



Dan's Top 10 Oracle12c New Features

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❖ Dan Hotka

– Oracle ACE Director

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- www.oracle.com/technology/community/oracle_ace/index.html

– Oracle Authored Expert

- 34 Years in IT – 28 years working with Oracle
- 12 books – hundreds of articles

❖ Register for my quarterly Newsletter

- Full of tips and techniques, downloads, book reviews, etc

❖ DanHotka.Blogspot.com

- I also blog on TOADWorld.com

❖ Training at your Desk!

- Public Web-based training
- Half day lectures with hands-on lab exercises
- Almost like being there!

❖ Flat Fee Training for your company:

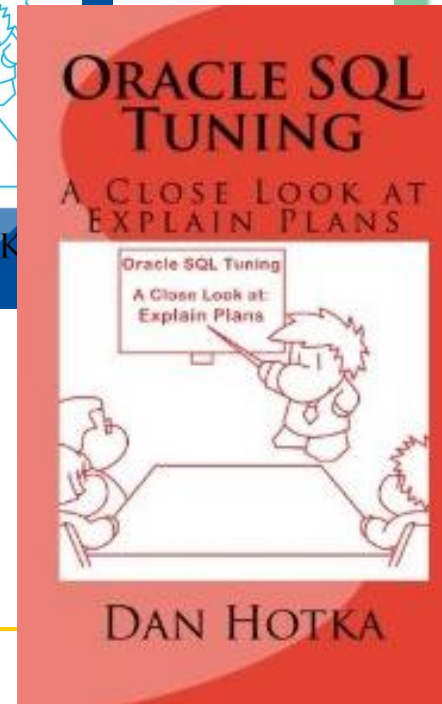
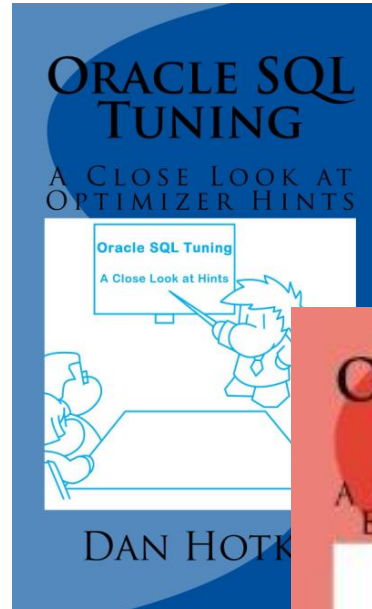
- 1 Course Fee Price
 - Price includes my portable computer lab!
- On-site or over the Web!
- Portable computer lab

❖ Training Courses Include:

- Oracle12 New Features!!!!
- Oracle Advanced PL/SQL
- Oracle SQL Tuning
- TOAD Courses
- APEX – Admin, Developers, Installation
- Oracle OBIEE – Admin & Queries/Reports
- Discoverer, Intro courses, Cross training!

www.Amazon.com

- ❖ Lecture Notes
- ❖ Useful Hints
- ❖ Great info for TOAD users
- ❖ Available in Kindle format too!
- ❖ www.Amazon.com



Additional Reading

- ❖ **Oracle12c New Features**
 - By Robert Freeman;
 - Available in the book store???
 - www.Amazon.com





Agenda

- ❖ #1 Pluggable DB
- ❖ #2 New SQL Syntax
- ❖ #3 New Limits
- ❖ #4 New Histograms
- ❖ #5 New Hints
- ❖ #6 Adaptable Stats
- ❖ #7 Adaptable SQL Optimizer
- ❖ #8 Sequence Enhancements
- ❖ #9 PL/SQL Enhancements
- ❖ #10 Depreciated Features



Audience Background

❖ A few questions:

- What Oracle Database are you running?
- When do you plan to go to Oracle12?
- Working with Oracle12 Now?
- What is your Oracle background?
 - Newbee 1 – 3 years 4 – 8 years 8+ years?
- What is your main role?
 - Power User Analyst Developer DBA Management?



#1 Pluggable DB



Pluggable Database

❖ Pluggable Database

– The 'c' in Oracle12

- Container

- Pluggable databases come into the environment as a database that 'contains' other database

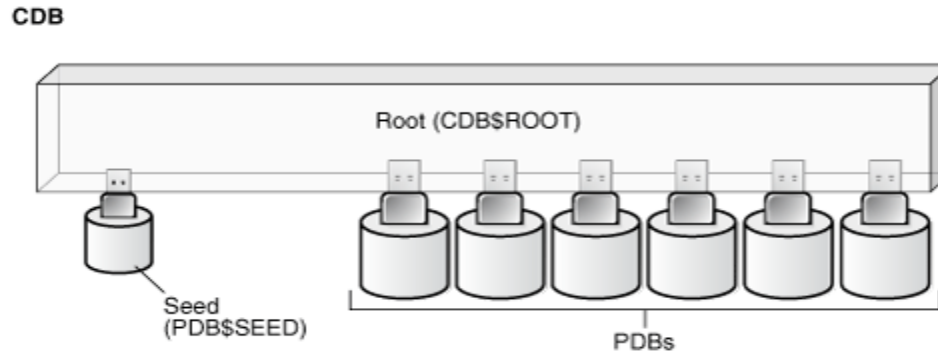
- Consolidate

- Allows for the sharing of resources, backup/recovery schemes, and ease of management of similar application DBs

- Cloud

- This new environment lends itself well for the cloud computing environment

Pluggable Database



❖ How it works:

- Root
 - Contains metadata and common users
- Seed
 - A template for new PDB's
- PDB
 - The actual application DB...just like a non-CDB.



Pluggable Database

❖ How it works:

- 1 set of Oracle executables per container
 - Think of the savings in memory/processing power alone!
- Sharing of features:
 - Container setup features shared across all PDB's automatically
 - Data guard, rac,
 - Resource management (memory, disk, etc)
 - Backup
- Eases management of lots of similar database environments



Pluggable Database

❖ Support

- Supports up to 252 databases per container DB
- Users can share PDB's
 - Called common users
- Can use SQL*Plus, DBCA, Enterprise Mngr Cloud Control, SQL Developer, or Server Control to manage the CDB and PDB's.

Pluggable Database

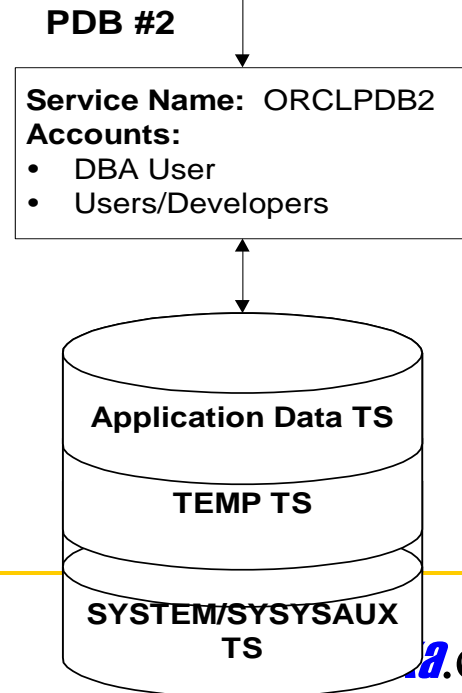
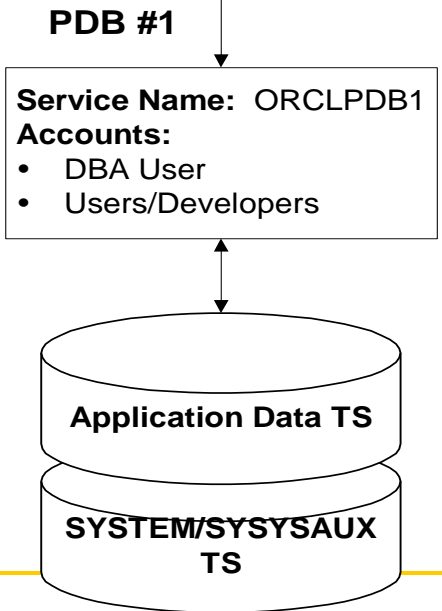
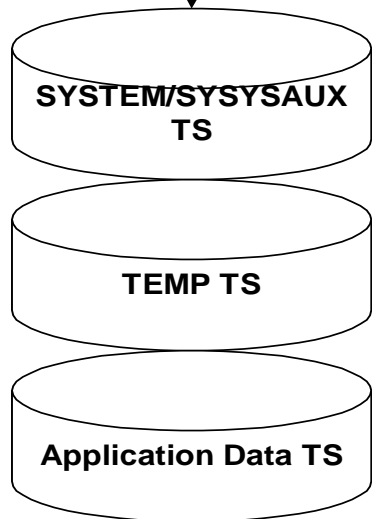
Oracle12 CDB

SID: Orcl
Service Name: ORCL
Container Name: CDB\$ROOT
Accounts:

- Sys
- System
- C## - common users

Alter Session Set container = <service name>;

upto 250
more
PDB's





Pluggable Database

❖ Problems

- Same synonym names pointing to different objects
- Same schema names
- Supports Oracle12 DBs only

❖ **Some planning is needed to insure consistency of common names across applications**



#2 New SQL Syntax



New SQL Syntax

❖ New SQL Syntax

– VIEW Enhancements

- Columns can be made visible and invisible as well
- BEQUEATH option to override default Invokers rights

New SQL Syntax

❖ New SELECT Syntax

- Pattern Matching enables patterns to be found across multiple rows

```
SELECT *
FROM Ticker MATCH_RECOGNIZE (
    PARTITION BY symbol
    ORDER BY tstamp
    MEASURES STRT.tstamp AS start_tstamp,
             LAST(DOWN.tstamp) AS bottom_tstamp,
             LAST(UP.tstamp) AS end_tstamp
    ONE ROW PER MATCH
    AFTER MATCH SKIP TO LAST UP
    PATTERN (STRT DOWN+ UP+)
    DEFINE
        DOWN AS DOWN.price < PREV(DOWN.price),
        UP AS UP.price > PREV(UP.price)
) MR
ORDER BY MR.symbol, MR.start_tstamp;
```

New SQL Syntax

❖ New SELECT Syntax

- Row_Limiting clause works with Top-N to specify the number or percentage of rows to return
- Does not work with For Update
- Offset is 0 if not defined
 - 0 if negative number
 - Fractions truncated
- WITH TIES works with the order by clause
 - To return the % of rows including matching values of the last item

```
SELECT employee_id, last_name  
FROM employees  
ORDER BY employee_id  
OFFSET 5 ROWS FETCH FIRST 5 ROWS ONLY;
```

```
SELECT employee_id, last_name  
FROM employees  
ORDER BY employee_id  
OFFSET 5 ROWS FETCH NEXT 5 ROWS ONLY;
```

```
SELECT employee_id, last_name, salary  
FROM employees  
ORDER BY salary  
FETCH FIRST 5 PERCENT ROWS ONLY;
```

New SQL Syntax

❖ New Join Syntax

- Cross_Outer_Apply_Clause
 - Allows a variation of the ANSI CROSS JOIN or ANSI LEFT OUTERJOIN with left correlation support.
 - Specify CROSS APPLY to perform a variation of the ANSI Cross Join
 - Specify OUTER APPLY to perform a variation of the ANSI Left Outer Join



New SQL Syntax

```
SELECT d.department_name, v.employee_id, v.last_name  
FROM departments d CROSS APPLY (SELECT * FROM employees e  
WHERE e.department_id = d.department_id) v  
WHERE d.department_name IN ('Marketing', 'Operations', 'Public Relations')  
ORDER BY d.department_name, v.employee_id;
```

```
SELECT d.department_name, v.employee_id, v.last_name  
FROM departments d OUTER APPLY (SELECT * FROM employees e  
WHERE e.department_id = d.department_id) v  
WHERE d.department_name IN ('Marketing', 'Operations', 'Public Relations')  
ORDER by d.department_name, v.employee_id;
```

New SQL Syntax

❖ New Join Syntax

- Lateral clause for Inline Views
 - Allows for columns in the inline view to be accessed!

```
SELECT * FROM employees e, (SELECT * FROM departments d  
WHERE e.department_id = d.department_id);
```

```
ORA-00904: "E"."DEPARTMENT_ID": invalid identifier
```

```
SELECT * FROM employees e, LATERAL(SELECT * FROM  
departments d  
WHERE e.department_id = d.department_id);
```



#3 New Limits



New Limits

❖ Increased column size limits

- IF MAX_STRING_SIZE = EXTENDED
 - Varchar2 – new limit 32K
 - NVarchar2 – new limit 32K
 - RAW – new limit 32K
- MAX_STRING_SIZE = STANDARD (default behavior)
 - Varchar2 –limit 4K
 - NVarchar2 –limit 4K
 - RAW – limit 2K



New Limits

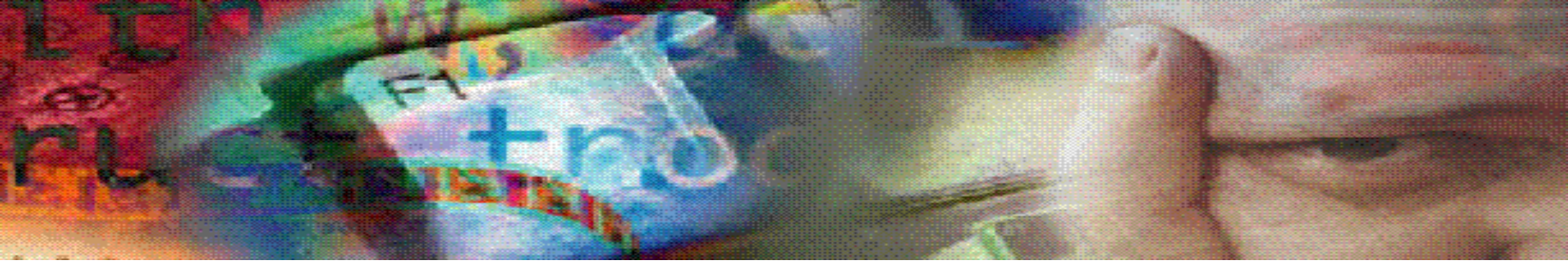
Database Type	Current Table Limit	Current PL/SQL Limit	Oracle12c New Limit
Varchar2	2K	4K	32K
Nvarchar2	2K	4K	32K
Raw	2K	4K	32K



New Limits

❖ New init.ora setting: Max_String_Size

- Set to EXTENDED
 - Allows new limits
- Set to STANDARD
 - Old limits used
- NO Going Back!!!!
- Indexed column max size 6400 Bytes
 - Make sure no indexes are using long varchar columns



#4 New Histograms

New Optimizer Features

❖ New Histograms

- TOP-FREQUENCY
 - Ignores unpopular values
 - Created only with `AUTO_SAMPLE_SIZE Dbms_Stats` option
- HYBRID Histograms
 - Similar to height balanced
 - No value spills over to next bucket
 - More end points are stored
 - has new column: Endpoint Repeat Count
 - Created only with `AUTO_SAMPLE_SIZE Dbms_Stats` option
- Both Histograms default to 254 buckets
 - Using the `SIZE` parameter. Max buckets is now 2048!
- Can see values by using `USER_TAB_HISTOGRAMS`



#5 New Hints



New Hints

❖ New Hints

- GATHER_OPTIMIZER_STATISTICS/NO_GATHER_OPTIMIZER_STATISTICS
 - enables and disables statistics gathering during bulk loads.
- PQ_CONCURRENT_UNION/NO_PQ_CONCURRENT_UNION
 - enables and disables concurrent processing of UNION and UNIONALL operations.
- PQ_FILTER
 - Tells the optimizer on how to process rows when filtering correlated subqueries
- PQ_SKEW/NO_PQ_SKEW Hint
 - tells optimizer of whether the distribution of the values of the join keys for a parallel join is skewed.
- USE_CUBE/NO_USE_CUBE Hint
 - specify whether to use or exclude cube joins



#6 Adaptable Stats

Statistic Improvements

❖ Statistics have Improved in 12c

- Dynamic Stats/Adaptive Stats
 - Replaces Dynamic Sampling
 - Depends on the SQL, existing Stats, and total execution time
 - Used with complex where clauses (predicates)
 - Dynamic sampling occurs on a subset of blocks

Statistic Improvements

❖ Statistics have Improved in 12c

– Adaptive Stats (continued)

- Used to compensate for missing/stale, or incomplete stats
- Used for table scans, index access, and join operations
- Does dynamic sampling/dynamic stats based on query run-time
 - After first execution...SQL has accurate row counts
 - New join order then used for subsequent executions
- Stats are then shared across SQL!

Statistic Improvements

❖ Statistics have Improved in 12c

- Adaptive Stats (continued)
 - Works with Adaptive Cursor Sharing
 - introduced in 11g – better bind variable processing)
 - Stats stored in Directive Cache
 - Occasionally written to SYSAux TX – SQL Directives
 - DBMS_SPD.Flush_SQL_Plan_Directive
 - New V\$SQL column IS_REOPTIMIZABLE
 - Indicates SQL has a dynamic plan that was resolved on the SQL's first execution
 - Creates new child cursor
 - New but similar SQL...uses the SQL Directives...

Statistic Improvements

❖ Statistics have Improved in 12c

- Adaptive Stats (continued)
 - Monitor with this SQL
 - Will show how stats were collected and any STATS issues

```
SELECT d.directive_id dir_id, o.owner, o.object_name,  
       o.subobject_name col_name, o.object_type, d.type, d.state, d.reason  
FROM dba_sql_plan_directives d, dba_sql_plan_dir_objects o  
WHERE d.directive_id = o.directive_id  
       and o.owner = '&Enter_Owner'  
ORDER BY 1,2,3,4,5;
```



#7 Adaptable SQL Optimizer



New Optimizer Features

❖ Adaptive SQL Plans

- Run-time adjustments to query plans
- SQL Plan directives collected per query expression
 - Not at a SQL statement level as in 11g and before
- Automatic feature
- New Evolve auto task
 - Runs this process for all non-accepted plans
 - Automatically accepts new plans that perform better than existing plan

New Optimizer Features

❖ Adaptive SQL Plans

- Adaptive Join methods
 - Default plan used/alternate sub-plans are also pre-computed and stored with the cursor Adapts to statistics collected at compile time
 - Static collectors holds valid ranges per join method
- Adapts to statistics collected at run time
 - If stats prove to be out of range
 - Sub-plans will be used

New Optimizer Features

❖ Adaptive SQL Plans

– Adaptive Join methods

- Can see using `/*+ gather_plan_statistics */` displays default plan
- `Select * from table(dbms_xplan.display_cursor(' <sql_id> '));` displays the final plan used
- `Select * from table(dbms_xplan.display_cursor(format => '+all_dyn_plan +adaptive');` displays all plans generated and which one used!

New Optimizer Features

❖ Adaptive SQL Plans

- New V\$SQL column IS_RESOLVED_DYNAMIC_PLAN
 - Indicates SQL has a dynamic plan that was resolved on the SQL's first execution
- Init.ora setting can disable but shows what would have happened
 - Optimizer_Adaptive_Reporting_Only



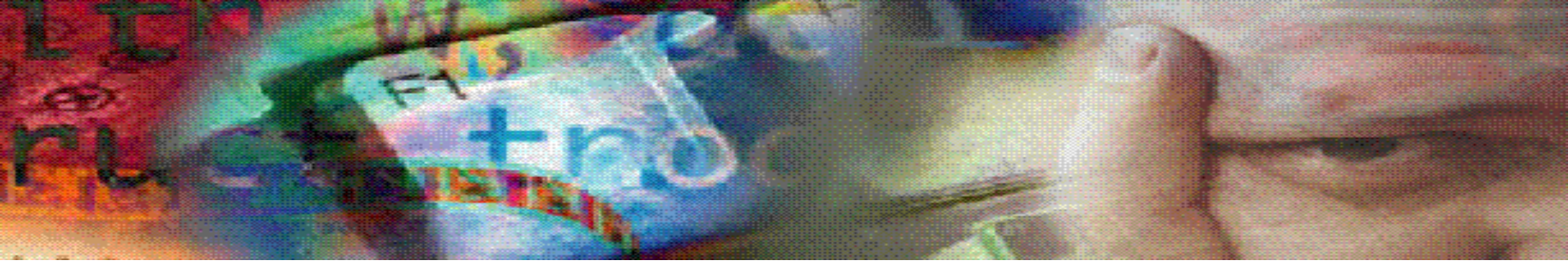
#8 Sequence Enhancements



New SQL Syntax

❖ New Options for Sequences

- KEEP and NOKEEP feature added
 - Works with database Replay
 - Controls if NEXTVAL retains its original value (keep feature) or not (nokeep feature)
- Can be used as Table column default values!



#9 New PL/SQL Syntax

New SQL Syntax

❖ Functions in WITH Clause

- Now can have a PL/SQL function as part of a WITH clause

WITH

```
FUNCTION get_domain(url VARCHAR2) RETURN  
VARCHAR2 IS
```

```
    pos BINARY_INTEGER;
```

```
    len BINARY_INTEGER;
```

```
BEGIN
```

```
    pos := INSTR(url, 'www.');
```

```
    len := INSTR(SUBSTR(url, pos + 4), '.') - 1;
```

```
    RETURN SUBSTR(url, pos + 4, len);
```

```
END;
```

```
SELECT DISTINCT get_domain(catalog_url)
```

```
    FROM product_information;
```

```
/
```



New PL/SQL Features

❖ New PL/SQL Features

- PL/SQL And SQL
- Enhanced DBMS_UTILITY
- New UTL_CALL_STACK
- Enhanced DBMS_SQL
- Enhanced Native SQL

New PL/SQL Features

❖ PL/SQL and SQL

- Same new size limits on Varchar2, Nvarchar2, and Raw
 - Same options to turn it on...
- Bulk Collect supports the Fetch First SQL Features
- PL/SQL Functions that Run Faster in SQL
 - Support for the previously discussed WITH SQL syntax
- Invisible Columns
 - CAN be directly referenced via PL/SQL
 - NOT using '*' syntax...
 - Can make columns visible/invisible too



New PL/SQL Features

- ❖ **Easily another 25 or so packages**
 - Not time to cover all here
 - Coverage for PDB's, etc
- ❖ **DBMS_UTILITY**
 - Expand_SQL_Text
 - Easily exposes the SQL contained in a view
- ❖ **UTL_CALL_STACK**
 - Provides info on currently executing sub programs
 - Info includes name, owner, and line numbers
 - Enhanced Native SQL

New PL/SQL Features

❖ UTL_Call_Stack

- Provides info on currently executing sub programs
 - Info includes name, owner, and line numbers
- Programs include:
 - Backtrace_Depth _Line _Unit
 - Error_Depth _Msg _Number
 - Unit_Line
 - Subprogram



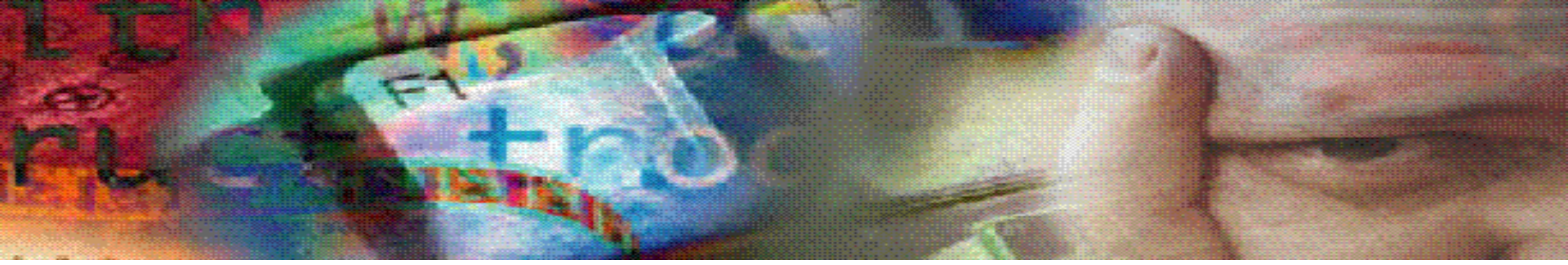
New PL/SQL Features

❖ **DBMS_SQL.Parse**

- Now has a schema input parameter

❖ **Enhanced Native SQL**

- Also now supports the Fetch First SQL feature



#10 Depreciated Features

Deprecated Features

❖ Deprecated Features

- Stored Outlines
 - Still supported for backward compatibility
 - Use plan baselines instead
- Streams – deprecated
 - Possibly desupported and unavailable in future releases
- Advanced Replication
 - Use Oracle GoldenGate to replace all features
- OEM Database Control is desupported and is no longer available

Deprecated Features

❖ Deprecated Features

- Oracle Label Security
- IGNORECASE and SEC_CASE_SENSITIVE_LOGON
 - Passwords are now ALWAYS case sensitive
- Database Vault Configuration Assistant and Vault Administrator
 - Use OEM Cloud Control instead

Deprecated Features

❖ **Deprecated Parameters**

- active_instance_count
- background_dump_dest
- buffer_pool_keep
- buffer_pool_recycle
- commit_write
- cursor_space_for_time
- fast_start_io_target
- global_context_pool_size
- instance_groups
- lock_name_space
- log_archive_local_first
- log_archive_start
- max_enabled_roles
- parallel_automatic_tuning
- parallel_io_cap_enabled
- parallel_server
- parallel_server_instances
- plsql_v2_compatibility
- remote_os_authent
- resource_manager_cpu_allocation
- sec_case_sensitive_logon
- serial_reuse
- sql_trace
- standby_archive_dest
- user_dump_dest

Deprecated Features

❖ **Deprecated Parameters**

Select name from v\$parameter

Where isdeprecated = 'TRUE'

Order by name;

Deprecated Features

❖ **Deprecated Views**

- ALL_SCHEDULER_CREDENTIALS
- DBA_NETWORK_ACL_PRIVILEGES
- DBA_NETWORK_ACLS
- DBA_SCHEDULER_CREDENTIALS
- USER_NETWORK_ACL_PRIVILEGES
- USER_SCHEDULER_CREDENTIALS
- V\$OBJECT_USAGE

Use the USER_OBJECT_USAGE



Watch for Dan

- ❖ **At a User Group near you...**
 - Oracle12c New Features for Developers
 - Oracle12c New Features for DBA's
 - TOAD as a SQL Tuning Tool
 - OBIEE Tips and Techniques



Watch for Dan

- ❖ **Oracle Open World (San Francisco)**
 - September 22 - 26, 2013
- ❖ **BIWA Summit (San Francisco)**
 - January 14 - 16, 2014
- ❖ **RMOUG (Denver)**
 - February 5-7, 2014
- ❖ **HOTSOS (Dallas)**
 - March 2 - 6, 2014
- ❖ **Collaborate (Las Vegas)**
 - April 7 - 11, 2014



October Training

- ❖ **Training at your Desk – Same lectures and hands-on labs...**
 - Oct 7 – 11 – Oracle SQL Tuning for Developers
 - Oct 12 – Advanced Oracle SQL Tuning Tips Lecture
 - Oct 21 – 25 – Oracle Adv PL/SQL Tips and Techniques

What have we learned?

❖ Thank you for your time

- Keep in touch
- Dan 😊
- Dan@DanHotka.com
- www.DanHotka.com

