Oracle Database 11gR2 Syntax for Developers

or

What you should know before the release of 12c

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  - May 30-31: OUG Harmony Finland
  - Jun 1: OUG Harmony Latvia
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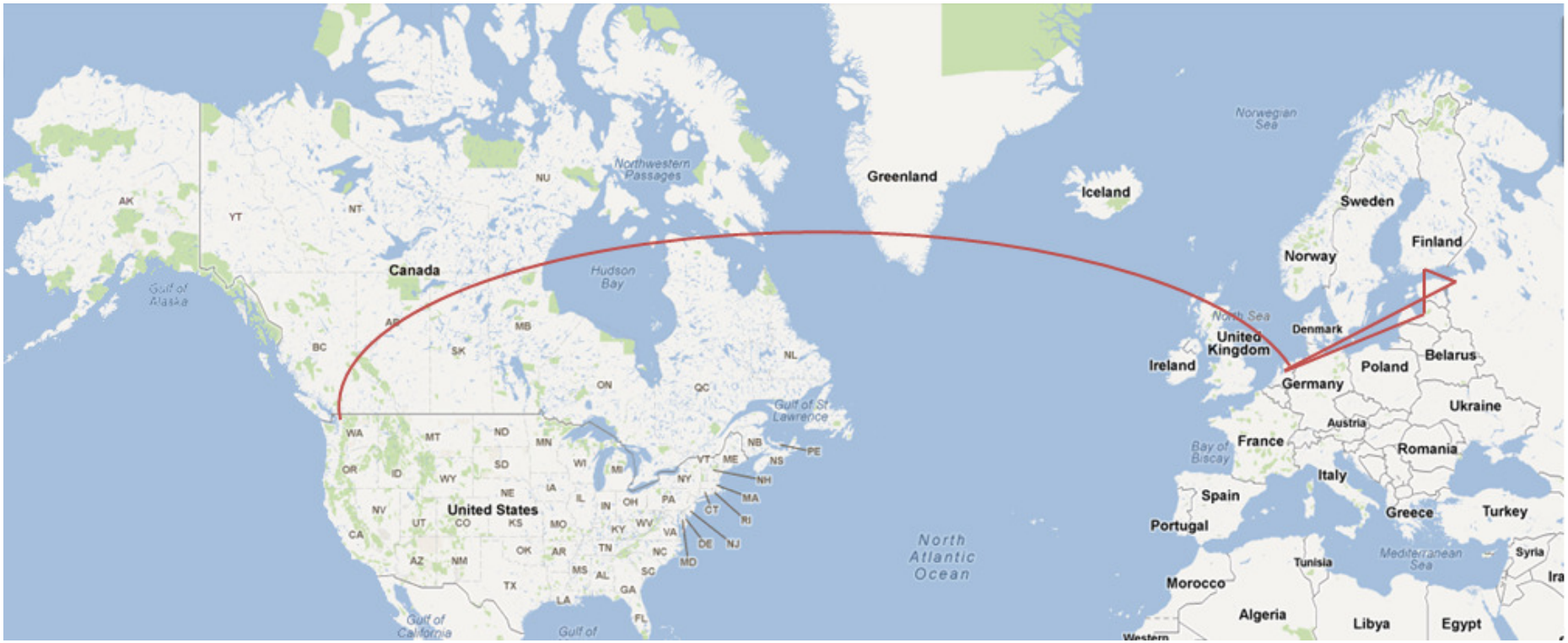

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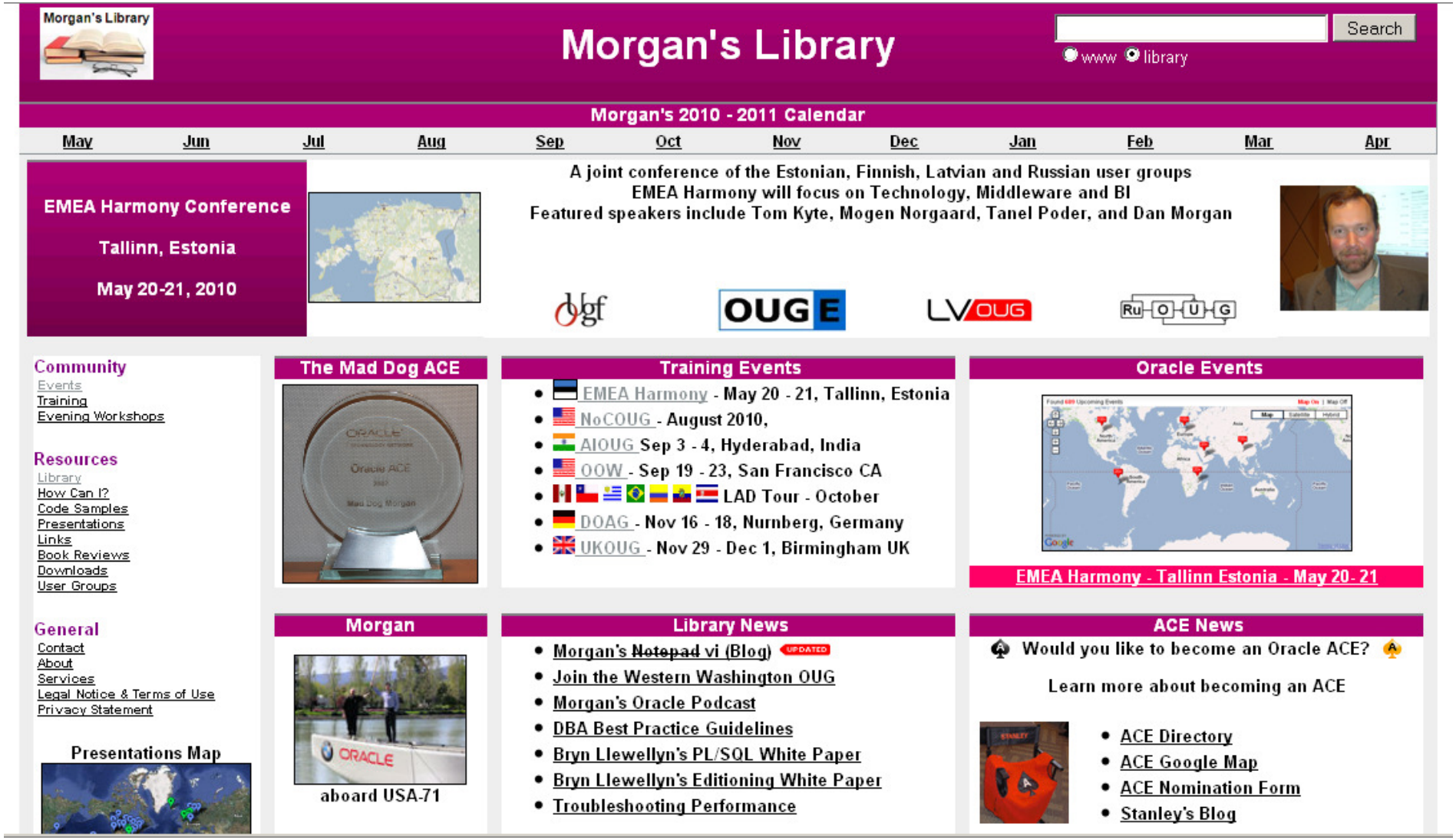


Syllabus

- What can I tell you about Database Version 12c?

- What should everyone know about Oracle 8.0i?
- What should everyone know about Oracle 8.i?
- What should everyone know about Oracle 9.0?
- What should everyone know about Oracle 9.2?
- What should everyone know about Oracle 10gR1?
- What should everyone know about Oracle 10gR2?
- What should everyone know about Oracle 11gR1?
- What should everyone know about Oracle 11gR2?

One Take-Away: Get your money's worth!

- Some people complain about the cost of Oracle Database software
  - While not using a fraction of what they paid for
  - While reinventing the wheel

- Would anyone purchase a house and not use the kitchen?

Basic SQL

- DDL statements
  - Tables and Columns
  - Constraints
  - Indexes
  - Database Links

Tables and Columns

- Heap
- Partitioned and Composite Partitioned
- Compressed
- External
- Global Temporary
- Index Organized
- XML
- Read Only
- CLOB, BLOB, XMLTYPE, Virtual

Production Code

```
CREATE TABLE orders OF XMLType
 XMLTYPE STORE AS BINARY XML
 VIRTUAL COLUMNS (
  SITE_ID AS (XMLCast(XMLQuery('/Order/@SiteId' PASSING OBJECT_VALUE RETURNING CONTENT) AS NUMBER)))
 PARTITION BY RANGE (site_id) (
 PARTITION p1 VALUES LESS THAN (10),
 PARTITION p2 VALUES LESS THAN (20),
 PARTITION pm VALUES LESS THAN (MAXVALUE));

 DECLARE
  x XMLTYPE;
 BEGIN
   x := XMLTYPE('<?xml version="1.0" encoding="utf-8"?>
          <Order orderId="1" orderRevision="1" orderTimeStamp="01-JAN-2012">
            <OrderHeader>
              <AlternateIds>
                <AlternateId altIdType="SiteId">12</AlternateId>
                <AlternateId altIdType="MerchantOrderNumber">Merch</AlternateId>
                <AlternateId altIdType="MarketplaceOrderNumber">Place</AlternateId>
                <AlternateId altIdType="CustomerReferenceId">Ref</AlternateId>
                <AlternateId altIdType="CartId">Cart</AlternateId>
                <AlternateId altIdType="SessionId">1</AlternateId>
              </AlternateIds>
            </OrderHeader>
          </Order>');
   INSERT INTO orders VALUES (x);
 END;
 /

...
```

READ ONLY Optimization

- When consistent with their usage:
- Set tablepaces to READ ONLY
- Set tables to READ ONLY
- Set partitions to READ ONLY

READ ONLY Optimization

```
CREATE TABLE t1 AS SELECT * FROM sh.sales;

ALTER SESSION SET tracefile_identifier = 'test_plan1';
ALTER SESSION SET EVENTS '10046 trace name context forever, level 12';

SELECT COUNT(*) FROM (SELECT * FROM t1);

ALTER SESSION SET EVENTS '10046 trace name context OFF';
```

```
--------------------------------------------------------------------------------

call     count       cpu    elapsed       disk      query    current        rows
------- ------  -------- ---------- ---------- ---------- ----------  ----------
Parse        1      0.00       0.00          0          1          0           0
Execute      1      0.00       0.00          0          0          0           0
Fetch        2      0.67       1.32       4433       4438          0           1
------- ------  -------- ---------- ---------- ---------- ----------  ----------
total        4      0.67       1.32       4433       4439          0           1
```

Read-Write

```
CREATE TABLE t2 AS SELECT * FROM sh.sales;
ALTER TABLE t2 READ ONLY;

ALTER SESSION SET tracefile_identifier = 'test_plan2;
ALTER SESSION SET EVENTS '10046 trace name context forever, level 12';

SELECT COUNT(*) FROM (SELECT * FROM t2);

ALTER SESSION SET EVENTS '10046 trace name context OFF';
```

Read-Only

```
--------------------------------------------------------------------------------

call     count       cpu    elapsed       disk      query    current        rows
------- ------  -------- ---------- ---------- ---------- ----------  ----------
Parse        1      0.00       0.00          0          1          0           0
Execute      1      0.00       0.00          0          0          0           0
Fetch        2      0.28       1.14       4433       4438          0           1
------- ------  -------- ---------- ---------- ---------- ----------  ----------
total        4      0.28       1.15       4433       4439          0           1
```

Note: There is a consistent benefit seen in the traces but what you find in your version and application may not be as large.

Constraints

- Why do primary keys and unique constraints have unique indexes?
- When is it appropriate to create deferrable constraints
- Unique and Check constraints on Virtual Columns
- Why does everyone create NOT NULL constraints on Primary Key columns?

Indexes

- B*Tree
- Bitmap
- Bitmap Join (Star)
- Compressed
- Descending
- Function Based
- Invisible
- No Segment
- Reverse
- Indexes on Virtual Columns

Database Links

```
CREATE DATABASE LINK fixed_user
CONNECT TO hr IDENTIFIED BY hr;

 col owner format a20
 col db_link format a15
 col username format a20
 col host format a12

 SELECT * FROM dba_db_links;

 ALTER DATABASE LINK fixed_user
 CONNECT TO hr IDENTIFIED BY hrnew;
```

Basic SQL

- DML statements
  - SELECT with SAMPLE clause
  - SELECT into a ROW
  - INSERT WHEN
  - INSERT ALL
  - INSERT FIRST
  - INSERT into a SELECT statement
  - INSERT with the RETURNING clause
  - INSERT statement with records
  - UPDATE with RETURNING clause
  - UPDATE with SET ROW
  - DELETE from a SELECT statement
  - DELETE with RETURNING clause
  - MERGE can also include a DELETE

SELECT SAMPLE CLAUSE

```
SELECT *
FROM t
SAMPLE(1);


SELECT /*+ FULL */ COUNT(*)
FROM t
SAMPLE BLOCK(1);


SELECT *
FROM t
SAMPLE(1) SEED(5);
```

SELECT (PL/SQL)

```
DECLARE
  trec t%ROWTYPE;
 BEGIN
   SELECT *
   INTO trec
   FROM t
   WHERE rownum = 1;

   dbms_output.put_line(trec.table_name);
 END;
 /
```

I am not not afraid to show mine in public

Optimizer Plans (customer's SQL before "tuning")

```
SELECT DISTINCT E1_2.OBJECT_ID
   FROM PMCM.ELEMENT_DETAIL E1_1, PMCM.ELEMENT_DETAIL E1_2, PMCM.MARK_NETW_HIERARCHY H1,
        PMCM.ELEMENT_DETAIL E2_1, PMCM.ELEMENT_DETAIL E2_2, PMCM.MARK_NETW_HIERARCHY H2
   WHERE E1_1.OBJECT_ID = H1.PARENT_ID
     AND E1_2.OBJECT_ID = H1.OBJECT_ID
     AND E2_1.OBJECT_ID = H2.PARENT_ID
     AND E2_2.OBJECT_ID = H2.OBJECT_ID
     AND E1_1.CURRENT_IND = 'Y' AND E2_1.CURRENT_IND = 'Y'
     AND E2_1.CURRENT_IND = 'Y' AND E2_2.CURRENT_IND = 'Y'
     AND H1.CURRENT_IND = 'Y' AND H2.CURRENT_IND = 'Y'
     AND H1.HIERARCHY_TYPE = 'NETWORK' AND H2.HIERARCHY_TYPE = 'NETWORK'
     AND H1.PARENT_TYPE IN ('BSC','RNC')  AND H2.PARENT_TYPE IN ('BSC','RNC')
     AND E2_2.ELEMENT_TYPE = 'CELL' AND E1_2.ELEMENT_TYPE = 'CELL'
     AND H1.PARENT_TYPE IN ('BSC','RNC')
     AND E1_1.ELEMENT_NAME = E2_1.ELEMENT_NAME
     AND E1_1.ELEMENT_ID = E2_1.ELEMENT_ID
     AND E1_2.ELEMENT_NAME = E2_2.ELEMENT_NAME
     AND E1_2.ELEMENT_ID = E2_2.ELEMENT_ID
     AND E1_2.USEID LIKE '*%' AND E2_2.USEID NOT LIKE '*%';
```

Id	Operation	Name	Rows	Bytes	TempSpc	Cost (%CPU)	Time	Pstart	Pstop
0	SELECT STATEMENT		1	78		74M (40)	50:54:42		
1	TEMP TABLE TRANSFORMATION								
2	LOAD AS SELECT								
3	PARTITION RANGE ALL		22M	1111M		38153 (11)	00:01:34	1	29
* 4	TABLE ACCESS FULL	ELEMENT_DETAIL	22M	1111M		38153 (11)	00:01:34		
5	LOAD AS SELECT								
6	PARTITION HASH ALL		337K	9231K		3514 (15)	00:00:09	1	16
* 7	TABLE ACCESS FULL	MARK_NETW_HIERARCHY	337K	9231K		3514 (15)	00:00:09		
8	SORT AGGREGATE		1	78					
* 9	HASH JOIN		927G	65T	534M	74M (40)	50:53:00		
10	VIEW		22M	277M		16808 (12)	00:00:42		
11	TABLE ACCESS FULL	SYS_TEMP_0FDA7485F_6A66C42E	22M	1111M		16808 (12)	00		
* 12	HASH JOIN		21G	1272G	534M	1616K (43)	01:06:04		
13	VIEW		22M	277M		16808 (12)	00:00:42		
14	TABLE ACCESS FULL	SYS_TEMP_0FDA7485F_6A66C42E	22M	1111M		16808 (12)	0		
* 15	HASH JOIN		476M	23G	524M	97327 (22)	00:03:59		
* 16	HASH JOIN		10M	401M	8704K	34520 (10)	00:01:25		
* 17	HASH JOIN		234K	5948K	8256K	783 (10)	00:00:02		
18	VIEW		337K	4286K		142 (14)	00:00:01		
19	TABLE ACCESS FULL	SYS_TEMP_0FDA74860_6A66C42E	337K	3956K		142 (14)	00:00:01		
20	VIEW		337K	4286K		142 (14)	00:00:01		
21	TABLE ACCESS FULL	SYS_TEMP_0FDA74860_6A66C42E	337K	3956K		142 (14)	00:00:01		
22	VIEW		22M	277M		16808 (12)	00:00:42		
23	TABLE ACCESS FULL	SYS_TEMP_0FDA7485F_6A66C42E	22M	1111M		16808 (12)	00:00:42		
24	VIEW		22M	277M		16808 (12)	00:00:42		
25	TABLE ACCESS FULL	SYS_TEMP_0FDA7485F_6A66C42E	22M	1111M		16808 (12)	0		

Optimizer Plans (tuning gone terribly wrong)

Id	Operation	Name	Rows	Bytes	TempSpc	Cost (%CPU)	Time	Pstart	Pstop
0	SELECT STATEMENT		1	78		14T(100)	999:59:59		
1	TEMP TABLE TRANSFORMATION								
2	LOAD AS SELECT								
3	PARTITION RANGE ALL		22M	1111M		38153 (11)	00:01:34	1	29
* 4	TABLE ACCESS FULL	ELEMENT_DETAIL	22M	1111M		38153 (11)	00:01:34		
5	LOAD AS SELECT								
6	PARTITION HASH ALL		337K	9231K		3514 (15)	00:00:09	1	16
* 7	TABLE ACCESS FULL	MARK_NETW_HIERARCHY	337K	9231K		3514 (15)	00:00:09		
8	SORT AGGREGATE		1	78					
9	MERGE JOIN		471P	15E		14T(100)	999:59:59		
10	MERGE JOIN		10P	616P		694G (81)	999:59:59		
11	MERGE JOIN		231T	10P		377G (64)	999:59:59		
12	SORT JOIN		334T	11P	28P	377G (64)	999:59:59		
13	MERGE JOIN CARTESIAN		334T	11P		140G (14)	999:59:59		
* 14	HASH JOIN		989M	23G	534M	96010 (38)	00:03:56		
15	VIEW		22M	277M		16808 (12)	00:00:42		
16	TABLE ACCESS FULL	SYS_TEMP_0FDA7485B_6A66C42E	22M	1111M		16808 (12)	00:00:42		
17	VIEW		22M	277M		16808 (12)	00:00:42		
18	TABLE ACCESS FULL	SYS_TEMP_0FDA7485B_6A66C42E	22M	1111M		16808 (12)	00:00:42		
19	BUFFER SORT		337K	4286K		140G (14)	999:59:59		
20	VIEW		337K	4286K		142 (14)	00:00:01		
21	TABLE ACCESS FULL	SYS_TEMP_0FDA7485C_6A66C42E	337K	3956K		142 (14)	00:00:01		
* 22	SORT JOIN		337K	4286K	12M	844 (14)	00:00:03		
23	VIEW		337K	4286K		142 (14)	00:00:01		
24	TABLE ACCESS FULL	SYS_TEMP_0FDA7485C_6A66C42E	337K	3956K		142 (14)	00:00:01		
* 25	SORT JOIN		22M	277M	855M	65084 (16)	00:02:40		
26	VIEW		22M	277M		16808 (12)	00:00:42		
27	TABLE ACCESS FULL	SYS_TEMP_0FDA7485B_6A66C42E	22M	1111M		16808 (12)	0		
* 28	SORT JOIN		22M	277M	855M	65084 (16)	00:02:40		
29	VIEW		22M	277M		16808 (12)	00:00:42		
30	TABLE ACCESS FULL	SYS_TEMP_0FDA7485B_6A66C42E	22M	1111M		16808 (12)	0		

Optimizer Plans (making it better)

```
WITH ed AS (SELECT object_id, element_id, element_name, element_type, useid
            FROM pmcm.element_detail
            WHERE element_type = 'CELL'
            AND current_ind = 'Y'),
     mnh AS (SELECT parent_id, object_id
             FROM pmcm.mark_netw_hierarchy
             WHERE current_ind = 'Y'
             AND hierarchy_type = 'NETWORK'
             AND parent_type IN ('BSC', 'RNC'))
SELECT COUNT(*)
FROM ed e1_1, ed e1_2, ed e2_1, ed e2_2, mnh h1, mnh h2
WHERE e1_1.object_id = h1.parent_id AND   e1_2.object_id = h1.object_id
AND   e2_1.object_id = h2.parent_id AND   e2_2.object_id = h2.object_id
AND   e1_1.element_name = e2_1.element_name
AND   e1_1.element_id = e2_1.element_id
AND   e1_2.element_name = e2_2.element_name
AND   e1_2.element_id = e2_2.element_id
AND   e1_2.useid LIKE '*%'
AND   e2_2.useid NOT LIKE '*%';
```

```
-----------------------------------------------------------------------------------------------------------------------
| Id  | Operation                              | Name                | Rows  | Bytes |TempSpc| Cost (%CPU)| Time     |
-----------------------------------------------------------------------------------------------------------------------
|   0 | SELECT STATEMENT                       |                     |     1 |   214 |       |   100K  (6)| 00:04:08 |
|   1 |  HASH UNIQUE                           |                     |     1 |   214 |       |   100K  (6)| 00:04:08 |
|*  2 |   HASH JOIN                            |                     |     1 |   214 |    12M|   100K  (6)| 00:04:08 |
|   3 |    PARTITION HASH ALL                  |                     |   337K|  9231K|       |  3514  (15)| 00:00:09 |
|*  4 |     TABLE ACCESS FULL                  | MARK_NETW_HIERARCHY |   337K|  9231K|       |  3514  (15)| 00:00:00 |
|*  5 |    HASH JOIN                           |                     |   207K|    36M|    22M| 95860   (6)| 00:03:56 |
|   6 |     PARTITION RANGE ALL                |                     |   586K|    15M|       | 16233   (2)| 00:00:40 |
|   7 |      TABLE ACCESS BY LOCAL INDEX ROWID | ELEMENT_DETAIL      |   586K|    15M|       | 16233      | ??:??:?? |
|*  8 |       INDEX SKIP SCAN                  | ED_ET_TECH_CI       |   586K|       |       | 12791   (1)| 00:00:3? |
|*  9 |     HASH JOIN                          |                     |   207K|    31M|    22M| 77982   (7)| 00:03:12 |
|  10 |      PARTITION RANGE ALL               |                     |   586K|    15M|       | 16233   (2)| 00:00:40 |
|  11 |       TABLE ACCESS BY LOCAL INDEX ROWID | ELEMENT_DETAIL      |   586K|    15M|       | 16233      | ??:??:?? |
|* 12 |        INDEX SKIP SCAN                 | ED_ET_TECH_CI       |   586K|       |       | 12791   (1)| 00:00:?? |
|* 13 |      HASH JOIN                         |                     |   179K|    22M|    12M| 60372   (8)| 00:02:29 |
|  14 |       PARTITION HASH ALL               |                     |   337K|  9231K|       |  3514  (15)| 00:00:09 |
|* 15 |        TABLE ACCESS FULL               | MARK_NETW_HIERARCHY |   337K|  9231K|       |  3514  (15)| 00:00:?? |
|* 16 |       HASH JOIN                        |                     |   184K|    17M|    10M| 55886   (8)| 00:02:18 |
|  17 |        PARTITION RANGE ALL             |                     |   184K|  9008K|       | 37137   (8)| 00:01:32 |
|* 18 |         TABLE ACCESS FULL              | ELEMENT_DETAIL      |   184K|  9008K|       | 37137   (8)| 00:01:32 |
|  19 |        PARTITION RANGE ALL             |                     |   576K|    28M|       | 17383   (8)| 00:00:43 |
|* 20 |         TABLE ACCESS BY LOCAL INDEX ROWID| ELEMENT_DETAIL      |   576K|    28M|       | 17383   (8)| ??:??:?? |
|* 21 |          INDEX SKIP SCAN               | ED_ET_TECH_CI       |   583K|       |       | 13939   (9)| 00:00:35 |
-----------------------------------------------------------------------------------------------------------------------
```

INSERT WHEN

```
INSERT
 WHEN (deptno=10) THEN
   INTO emp_10 (empno,ename,job,mgr,sal,deptno)
   VALUES (empno,ename,job,mgr,sal,deptno)
 WHEN (deptno=20) THEN
   INTO emp_20 (empno,ename,job,mgr,sal,deptno)
   VALUES (empno,ename,job,mgr,sal,deptno)
 WHEN (deptno=30) THEN
   INTO emp_30 (empno,ename,job,mgr,sal,deptno)
   VALUES (empno,ename,job,mgr,sal,deptno)
 ELSE
   INTO leftover (empno,ename,job,mgr,sal,deptno)
   VALUES (empno,ename,job,mgr,sal,deptno)
 SELECT * FROM emp;
```

INSERT ALL

```
INSERT ALL
 INTO ap_cust
   VALUES (customer_id, program_id, delivered_date)
 INTO ap_orders
   VALUES (order_date, program_id)
SELECT program_id, delivered_date, customer_id, order_date
FROM airplanes;
```

INSERT RETURNING

```
DECLARE
  x emp.empno%TYPE;
  r rowid;
BEGIN
   INSERT INTO emp
   (empno, ename)
   VALUES
   (seq_emp.NEXTVAL, 'Harmony')
   RETURNING rowid, empno
   INTO r, x;

   dbms_output.put_line(r);
   dbms_output.put_line(x);
END;
/
```

INSERT (PL/SQL)

```
DECLARE
  trec  t%ROWTYPE;
 BEGIN
   trec.table_name := 'NEW';
   trec.tablespace_name := 'NEW_TBSP';

   INSERT INTO t
   VALUES trec;

   COMMIT;
 END;
 /
```

UPDATE: SET ROW

```
DECLARE
  trec  t%ROWTYPE;
 BEGIN
   trec.table_name := 'DUAL';
   trec.tablespace_name := 'NEW_TBSP';

   UPDATE t
   SET ROW = trec
   WHERE table_name = 'DUAL';

   COMMIT;
 END;
 /
```

UPDATE RETURNING

```
var bnd1 NUMBER
var bnd2 VARCHAR2(30)

UPDATE employees
SET job_id ='SA_MAN',
    salary = salary + 1000,
    department_id = 140
WHERE last_name = 'Jones'
RETURNING salary*0.25, last_name
INTO :bnd1, :bnd2

print bnd1
print bnd2
```

DELETE FROM SELECT

```
DELETE FROM (
  SELECT * FROM t WHERE table_name LIKE '%MAP');
```

DELETE RETURNING

```
DECLARE
  r  urowid;
 BEGIN
   DELETE FROM t
   WHERE rownum = 1
   RETURNING rowid INTO r;

   dbms_output.put_line(r);
 END;
 /
```

Basic PL/SQL

- Explicitly declare CONSTANTS
- CONTINUE clause
- Native compilation
- NOCOPY compiler hint
- PL/SQL Warnings
- PRAGMA INLINE
- PRAGMA SERIALLY REUSABLE
- Result Cache
- Triggers
- Array Processing
  - BULK COLLECT & FORALL
  - SAVE EXCEPTIONS

Basic PL/SQL

- Table Triggers
  - COMPOUND
  - FOLLOWS clause
  - OF clause
  - WHEN clause

CONSTANT Optimization

- Identify constants as constants … don't define them as variables if the value will not vary
- Using the constant keyword can, under some circumstances, tell the PL/SQL compiler that particular optimizations are safe where, without this information, they would have to be assumed to be unsafe.
- Reduces opportunities for SQL Injection

Edition Based Redefinition

- Editions
- Editioning Views
- Cross-Edition Triggers

GLOGIN.SQL

```
COL column_name FORMAT a30
COL data_type FORMAT a20
COL file_name FORMAT a60
COL name FORMAT a30
COL object_name FORMAT a30
COL owner FORMAT a25
COL segment_name FORMAT a30
COL service_name FORMAT a30
COL triggering_event FORMAT a35
COL value FORMAT a30

DEFINE _EDITOR=VI

SET ARRAYSIZE 500
SET DEFINE OFF
SET LINESIZE 121
SET LONG 1000000
SET PAGESIZE 45
SET SERVEROUTPUT ON
SET TRIM ON
SET TRIMSPOOL ON

SET sqlprompt '_CONNECT_IDENTIFIER> '

ALTER SESSION SET NLS_DATE_FORMAT = 'DD-MON-YYYY HH24:MI:SS';
ALTER SESSION SET PLSQL_WARNINGS='ENABLE:ALL';
```

Craft Your Own DBA Role

```
-- the default Oracle DBA role will be granted to no users: ever!
prompt Creating X2 DBA Role

CREATE ROLE x2dba;
GRANT advisor TO x2dba;
GRANT alter any index TO x2dba;
GRANT alter any table TO x2dba;
GRANT alter database TO x2dba;
GRANT alter profile TO x2dba;
GRANT alter system TO x2dba;
GRANT alter session TO x2dba;
GRANT alter tablespace TO x2dba;
GRANT analyze any TO x2dba;
GRANT analyze any dictionary TO x2dba;
GRANT create any edition TO x2dba;
GRANT create any index TO x2dba;
GRANT create any job TO x2dba;
GRANT create any procedure TO x2dba;
GRANT create any synonym TO x2dba;
GRANT create any table TO x2dba;
GRANT create any view TO x2dba;
GRANT create external job TO x2dba;
GRANT create session TO x2dba;
GRANT create tablespace TO x2dba;
GRANT drop any edition TO x2dba;
GRANT drop any index TO x2dba;
GRANT drop any procedure TO x2dba;
GRANT drop any synonym TO x2dba;
GRANT drop any table TO x2dba;
GRANT drop user TO x2dba;
GRANT flashback any table TO x2dba;
GRANT grant any object privilege TO x2dba;
GRANT manage scheduler TO x2dba;
...
```

Create Customized Profiles

```
CREATE PROFILE readonly LIMIT
COMPOSITE_LIMIT           UNLIMITED
CONNECT_TIME              600
CPU_PER_CALL              UNLIMITED
CPU_PER_SESSION           UNLIMITED
FAILED_LOGIN_ATTEMPTS     3
IDLE_TIME                 60
LOGICAL_READS_PER_CALL    UNLIMITED
LOGICAL_READS_PER_SESSION UNLIMITED
PASSWORD_GRACE_TIME       7
PASSWORD_LIFE_TIME        60
PASSWORD_LOCK_TIME        2
PASSWORD_REUSE_MAX        0
PASSWORD_REUSE_TIME       0
PASSWORD_VERIFY_FUNCTION  verify_function_11g
PRIVATE_SGA               UNLIMITED
SESSIONS_PER_USER         2;

CREATE PROFILE mechid LIMIT
COMPOSITE_LIMIT           UNLIMITED
CONNECT_TIME              UNLIMITED
CPU_PER_CALL              UNLIMITED
CPU_PER_SESSION           UNLIMITED
FAILED_LOGIN_ATTEMPTS     4
IDLE_TIME                 1440
LOGICAL_READS_PER_CALL    UNLIMITED
LOGICAL_READS_PER_SESSION UNLIMITED
PASSWORD_GRACE_TIME       30
PASSWORD_LIFE_TIME        60
PASSWORD_LOCK_TIME        1
PASSWORD_REUSE_MAX        0
PASSWORD_REUSE_TIME       0
PASSWORD_VERIFY_FUNCTION  NULL
PRIVATE_SGA               UNLIMITED
SESSIONS_PER_USER         UNLIMITED;

...
```

Lock Accounts ... use Proxy Users

```
-- presentment (PCI)
CREATE USER
IDENTIFIED BY "N0way!n"
DEFAULT TABLESPACE pat_tbs
TEMPORARY TABLESPACE temp
QUOTA 0 ON SYSTEM
QUOTA 0 ON SYSAUX
QUOTA UNLIMITED ON pat_tbs
PROFILE x2opera
ACCOUNT LOCK;

GRANT x2readonly TO pat;

CREATE USER events
IDENTIFIED BY "N0way!n"
DEFAULT TABLESPACE events_tbs
TEMPORARY TABLESPACE temp
QUOTA UNLIMITED ON events_tbs
PROFILE x2opera
ACCOUNT LOCK;

GRANT x2readonly TO events;

CREATE USER c_dmorgan
IDENTIFIED BY oracle1
DEFAULT TABLESPACE opera_tbs
TEMPORARY tablespace temp
QUOTA UNLIMITED ON opera_tbs
PROFILE dbateam;

GRANT create session, alter user TO c_dmorgan;
ALTER USER c_dmorgan GRANT CONNECT THROUGH dbadmin;
AUDIT CONNECT BY dbadmin ON BEHALF OF c_dmorgan;

...
```

Discussion

Developer Practices

Unnecessary SQL

```
PROCEDURE get_records(pCustID IN NUMBER) AUTHID DEFINER IS
 vCount PLS_INTEGER;
BEGIN
  SELECT COUNT(*)
  INTO vCount
  FROM customers
  WHERE cust_id = pCustID;

  IF vCount > 0 THEN
    process_customer_recs(pCustID);
  END IF;
END get_records;
/
```

```
PROCEDURE process_customer_recs(pCustID IN NUMBER) AUTHID DEFINER IS
 CURSOR cust_cur IS
 SELECT transno, trans_type, transdate
 FROM customers
 WHERE cust_id = pCustID;
BEGIN
  ... do stuff ...
END process_customer_recs;
/
```

Unnecessary Dynamic SQL

```
PROCEDURE gather_schema_stats(pschema IN VARCHAR2, pGlobalOption IN BOOLEAN := TRUE) IS
BEGIN
  IF pschema IS NOT NULL THEN
    DBMS_STATS.UNLOCK_SCHEMA_STATS (pschema);

    IF pGlobalOption = TRUE THEN
      EXECUTE IMMEDIATE 'BEGIN DBMS_STATS.GATHER_SCHEMA_STATS(OWNNAME => ''' ||
        pschema || ''',' ||
        '  ESTIMATE_PERCENT => 25, METHOD_OPT => ''FOR ALL INDEXED COLUMNS SIZE 254'',  DEGREE => 4,' ||
        '  CASCADE => TRUE, granularity => ''GLOBAL'', OPTIONS => ''GATHER STALE'', no_invalidate => TRUE); END;';
    ELSE
      EXECUTE IMMEDIATE 'BEGIN DBMS_STATS.GATHER_SCHEMA_STATS(OWNNAME => ''' ||
        pschema || ''',' ||
        '  ESTIMATE_PERCENT => 25,  METHOD_OPT => ''FOR ALL INDEXED COLUMNS SIZE 254'',  DEGREE => 4,' ||
        '  CASCADE => TRUE, OPTIONS => ''GATHER STALE'', no_invalidate => TRUE); END;';
    END IF;

    add_to_log_table(clogInformation, 827533, 'Schema stats gathered for schema ' || upper(pschema));
    -- Lock schema stats
    DBMS_STATS.LOCK_SCHEMA_STATS (pschema);
  END IF;
EXCEPTION
  WHEN OTHERS THEN
    --log error in COMMON_LOGS table
    add_to_log_table(clogmajor, 827516, 'Error in Gather_Schema_stats for schema ' ||
                     upper(pschema) || ' - message:' || SQLERRM);
END;
```

```
dbms_stats.gather_schema_stats(pschema, ESTIMATE_PERCENT => 25,
METHOD_OPT => 'FOR ALL INDEXED COLUMNS SIZE 254', DEGREE => 4,
CASCADE => TRUE, granularity => 'GLOBAL', OPTIONS => 'GATHER STALE', no_invalidate => TRUE);

 dbms_stats.gather_schema_stats(pschema, ESTIMATE_PERCENT => 25,
METHOD_OPT => 'FOR ALL INDEXED COLUMNS SIZE 254', DEGREE => gcDegree,
CASCADE => TRUE, granularity => 'GLOBAL', OPTIONS => 'GATHER STALE', no_invalidate => TRUE);
```

Unnecessary Concatenation

```
FUNCTION delete_partitions_in_range(pschema    IN VARCHAR2,
                                    ptable     IN VARCHAR2,
                                    pretention IN INTEGER,
                                    parttype   IN INTEGER) RETURN PLS_INTEGER
IS
 ... variable declarations ...

BEGIN
  --add starting processing
  IF ptable <> 'COMMON_LOGS' THEN
    add_to_log_table(cloginformation,
                     827600,
                     upper(pschema) || '.' || upper(ptable) ||
                     ' - Processing (Delete partitions in range)');
  END IF;
  ... code here ...
  LOOP
    BEGIN
      ... code here ...
    EXCEPTION
      WHEN OTHERS THEN
        add_to_log_table(clogmajor,
                         827604,
                         upper(pschema) || '.' || upper(ptable) ||
                         ' - Unable to Delete Partition ' ||
                         partTable(i).Partition_Name || ':' ||
                         SQLERRM);
        RAISE;
    END;
  END LOOP;

  --Add log entry to summarise the partitions added
  IF ((vSummaryMinDate < vmindate) AND (ptable <> 'COMMON_LOGS')) THEN
    add_to_log_table(cloginformation,
                     827605,
                     upper(pschema) || '.' || upper(ptable) ||
                     ' - Deleted partitions from ' ||
                     to_char(vSummaryMinDate, 'YYYY-MM-DD HH24:MI:SS') ||
                     ' to ' || to_char(vmindate, 'YYYY-MM-DD HH24:MI:SS'));
  END IF;
  RETURN partTable.count;
END;
```

Replaced by a Variable Assignment

```
FUNCTION delete_partitions_in_range(pschema    IN VARCHAR2,
                                    ptable     IN VARCHAR2,
                                    pretention IN INTEGER,
                                    parttype   IN INTEGER) RETURN PLS_INTEGER
IS
 ... variable declarations ...
 cObject VARCHAR2(61) := UPPER(pschema || '.' || ptable);
BEGIN
  --add starting processing
  IF ptable <> 'COMMON_LOGS' THEN
    add_to_log_table(cloginformation,
                     827600,
                     cObject ||
                     ' - Processing (Delete partitions in range)');
  END IF;
  ... code here ...
  LOOP
    BEGIN
      ... code here ...
    EXCEPTION
      WHEN OTHERS THEN
        add_to_log_table(clogmajor,
                         827604,
                         cObject ||
                         ' - Unable to Delete Partition ' ||
                         partTable(i).Partition_Name || ':' ||
                         SQLERRM);
        RAISE;
    END;
  END LOOP;

  --Add log entry to summarise the partitions added
  IF ((vSummaryMinDate < vmindate) AND (ptable <> 'COMMON_LOGS')) THEN
    add_to_log_table(cloginformation,
                     827605,
                     cObject ||
                     ' - Deleted partitions from ' ||
                     to_char(vSummaryMinDate, 'YYYY-MM-DD HH24:MI:SS') ||
                     ' to ' || to_char(vmindate, 'YYYY-MM-DD HH24:MI:SS'));
  END IF;
  RETURN partTable.count;
END;
```

Deterministic Functions

- Indicates that the function returns the same result value whenever it is called with the same values for its parameters

```
SQL> SELECT owner, COUNT(*)
  2  FROM dba_arguments
  3  WHERE sequence = 0
  4  AND owner NOT LIKE '%SYS%'
  5  GROUP BY owner
  6  ORDER BY 1;

OWNER                          COUNT(*)
------------------------------ ----------
PMCM                                   16
OSSBACKEND                              3
OSS_DICTIONARY                          8
SRE                                     6
WEBWIZ                                  2
ZZYZX                                  17
```

```
SQL> SELECT owner, COUNT(*)
  2  FROM dba_source
  3  WHERE owner NOT LIKE '%SYS%'
  4  AND UPPER(text) LIKE '%DETERMINISTIC%'
  5  GROUP BY owner
  6  ORDER BY 1;

OWNER                          COUNT(*)
------------------------------ ----------
ZZYZX                                   1
SRE                                    79
```

```
CREATE OR REPLACE FUNCTION get_date_determ RETURN DATE DETERMINISTIC IS
BEGIN
  RETURN TRUNC(SYSDATE);
END get_date_determ;
/
```

GV$ Dynamic Performance Views

- V$ is the local instance
- GV$ view hit all instances
  - Creating delays and increased cache fusion interconnect traffic
- Do not query a gv$ unless you really need to collect information from more than one node

```
SELECT name FROM v$database;
```

```
SELECT name FROM gv$database;
```

Result Cache

SQL ordered by Executions

- Total Executions: 29,717,627
- Captured SQL account for 77.4% of Total

Executions	Rows Processed	Rows per Exec	CPU per Exec (s)	Elap per Exec (s)	SQL Id	SQL Module	SQL Text
10,128,178	2,506,529	0.25	0.00	0.00	932srzg1krc33	ASN_07B_DIP(004110016)	SELECT NE_TIMEZONE FROM CMPM.E...
7,576,759	7,579,197	1.00	0.00	0.00	1h698sb62un99	asci_56_RANAPProtocolStats(016110008)	SELECT DISTINCT NE_TIMEZONE FR...
3,914,621	3,848,268	0.98	0.00	0.00	5tbzddgguu8cc	asci_56_RANAPProtocolStats(016110008)	SELECT SYS_VERSION FROM CMPM.T...
311,645	311,604	1.00	0.00	0.00	7gtztzv329wg0		select c.name, u.name from co...
301,428	301,325	1.00	0.00	0.00	36s446f9cnwhw		SELECT C.NAME FROM COL$ C WHER...
200,692	200,669	1.00	0.00	0.00	4vs91dcv7u1p6	OMS	insert into sys.aud$(sessioni...
65,044	65,035	1.00	0.00	0.00	fz9xwpt2cvt0k		SELECT par_type, param_clob, ...
64,949	3,945,482	60.75	0.00	0.00	f5ra7dru5fk5n	XML_P7R_RNC_RCS(003110008)	SELECT NAME, PATH, READ, WR...
64,801	64,807	1.00	0.00	0.00	fhzj09a7fnrnb	XML_V7I_IN_LP_DC(00811000V)	SELECT DBTIMEZONE, LENGTH(DBT...
64,632	64,542	1.00	0.00	0.00	15jnrrb6016nd	XML_V7I_IN_LP_DC(00811000V)	SELECT SESSIONTIMEZONE, LENGT...

```
CREATE OR REPLACE FUNCTION rcache(p_srvr_id IN servers.srvr_id%TYPE) RETURN BOOLEAN
RESULT_CACHE RELIES_ON(servers) IS
  srvrow servers%ROWTYPE;
BEGIN
  SELECT *
  INTO srvrow
  FROM servers
  WHERE srvr_id = p_srvr_id;
  RETURN TRUE;
EXCEPTION
  WHEN OTHERS THEN
    RETURN FALSE;
END rcache;
/
```

```
SELECT /*+ RESULT_CACHE */ srvr_id
FROM (
  SELECT srvr_id, SUM(cnt) SUMCNT
  FROM (
    SELECT DISTINCT srvr_id, 1 AS CNT
    FROM servers
    UNION ALL
    SELECT DISTINCT srvr_id, 1
    FROM serv_inst)
  GROUP BY srvr_id)
WHERE sumcnt = 2;
```

Sequence Optimization

- High volume insert intensive applications using sequence generated keys add extra overhead
- NOCACHE is the worst for performance
- CACHE NOORDER is the best for performance
- Services may help improve performance even for CACHE NOORDER sequences if the insert application uses a service with only one Preferred Instance
- This eliminates the Interconnect traffic and synchronization overhead required to coordinate the next value from amongst all the instances when using CACHE ORDER

Sequence Caching

```
SQL> SELECT sequence_owner, cache_size, COUNT(*)
  2  FROM dba_sequences
  3  WHERE sequence_owner IN ('ADMIN','PMCM','OPS','OSSBACKEND','OSS_DICTIONARY','SRE','WEBWIZ','ZZYZX')
  4  GROUP BY sequence_owner, cache_size
  5  ORDER BY 1,2;
```

SEQUENCE_OWNER	CACHE_SIZE	COUNT(*)
ADMIN	20	1
PMCM	1000	2
OPS	0	1
OSSBACKEND	0	11
OSS_DICTIONARY	0	23
SRE	0	33
SRE	20	7
WEBWIZ	20	24
ZZYZX	0	21
ZZYZX	20	44

"You would be amazed what setting a sequence cache via alter sequence to 100,000 or more can do during a large load -- amazed."

~ Tom Kyte

Sequence Ordering

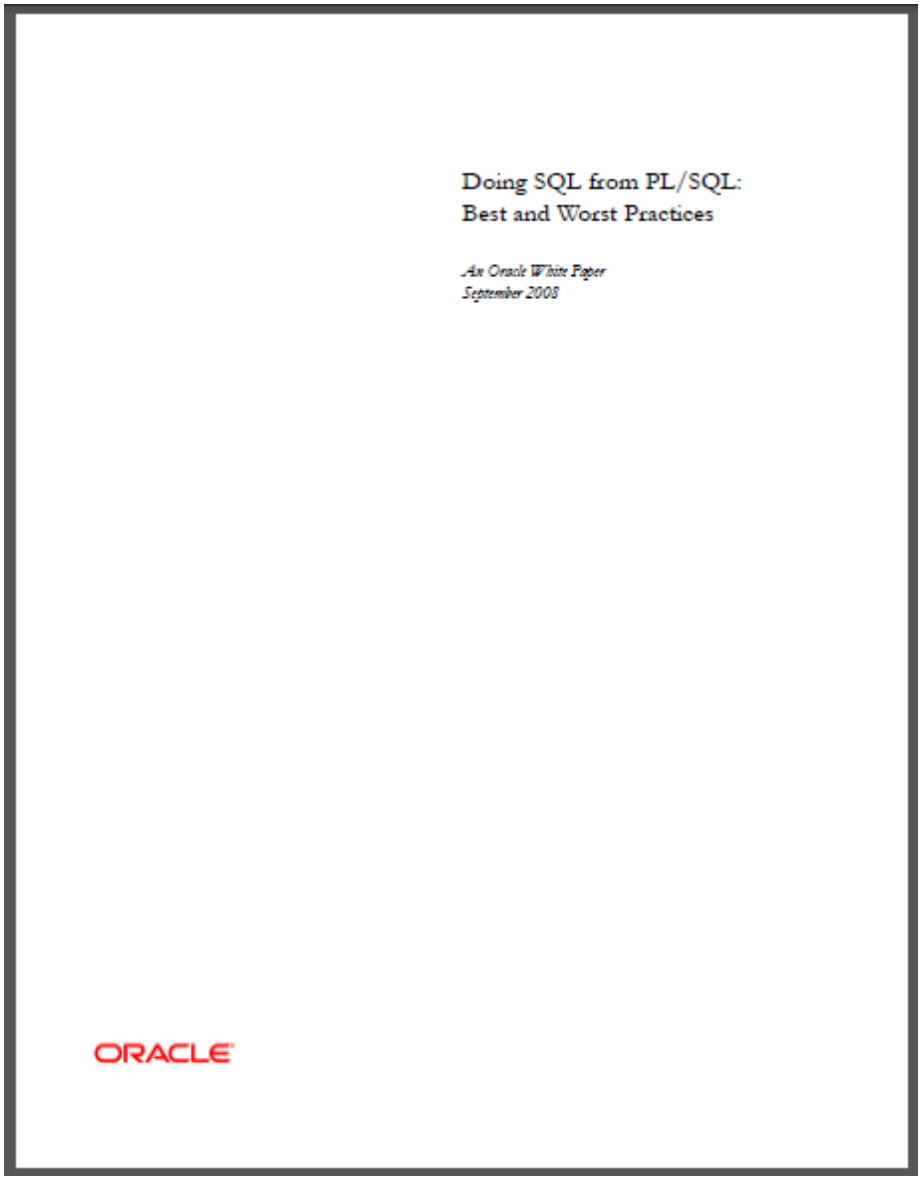
```
SQL> SELECT sequence_owner, order_flag, COUNT(*)
  2  FROM dba_sequences
  3  WHERE sequence_owner IN ('ADMIN','PMCM','OPS','OSSBACKEND','OSS_DICTIONARY','SRE','WEBWIZ','ZZYZX')
  4  GROUP BY sequence_owner, order_flag
  5  ORDER BY 1,2;
```

SEQUENCE_OWNER	O	COUNT(*)
ADMIN	N	1
PMCM	N	2
OPS	N	1
OSSBACKEND	N	5
OSSBACKEND	Y	6
OSS_DICTIONARY	N	7
OSS_DICTIONARY	Y	16
SRE	N	39
SRE	Y	1
WEBWIZ	Y	24
ZZYZX	N	59
ZZYZX	Y	6

Built-in PL/SQL Packages

- DBMS_APPLICATION_INFO
- DBMS_ASSERT
- DBMS_DB_VERSION
- DBMS_METADATA
- DBMS_RESULT_CACHE
- OWA_UTIL

Brynn's White Paper



Two More Presentations

- Thursday 31, May: 13:00 - 14:00

  Oracle Database Coding Practices for Security and Data Security

- Thursday 31, May: 14:10 - 15:10

  Oracle Database Appliances

Questions

ERROR at line 1:
ORA-00028: your session has been killed

All demo code at morganslibrary.org

Thank you