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Controlling Execution Plans - 2016

(without touching the code)

Because there are just some things that no one wants to touch!

by Kerry Osborne

- an oldish Oracle guy

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whoami

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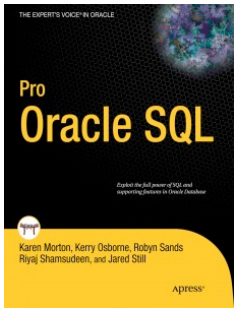

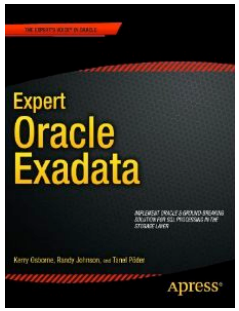

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Top Secret Feature of Oracle's BDA

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What's the Point?

Many Performance Issues Are Related to Bad Plans
Many Can Be Improved Without Changing SQL
Some Techniques Are Still Not Well Understood
Can Provide Instant Relief
Closest Thing to Magic I've Ever Seen

Reasons for Bad Plans?

The Optimizer is Complex …
… and We Don't Understand it Well Enough!

- Bad Code
- Bad Stats
- Bad Parameters

The Optimizer is not perfect …

- Not Smart Enough (Yet)
- Too Clever for it's Own Good!

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So why can't we just "fix" the code?

- Sometimes it's Not Ours to Fix (i.e. packaged application)
- Sometimes there's Not Enough Time
  - it's an emergency
  - onerous change control
- Sometimes it's Not the Code!

Predictability

In the good old days, life was simple

The RBO only had a handful of options
The CBO was introduced in Version 7
Plan Stability feature was introduced in 8i

Plan Instability

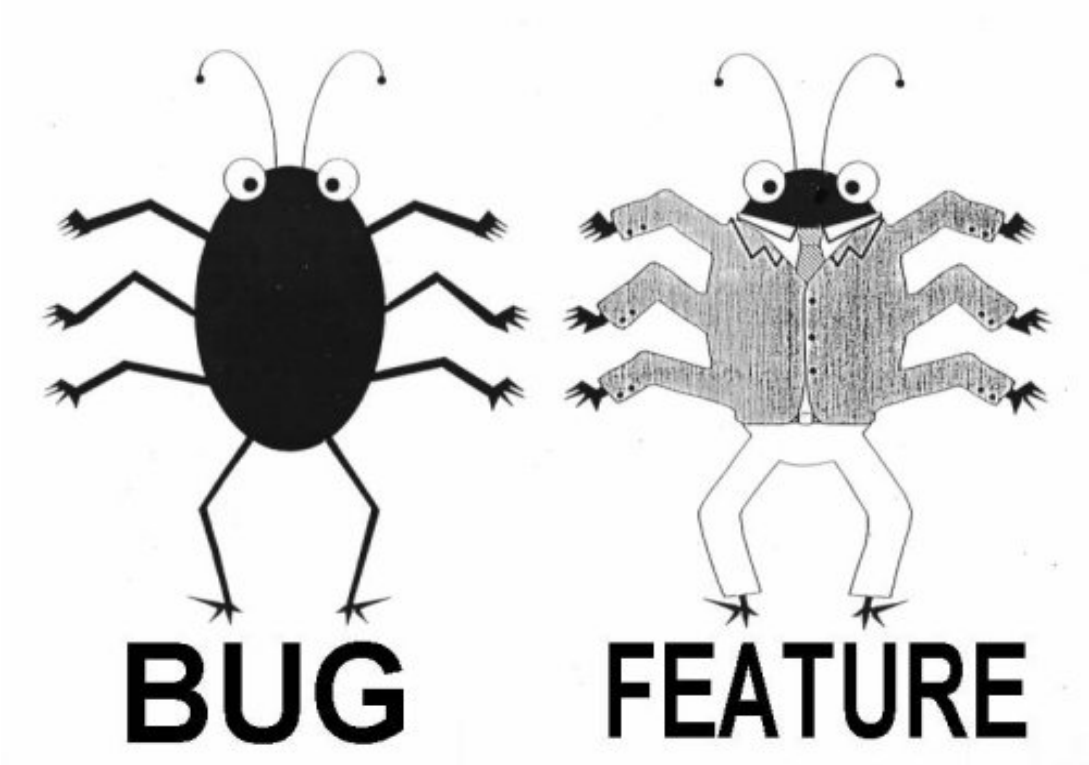
Sometimes the Optimizer Just Can't
Seem to Make Up It's Mind!

Several Contributors:

- Cardinality Feedback
- Stats
- SQL Plan Directives
- And My Favorite
  - Bind Variable Peeking

Digression – Bind Variable Peeking

Drives Me Nuts!



Improvements in 11g and 12c

11g - Adaptive Cursor Sharing (ACS)

- Attempts to solve the BVP issue
- Unfortunately – has to run badly at least once
- Fortunately – multiple plans can exist
- Unfortunately – bind sensitivity not persisted

12c – Adaptive Optimization

- Attempts to fix on the fly
- Attempts to persist

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So What Can We Do?

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Some Possible Solutions?

Change Database Parameters (Big Knob Tuning)
Add additional access paths (Indexes)
Remove some access paths
Monkey with Stats

problem with these approaches –

they are very nonspecific

Or We Can Use Hints Behind the Scenes

As of 11g there are 4 options (that I'm aware of)

- Outlines (aka Plan Stability)
- SQL Profiles (SQL Tuning Advisor)
- SQL Patches (SQL Repair Advisor)
- SQL Baselines (SQL Plan Management)

Each was created with a Different Goal
But they all work basically the same way
They each apply a set of hints behind the scenes
Each iteration has added something new to the mix

Just to be Clear

These are not plans
They are sets of hints
They are assigned a name
And attached to a single SQL
  - or possibly a set of SQL statements
  - in the case of SQL Profiles
None of these objects “lock” plans
They do reduce the optimizer’s options

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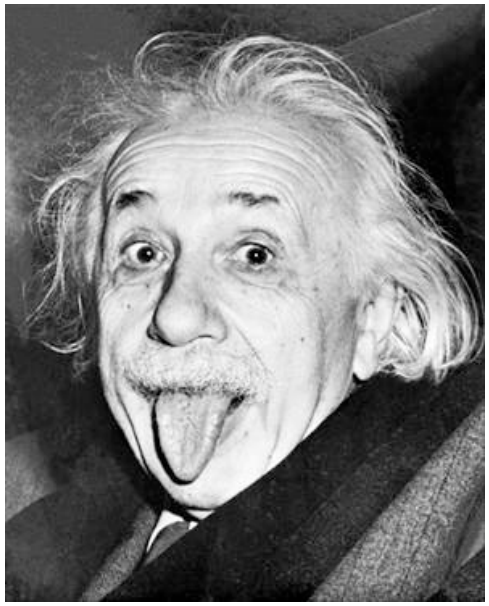
Where Hint Based Mechanisms Work Well

A Few Statements with "Bad" plans

- **Plan Instability (bind variable peeking)**
- **Fixing optimizer shortcomings (correlated columns)**
- **Band Aids**

Note that they can have laser like specificity.

(I know it's a big word!)



Where They Don't Work Well

Anywhere there are lot's of problems
- Lot's of statements that have "Bad" plans
- Systemic Problems

Anywhere that the structure of a query needs to change
- Unions that should have been joins …
- Sub-queries (subquery factoring for example) …

```
Select col1 from skew where col2 = 'D'
Union all
Select col1 from skew where col12 = 'E'
Union all
Select col1 from skew where col12 = 'U';
```

```
Select col1 from kso.skew
where col4 in ('D' , 'E', 'Y');
```

Digression: Rewrite Options

SQL Translation Framework

Materialized View Rewrite (dbms_advanced_rewrite)

http://kerryosborne.oracle-guy.com/2013/07/sql-translation-framework/
http://kerryosborne.oracle-guy.com/2015/09/controlling-execution-plans-workshop/

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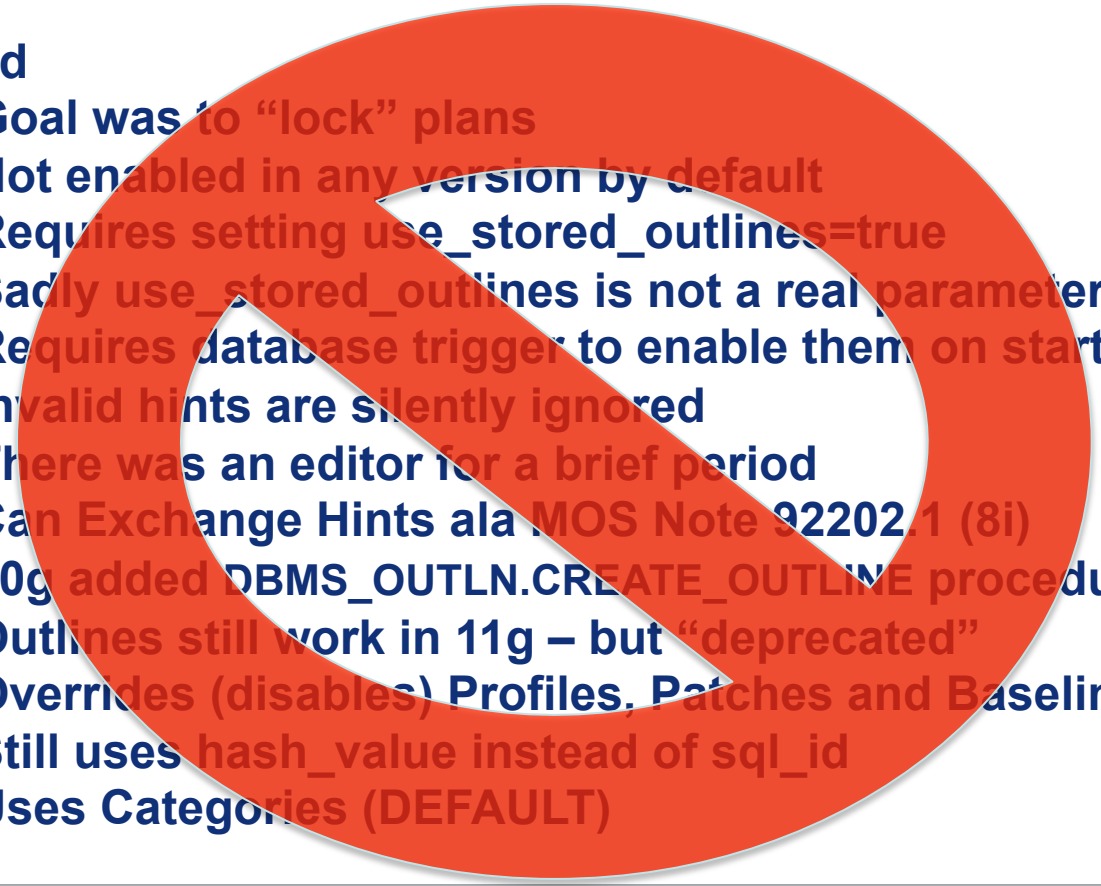
Stored Outlines



Half Baked

- Goal was to “lock” plans
- Not enabled in any version by default
- Requires setting use_stored_outlines=true
- Sadly use_stored_outlines is not a real parameter
- Requires database trigger to enable them on startup
- Invalid hints are silently ignored
- There was an editor for a brief period
- Can Exchange Hints ala MOS Note 92202.1 (8i)
- 10g added DBMS_OUTLN.CREATE_OUTLINE procedure
- Outlines still work in 11g – but “deprecated”
- Overrides (disables) Profiles, Patches and Baselines
- Still uses hash_value instead of sql_id
- Uses Categories (DEFAULT)

SQL Profiles

¾ Baked

Goal was to apply statistical fixes
Created by SQL Tuning Advisor (dbms_sqltune)
Using semi-undocumented OPT_ESTIMATE hint
Enabled by default
* Can apply to multiple statements (force_matching)
* Invalid hints silently ignored
Stored in SMB like SQL BASELINES (in 11g)
* Provides procedure to import hints (import_sql_profile)
Capable of applying any valid hints (I think)
Uses Categories (DEFAULT)

SQL Tuning Advisor (STA) Profiles

So, a SQL profile is sort of like gathering statistics on A QUERY - which involves many tables, columns and the like....

In fact - it is just like gathering statistics for a query, it stores additional information in the dictionary which the optimizer uses at optimization time to determine the correct plan. The SQL Profile is not "locking a plan in place", but rather giving the optimizer yet more bits of information it can use to get the right plan.

~ Tom Kyte

OPT_ESTIMATE Hint

Applies Fudge Factors

- basically scales an optimizer calculation (up or down)
- valid (though undocumented) hint

```
OPT_ESTIMATE(@"SEL$5DA710D3", INDEX_FILTER, "F"@"SEL$1", IDX$$_1AA260002, SCALE_ROWS=8.883203639e-06)
OPT_ESTIMATE(@"SEL$5DA710D3", INDEX_SKIP_SCAN, "F"@"SEL$1", IDX$$_1AA260002, SCALE_ROWS=8.883203639e-06)
OPT_ESTIMATE(@"SEL$5DA710D3", JOIN, ("B"@"SEL$1", "A"@"SEL$1"), SCALE_ROWS=4.446153275)
OPT_ESTIMATE(@"SEL$5DA710D3", JOIN, ("C"@"SEL$1", "A"@"SEL$1"), SCALE_ROWS=7.884506683)
OPT_ESTIMATE(@"SEL$5DA710D3", JOIN, ("E"@"SEL$1", "A"@"SEL$1"), SCALE_ROWS=25.60960842)
OPT_ESTIMATE(@"SEL$5DA710D3", JOIN, ("F"@"SEL$1", "B"@"SEL$1"), SCALE_ROWS=26.34181566)
OPT_ESTIMATE(@"SEL$5DA710D3", JOIN, ("F"@"SEL$1", "B"@"SEL$1", "A"@"SEL$1"), SCALE_ROWS=839.9683673)
OPT_ESTIMATE(@"SEL$5DA710D3", TABLE, "D"@"SEL$1", SCALE_ROWS=5.083144565e+11)
OPT_ESTIMATE(@"SEL$5", INDEX_SCAN, "C"@"SEL$5", ORDER_FG_ITEM_IX3, SCALE_ROWS=0.2507281101)
```

HINT	SUBTYPE	COUNT(*)
OPT_ESTIMATE	INDEX_FILTER	12
OPT_ESTIMATE	INDEX_SCAN	32
OPT_ESTIMATE	INDEX_SKIP_SCAN	23
OPT_ESTIMATE	JOIN	154
OPT_ESTIMATE	TABLE	29

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STA Profiles (with OPT_ESTIMATE)

Goal is applying statistical fixes
Primarily using semi-undocumented OPT

I am really not a big fan, because …
… they tend to "sour" over time

But they have redeeming qualities …
1. Good for indicating where the optimiz
2. Good for finding new plans (which ca
3. Maybe good for optimizer shortcomir

But …
They tend to "sour" over time!

Issue Acknowledged in Docs

If the environment or SQL profile change, then the optimizer can create a new plan. As tables grow or indexes are created or dropped, the plan for a profile can change. The profile continues to be relevant even if the data distribution or access path of the corresponding statement changes. In general, you do not need to refresh SQL profiles.

Over time, profile content can become outdated. In this case, performance of the SQL statement may degrade. The statement may appear as high-load or top SQL. In this case, the Automatic SQL Tuning task again captures the statement as high-load SQL. You can implement a new SQL profile for the statement.

Other STA Profile Hints

```
SQL> @sql_profile_distinct_hints
Enter value for profile_name: SYS_SQLPROF%

HINT                                                COUNT(*)
-------------------------------------------------- ----------
COLUMN_STATS                                               13
FIRST_ROWS                                                  1
IGNORE_OPTIM_EMBEDDED_HINTS                                 1
INDEX_STATS                                                 1
OPTIMIZER_FEATURES_ENABLE                                  14
OPT_ESTIMATE                                              178
TABLE_STATS                                                 2



SYS@LAB112> @sql_profile_hints
Enter value for profile_name: SYS_SQLPROF_0126f1743c7d0005

HINT
--------------------------------------------------------------------------------------------------------------
COLUMN_STATS("KSO"."SKEW", "PK_COL", scale, length=5)
COLUMN_STATS("KSO"."SKEW", "COL1", scale, length=4 distinct=828841 nulls=12.8723033 min=1 max=1000000)
TABLE_STATS("KSO"."SKEW", scale, blocks=162294 rows=35183107.66)
OPTIMIZER_FEATURES_ENABLE(default)
```

IMPORT_SQL_PROFILE

Part of the DBMS_SQLTUNE Package

```
10.2 definition:

PROCEDURE IMPORT_SQL_PROFILE
 Argument Name                  Type                    In/Out Default?
 ------------------------------ ----------------------- ------ --------
 SQL_TEXT                       CLOB                    IN
 PROFILE                        SQLPROF_ATTR            IN
 NAME                           VARCHAR2                IN     DEFAULT
 DESCRIPTION                    VARCHAR2                IN     DEFAULT
 CATEGORY                       VARCHAR2                IN     DEFAULT
 VALIDATE                       BOOLEAN                 IN     DEFAULT
 REPLACE                        BOOLEAN                 IN     DEFAULT
 FORCE_MATCH                    BOOLEAN                 IN     DEFAULT


SQL> desc sqlprof_attr
 sqlprof_attr VARRAY(2000) OF VARCHAR2(500)
```

Note: part of tuning pack – (i.e. extra cost option)

SQL Patches

¾ Baked

- Goal was to modify plans to avoid errors
- Created by SQL Repair Advisor (dbms_sqldiag)
- Enabled by default
- No force_matching
- Invalid hints silently ignored
- Stored in SMB like SQL BASELINES (in 11g)
- Provides procedure to import hints (i_create_patch)
- Showed up in 10g (but funky – created SQL Profiles)
- Capable of applying any valid hints
- Uses Categories (DEFAULT)
- Hints can be merged with Profiles and Baselines
- Basically a 1 Hint SQL Profile

* https://blogs.oracle.com/optimizer/entry/how_can_i_hint_a

SQL Patches

```
In 11.2.0.3

SQL_ID  c7q8y75rh36sc, child number 1
-------------------------------------
select /* test */ avg(pk_col) from kso.skew where col1 = 23489

Plan hash value: 3723858078

-----------------------------------------------------------------------------------------------
| Id  | Operation                    | Name      | Rows  | Bytes | Cost (%CPU)| Time     |
-----------------------------------------------------------------------------------------------
|   0 | SELECT STATEMENT             |           |       |       |    36 (100)|          |
|   1 |  SORT AGGREGATE              |           |     1 |    11 |            |          |
|   2 |   TABLE ACCESS BY INDEX ROWID| SKEW      |    35 |   385 |    36   (0)| 00:00:01 |
|*  3 |    INDEX RANGE SCAN          | SKEW_COL1 |    37 |       |     3   (0)| 00:00:01 |
-----------------------------------------------------------------------------------------------

Predicate Information (identified by operation id):
---------------------------------------------------

   3 - access("COL1"=23489)

Note
-----
   - SQL profile PROF_c7q8y75rh36sc_3723858078 used for this statement
   - SQL patch "KSO_c7q8y75rh36sc_MANUAL" used for this statement
   - SQL plan baseline SQLID_C7Q8Y75RH36SC_3723858078 used for this statement
```

SQL Baselines

Fully Baked (almost)

- Goal was to prevent performance regression
- (Closer to Outlines than to SQL Profiles)
- Enabled by default in 11g (optimizer_use_sql_plan_baselines)
- Capable of applying any valid hints
- * Has associated plan_hash_value
- * Invalid hints are NOT silently ignored!
- Provides procedure to import plans
- (DBMS_SPM.LOAD_PLANS_FROM_CURSOR_CACHE)
- Overridden by Outlines
- Can work with Profiles and Patches (merges hints)
- * Can have multiple Baselines per statement
- No Categories
- Preferred Set (fixed=yes)

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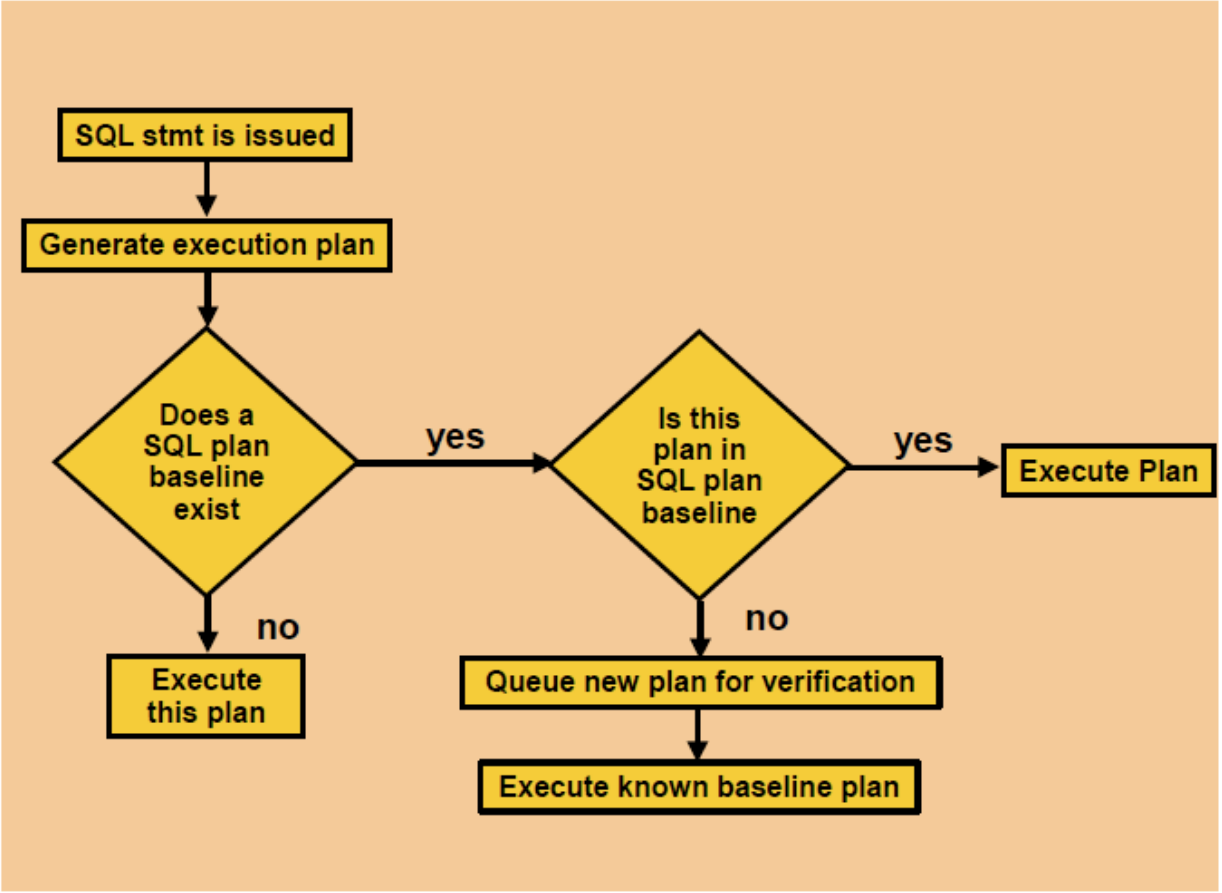
SQL Plan Management

Introduced in 11g
The Idea is to Prevent Backward Movement
New Framework using Baselines

SPM is On by default (sort of)

optimizer_use_sql_plan_baselines=true
But no plans are Baselined by default
Baselines can be bulk loaded
- From a SQL Tuning Set (10g)
- From Outlines
- From the cursor cache
- Via optimizer_capture_sql_plan_baselines=true

SQL Plan Management – Hard Parse



SQL Plan Management

So what's actually stored?

- A plan hash value (calculated differently than v$sql)
- Hints to reproduce the plan
- Signature (no sql_id)
- The actual plan is not stored in 11g
- Plan is stored in 12c
  - Sort of - only so XPLAN can display it

```
SYS@LAB111> select spb.sql_handle, spb.plan_name, spb.sql_text,
  2  spb.enabled, spb.accepted, spb.fixed,
  3  to_char(spb.last_executed,'dd-mon-yy HH24:MI') last_executed
  4  from
  5  dba_sql_plan_baselines spb;

SQL_HANDLE                PLAN_NAME                      SQL_TEXT             ENABLED ACC FIX LAST_EXECUTED
------------------------- ------------------------------ -------------------- ------- --- --- ---------------
SYS_SQL_36bf1c88f777e894  SYS_SQL_PLAN_f777e89455381d08  select avg(pk_col) f YES     YES NO  27-oct-09 10:20
SYS_SQL_f2784d83c1974f5e  SYS_SQL_PLAN_c1974f5e54680e33  select avg(pk_col) f YES     YES NO  27-oct-09 11:12
SYS_SQL_f2784d83c1974f5e  SYS_SQL_PLAN_c1974f5e55381d08  select avg(pk_col) f YES     NO  NO
…
```

So Which Is Most Useful?

And the Survey Says:

Profiles – No. 1 Answer
Baselines – No. 2 Answer

Why?

Profiles

- dbms_sqltune.import_sql_profile
- force_matching
- 10g

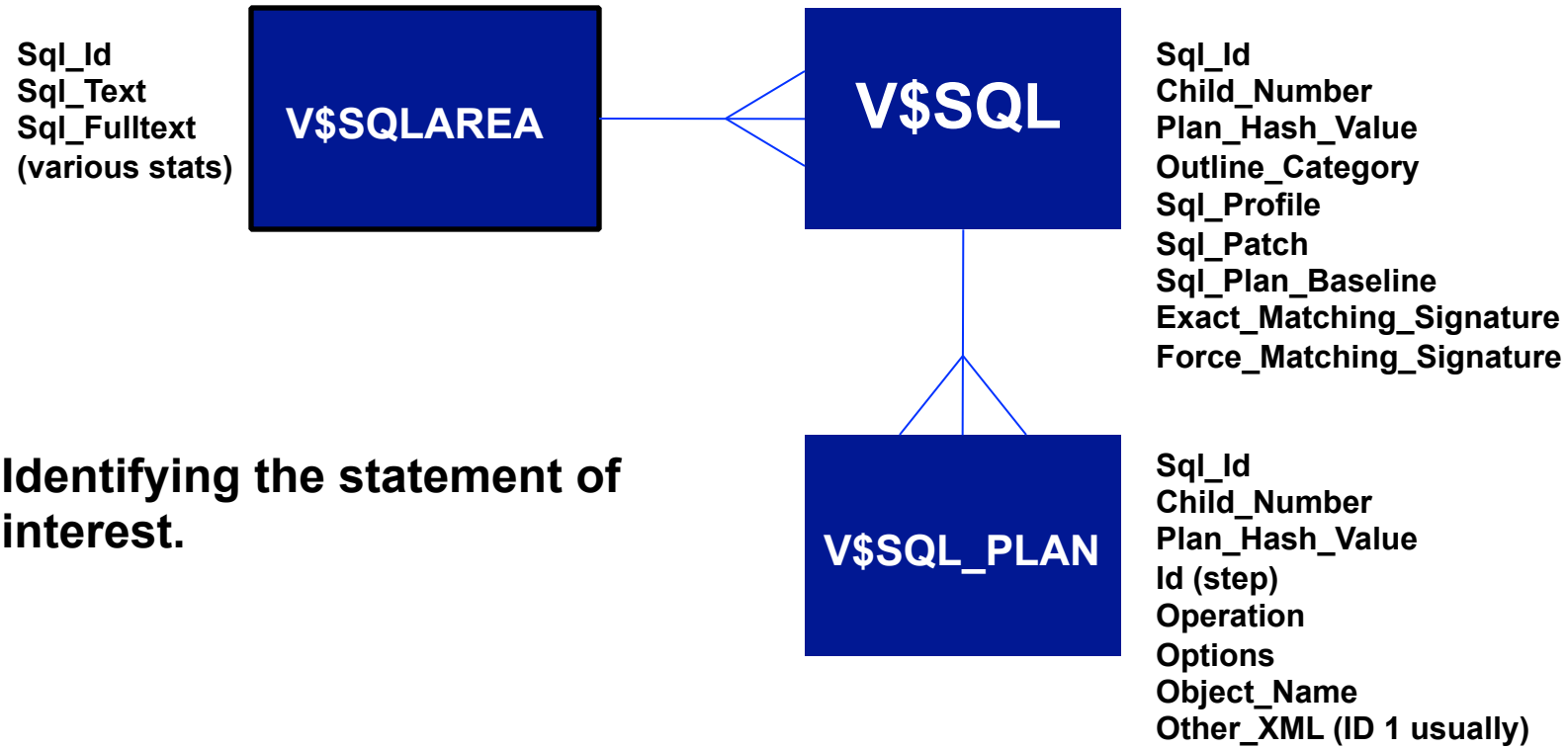
Baselines

- plan_hash_value
- multiple plans
- *no procedure to import hints
- *no force_matching
- *less stable (throws out all hints)

Warning: Addictive Behavior Ahead

Please Be Careful
These Techniques Can Be Addictive
Think of them as Band Aids

Shared Pool Layout (V$SQL…)



Identifying the statement of interest.

Note: prior to 10g hash_value used as key (no sql_id)

Finding Statements in the Shared Pool

```
SQL> !cat find_sql.sql
select sql_id, child_number, plan_hash_value plan_hash, executions execs,
(elapsed_time/1000000)/decode(nvl(executions,0),0,1,executions) avg_etime,
disk_reads/decode(nvl(executions,0),0,1,executions) avg_pio,
buffer_gets/decode(nvl(executions,0),0,1,executions) avg_lio,
sql_text
from v$sql s
where upper(sql_text) like upper(nvl('&sql_text',sql_text))
and sql_text not like '%from v$sql where sql_text like nvl(%'
and sql_id like nvl('&sql_id',sql_id)
order by 1, 2, 3
/


SQL> @find_sql
Enter value for sql_text: %skew%
Enter value for sql_id:

SQL_ID         CHILD  PLAN_HASH  EXECS  AVG_ETIME      AVG_LIO SQL_TEXT
------------- ------ ---------- ------ ---------- ------------ ----------------------------------------------
0qa98gcnnza7h      0  568322376      5      13.09      142,646 select avg(pk_col) from kso.skew where col1 > 0
0qa98gcnnza7h      1 3723858078      1       9.80    2,626,102 select avg(pk_col) from kso.skew where col1 > 0
```

Finding Plans for Statements in the Shared Pool

```
SQL> !cat dplan.sql
set lines 150
select * from table(dbms_xplan.display_cursor('&sql_id','&child_no','typical'))
/

SQL> @dplan
Enter value for sql_id: 0qa98gcnnza7h
Enter value for child_no: 0

PLAN_TABLE_OUTPUT
------------------------------------------------------------------------------------------------------------------------
SQL_ID  0qa98gcnnza7h, child number 0
-------------------------------------
select avg(pk_col) from kso.skew where col1 > 0

Plan hash value: 568322376

-------------------------------------------------------------------------------
| Id  | Operation          | Name | Rows  | Bytes | Cost (%CPU)| Time     |
-------------------------------------------------------------------------------
|   0 | SELECT STATEMENT   |      |       |       | 31719 (100)|          |
|   1 |  SORT AGGREGATE    |      |     1 |    11 |            |          |
|*  2 |   TABLE ACCESS FULL| SKEW |    32M|   335M| 31719   (37)| 00:00:43 |
-------------------------------------------------------------------------------

Predicate Information (identified by operation id):
---------------------------------------------------

   2 - filter("COL1">0)
```

Explain Plan - Lies

```
SQL> explain plan for select …
SQL> select * from table(dbms_xplan.display('plan_table','','ALL'));
```

It tells you what it thinks the optimizer might do …
- assuming the environment is the same as production
- assuming that bind variable peeking doesn't come into play
- etc…

(note: autotrace uses explain plan too)

The best liar is one that tells the truth most of the time.

Google for "Explain Plan Lies" for more info

Other Useful Metadata Info

Views:

- DBA_OUTLINES (outln.ol$)
- DBA_SQL_PROFILES (sqlobj$)
- DBA_SQL_PLAN_BASELINES (sqlobj$)
- DBA_SQL_PATCHES (sqlobj$)

Of Course V$SQL has the following:

- OUTLINE_CATEGORY
- SQL_PROFILE
- SQL_PATCH
- SQL_PLAN_BASELINE

Hints are stored for every statement: OTHER_XML

```
SYS@LAB112> @other_xml
SYS@LAB112> select other_xml from v$sql_plan
  2  where sql_id like nvl('&sql_id', sql_id)
  3  and child_number like nvl('&child_number',child_number)
  4  and other_xml is not null
  5  /
Enter value for sql_id: 2gs7q8n2y7j76
Enter value for child_number: 0

OTHER_XML
--------------------------------------------------------------------------------
<other_xml><info type="db_version">11.2.0.1</info><info type="parse_schema"><![C
DATA["SYS"]]></info><info type="plan_hash">1946853647</info><info type="plan_has
h_2">28316188</info><peeked_binds><bind nam=":N2" pos="1" dty="1" csi="178" frm=
"1" mxl="32">4e</bind></peeked_binds><outline_data><hint><![CDATA[IGNORE_OPTIM_E
MBEDDED_HINTS]]></hint><hint><![CDATA[OPTIMIZER_FEATURES_ENABLE('11.2.0.1')]]></
hint><hint><![CDATA[DB_VERSION('11.2.0.1')]]></hint><hint><![CDATA[ALL_ROWS]]></
hint><hint><![CDATA[OUTLINE_LEAF(@"SEL$1")]]></hint><hint><![CDATA[INDEX_RS_ASC(
@"SEL$1" "SKEW"@"SEL$1" ("SKEW"."COL4"))]]></hint></outline_data></other_xml>

1 row selected.
```

Easier on the Eyes: SQL_HINTS.SQL

```
SYS@LAB112> @sql_hints
SYS@LAB112> select
  2  extractvalue(value(d), '/hint') as outline_hints
  3  from
  4  xmltable('/*/outline_data/hint'
  5  passing (
  6  select
  7  xmltype(other_xml) as xmlval
  8  from
  9  v$sql_plan
 10  where
 11  sql_id like nvl('&sql_id',sql_id)
 12  and child_number = &child_no
 13  and other_xml is not null
 14  )
 15  ) d;
Enter value for sql_id: 84q0zxfzn5u6s
Enter value for child_no: 0

OUTLINE_HINTS
--------------------------------------------------------------------------------------------------------------------
IGNORE_OPTIM_EMBEDDED_HINTS
OPTIMIZER_FEATURES_ENABLE('11.2.0.1')
DB_VERSION('11.2.0.1')
ALL_ROWS
OUTLINE_LEAF(@"SEL$1")
FULL(@"SEL$1" "SKEW"@"SEL$1")

6 rows selected.
```

A Few Words on Hints!

They are finicky!
They are not particularly well documented!
If you get it wrong, they are silently ignored! (grrrrrr!)
Aliases are important!
Query Block Names are important!
New Complex Index Hint Format can be confusing!

I'd really love to have an option (maybe a hidden parameter) to see a warning when a hint is invalid or has incorrect syntax or is not able to work for any reason.

!!

A Few Words on Query Block Names

They are finicky!
They are not particularly well documented!
If you get it wrong, they are silently ignored (grrrrrr!)
…

Default QB Names look like SEL$1, DEL$1, UPD$1, SEL$2 ...
Can be named using the qb_name hint (seldom used)
Probably best to look at existing hints (v$sql_plan.other_xml)

```
INDEX_RS_ASC(@"SEL$1" "A"@"SEL$1" ("SKEW"."COL4" "SKEW"."COL3"))
```

Translation

```
Index_Hint (@QB_Name Alias (Column, …))
```

You can observe a lot by watching. ~ Yogi Bera

dbms_xplan – alias format option

```
SYS@LAB112> !cat dplan_alias.sql
set lines 150
select * from table(dbms_xplan.display_cursor('&sql_id','&child_no','alias'))
/

SYS@LAB112> @dplan_alias
Enter value for sql_id: 84q0zxfzn5u6s
Enter value for child_no:

PLAN_TABLE_OUTPUT
------------------------------------------------------------------------------------------------------------------------
SQL_ID  84q0zxfzn5u6s, child number 1
-------------------------------------
select avg(pk_col) from kso.skew where col1 = 136133

Plan hash value: 568322376

-----------------------------------------------------------------------------
| Id  | Operation          | Name | Rows  | Bytes | Cost (%CPU)| Time     |
-----------------------------------------------------------------------------
|   0 | SELECT STATEMENT   |      |       |       | 28360 (100)|          |
|   1 |  SORT AGGREGATE    |      |     1 |    24 |            |          |
|*  2 |   TABLE ACCESS FULL| SKEW |    35 |   840 | 28360   (1)| 00:05:41 |
-----------------------------------------------------------------------------

Query Block Name / Object Alias (identified by operation id):
-------------------------------------------------------------

   1 - SEL$1
   2 - SEL$1 / SKEW@SEL$1

Predicate Information (identified by operation id):
---------------------------------------------------

   2 - filter("COL1"=136133)
```

SQL Profile Secret Sauce

The Main Ah Ha:

- import_sql_profile can be used to manually create a SQL Profile with any hints

Closely related concept:

- <outline_data> from other_xml can be used as a source of hints

```
dbms_sqltune.import_sql_profile(sql_text => cl_sql_text,
                                profile => ar_profile_hints,
                                category => '&category',
                                name => '&profile_name',
                                force_match => &force_matching,
                                replace => true);
```

* Note: Randolf Geist gets credit for this idea

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*SQL Profile Scripts (*trivial)

sql_profiles – lists profiles (dba_sql_profiles)
sql_profile_hints – lists hints associated with a profile
find_sql_using_profile - (v$sql where sql_profile is not null)
drop_sql_profile - (dbms_sql_tune.drop_sql_profile)
disable_sql_profile - (dbms_sql_tune.alter_sql_profile)
enable_sql_profile - (dbms_sql_tune.alter_sql_profile)
alter_sql_profile - (name, category, status, description, ~~fixed~~)

DEMO

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SQL Profile Scripts (non-trivial)

create_sql_profile – uses OTHER_XML to create profile
create_sql_profile_awr – creates profile for plan in AWR history
move_sql_profile – copies a profile to another statement
create_1_hint_sql_profile – creates single line profile
gps.sql – creates a profile with the gather_plan_statistics hint

DEMO

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SQL Patch Scripts

sql_patches – lists SQL patches
sql_patch_hints – lists hints associated with a SQL patch
create_sql_patch – prompts for hint and creates SQL Patch
drop_sql_patch – drops a SQL patch

DEMO

Baseline Scripts

baselines – lists baselines
baseline_hints – lists hints associated with a baseline
create_baseline – create baseline on a statement
create_baseline_awr – create baseline from awr plan
drop_baseline – drops a baseline
enable_baseline – turn baseline on
disable_baseline – turn baseline off

DEMO

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Other Related Scripts

unstable_plans	– shows statements with multi-plans with significant statistical variance in exec time
whats_changed	– shows statements with significant statistical statistical variance in exec time before and after a point in time
awr_plan_stats	– aggregate execution stats by plan
awr_plan_change	– history of plan changes over time
mismatch	– shows why cursors invalidated
coe	- creates a script to create a SQL Profile based on C. Sierra SQL-T – useful for moving Profiles between systems or modifying hints

DEMO

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SQL Profiles - Wrong Tool for the Job?

Maybe:

Certainly I'm proposing using Profiles in a way that was not originally intended.

import_sql_profile is not documented and could change (in version 12?).

It's easy to convert to Baselines.

I think the benefits far outweigh the risks and …

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Appendixes

Sanctification
Licensing*

*** (with apologies to Jonathan about my spelling)**

Oracle Sanctions Manual Profiles

SQLT has a script to generate manual SQL Profiles
The script has a catchy name: coe_xfr_sql_profile.sql
Carlos Sierra is the author
See MOS Note: 215187.1 for more details
Or just google “Oracle Sanctions SQL Profiles”

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Licensing Issues

So Do You Need Tuning Pack?

Licensing rules are a bit unclear (to me)

General Consensus:

SQL Profiles require Tuning Pack
Outlines, SQL Patches, Baselines do not
Validated by CONTROL_MANAGEMENT_PACK_ACCESS=NONE

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SQL Profiles Licensing Issues

Oracle Tuning Pack

Oracle Tuning Pack provides database administrators with expert performance management for the Oracle environment, including SQL tuning and storage optimizations. Oracle Diagnostics Pack is a prerequisite product to Oracle Tuning Pack. Therefore, to use Oracle Tuning Pack, you must also have Oracle Diagnostics Pack.

Oracle Tuning Pack includes the following features:

- SQL Access Advisor
- SQL Tuning Advisor
- Automatic SQL Tuning
- SQL Tuning Sets
- Automatic Plan Evolution of SQL Plan Management
- SQL Monitoring
- Reorganize objects

SQL Profiles Licensing Issues

Command-Line APIs

Oracle Tuning Pack features can also be accessed by way of database server APIs and command-line interfaces:

- `DBMS_SQLTUNE`
- `DBMS_ADVISOR`, when the value of the `advisor_name` parameter is either SQL Tuning Advisor or SQL Access Advisor.
- `V$SQL_MONITOR`
- `V$SQL_PLAN_MONITOR`
- The following report found in the `/rdbms/admin/` directory of the Oracle home directory is part of this pack: sqltrpt.sql.

SQL Patches Licensing Issues

There is no mention of SQL Repair Advisor
Nor is there any mention of DBMS_SQLDIAG
So no License (other the EE) is required
Optimizer Group blog post agrees*

* https://blogs.oracle.com/optimizer/entry/additional_information_on_sql_patches

References

Maria Colgan. Several Good Posts on the Optimizer Group Blog.
https://blogs.oracle.com/optimizer

Tom Kyte. Pretty much everything he has ever written, but specifically
http://asktom.oracle.com/pls/asktom/f?p=100:11:0::::P11_QUESTION_ID:61313086268493

Jonathan Lewis. *Several Posts on Profiles*
http://jonathanlewis.wordpress.com/?s=%22sql+profile%22

Kerry Osborne. *Several Posts on Profiles*
http://kerryosborne.oracle-guy.com/

Randolf Geist. *Using Existing Cursors to Create Stored Outlines and SQL Profiles*
https://www.blogger.com/comment.g?blogID=5124641802818980374&postID=1108887738796239333

Notes on Editing Outlines on My Oracle Support (726802.1, 726802.1, 144194.1)
https:support.oracle.com

Questions / Contact Information

Questions?

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