions
  - <any> and anytype
  - Usage of xdb:sqlType = "CLOB" for elements whose type is complex

Query

- For better query performance, avoid the following Xpath constructs where possible
  - Minimize using descendent axis, reverse axis, following axis, sibling axis
  - Wildcards (except under certain restrictive conditions)
  - Xpath functions other than Oracle extension functions and the following for: not, floor, ceiling, substring, string-length, translate
  - UNION operations

Repository

- Share ACLs amongst resources
- Set acl-cache-size in xdbconfig.xml => default 32
- Keep #files in a folder < 200
- If # folders very large, keep #files in a folder > 100
- FTP: use binary mode when possible

Repository Views

- Analyze all indexes and tables involved
- Tune resource-view-cache-size to set cache size
- Equate under_path and equals_path with 1
  - Under_path(res,'/a/b/c') = 1

Oracle Text

Mohammad Faisal

Senior Development Manager

Query Performance

Relational Predicates and ORDER BY

- Problem: High number of Doc ID to ROWID resolutions ($R table)
- Solutions
  - Use FIRST_ROWS hint for ORDER BY SCORE() queries
  - Push resolution of equality predicates into Oracle Text index using sections
  - Push DATE range predicate into Oracle Text index
  - Use CTXCAT indextype instead of CONTEXT indextype for very short documents

Query Performance

Cache Hit

- Problem: Scattered I/O for Doc ID to ROWID resolutions
- Solution: Cache $R table for rowsource invocations or $K table for functional invocations of CONTAINS

- Problem: Poor cache hit ratio for Oracle Text index internal table blocks due to relatively low Oracle Text query load
- Solution: Use KEEP pool for all Oracle Text index internal tables e.g. $I, $R, $K

Query Performance

CONTAINS Query Re-write

- Problem: Multiple CONTAINS in the same SQL
- Solution: Merge into one CONTAINS (may have to use sections)

- Problem: Unnecessary use of expensive full-text operators
- Solution: Avoid wildcards, FUZZY, Stemming, Soundex

- Problem: Network and SQL overhead of multiple SQL
- Solution: Use Progressive Relaxation

Query Performance

SQL Plan

- Use FIRST_ROWS hint when using ORDER BY SCORE and selecting top-N hits using ROWNUM to optimize for response time. This will push the ORDER BY SCORE to Oracle Text.
- Do ANALYZE the Oracle Text index but NOT the Oracle Text index internal tables
- Make sure Oracle Text index access is not in the inner loop of NL

Query Performance

Full-text Operator Tuning

- Wildcard: Use Prefix Index or Substring Index
- FUZZY: Limit number of expansions
- WITHIN: Use Field sections or MDATA sections instead of Zone sections
- Stemming: Use Stem Index

Query Performance

Index Fragmentation and Garbage Collection

- Problem: Additional Reads of $I table due to logical fragmentation and garbage
- Solutions
  - Specify large amount of indexing memory for both CREATE INDEX and CTX_DDL.SYNC_INDEX
  - Use CTX_DDL.SYNC_INDEX infrequently to batch-up the workload
  - Use CTX_DDL.OPTIMIZE_INDEX frequently (I/O intensive)
    - If possible, avoid concurrent CTX_DDL.OPTIMIZE_INDEX and CTX_DDL.SYNC_INDEX
    - Use lightweight mode during business hours (e.g. TOKEN) and heavyweight mode otherwise (e.g. REBUILD)
      - Of all the heavyweight modes (FAST, FULL, REBUILD) the REBUILD mode provides the most reduction in additional Reads of $I table (but requires more temporary disk space)
        - Must apply patch for bug 5095220 before using REBUILD mode in parallel. Serial mode is OK without the patch.

Query Performance

Miscellaneous

- Transactional CONTAINS is expensive
- Avoid searching for very high frequency words by declaring them as Stop Words or modifying Lexer settings (e.g. by default e-mail address John.Smith@oracle.com is tokenized as JOHN SMITH ORACLE COM)
- If possible, partition the base table and create Oracle Text index as LOCAL (instead of GLOBAL), therefore reducing $I Read if the SQL query uses
  - partition elimination
  - ORDER BY partition column
- Reduce base table Reads by
  - Keeping the base table rows as narrow as possible, or
  - Creating a shadow table with minimal columns needed for CONTAINS, creating the Oracle Text index on the shadow table, and using USER_DATASTORE to index data from original base table

Indexing Performance

- If indexing binary documents, upgrade to patch-sets containing Verity filters instead of Stellent filters
  - 9iR2: 9.2.0.7 and later
  - 10gR1: 10.1.0.4 and later
  - 10gR2: all patch-sets
- Pre-filter binary documents (e.g. using CTX_DOC.POLICY_FILTER) and index filtered documents to avoid re-filtering during Document Service invocation
- In general, CREATE INDEX is several times faster than CTX_DDL.SYNC_INDEX
- If possible, avoid SYNC ON COMMIT due to base table contention for concurrent DML

Diagnostics
Timing

- In addition to general database timing tools, use CTX_OUTPUT package

Trace ID	Description
TRACE_IDX_USER_DATASTORE	Time spent executing user datastore
TRACE_IDX_AUTO_FILTER	Time spent invoking the AUTO_FILTER filter. (Replaces the deprecated TRACE_IDX_INSO_FILTER trace)
TRACE_QRY_XX_TIME	Time spent executing the $X cursor
TRACE_QRY_XF_TIME	Time spent fetching from $X
TRACE_QRY_IF_TIME	Time spent fetching the LOB locator from $I
TRACE_QRY_IR_TIME	Time spent reading $I LOB information
TRACE_QRY_R_TIME	Time spent fetching and reading $R information
TRACE_QRY_CON_TIME	Time spent in CONTAINS processing

Diagnostics
I/O

- In addition to general database timing tools, use CTX_OUTPUT package

Trace ID	Description
TRACE_QRY_X_ROWS	Total number of rows whose token metadata was fetched from $X
TRACE_QRY_I_ROWS	Number of rows whose $I token_info was actually read
TRACE_QRY_I_SIZE	Number of bytes read from $I LOBs

- In addition to general database I/O monitoring tools, use CTX_REPORT package to obtain Oracle Text index specific statistics, e.g. most frequent tokens, most fragmented tokens.

For More Information

http://search.oracle.com

Oracle Text 

or

http://www.oracle.com/technology/products/text/index.html

Panel

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