Profiling PL/SQL for Performance

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Why This Session?

- Why Performance Assessment in PL/SQL is Different?
  - Module-oriented
  - Depths of modules
  - Need to know the collective timings
- Traditional assessment methods
  - not relevant for modules
- Three tools
  - PL/SQL Profiler
  - PL/SQL Trace
  - PL/SQL Hierarchical Profiler

Traditional Profiler

Setup

- Install the profiler packages/libraries, etc.
- As SYS, execute

```
SQL> @$OH/rdbms/admin/profload.sql
```

- Create the profiler tables in the user schema

```
SQL> @$OH/rdbms/admin/profload.sql
```

General Structure

- Start Profiler

```
SQL> var r number
SQL> execute :r := dbms_profiler.start_profiler;
```

- Execute PL/SQL
- Stop Profiler

```
SQL> execute :r := dbms_profiler.stop_profiler;
```

Check Results

- Get the RUN ID of the profiler run
  - Table PLSQL_PROFILER_RUNS
  - Column: RUNID
- Get the data from PLSQL_PROFILER_DATA and PLSQL_PROFILER_UNITS

Script

```
SELECT
       u.unit_number u#,
       u.unit_type,
       u.unit_owner,
       u.unit_name,
       d.line#,
       d.total_occur,
       d.total_time,
       d.min_time,
       d.max_time
FROM   plsql_profiler_units u,
       plsql_profiler_data d
WHERE  u.runid = 2
and  u.unit_number = d.unit_number
and u.runid = d.runid
ORDER BY u.unit_number, d.line#
```

Result

U#	UNIT_TYPE	UNIT_OWNER	UNIT_NAME	LINE#	TOTAL_OCCUR	TOTAL_TIME	MIN_TIME	MAX_TIME
1	ANONYMOUS BLOCK	<anonymous>	<anonymous>	1	1	9999	2999	6999
2	ANONYMOUS BLOCK	<anonymous>	<anonymous>	1	2	117995	7999	55997
3	ANONYMOUS BLOCK	<anonymous>	<anonymous>	1	3	54997	1999	43998
4	PROCEDURE	ARUP	UPD_INT	1	1	5999	999	4999
4	PROCEDURE	ARUP	UPD_INT	6	10001	9220625	999	25998
4	PROCEDURE	ARUP	UPD_INT	7	10000	3.0703E+10	2854884	7081712
4	PROCEDURE	ARUP	UPD_INT	11	10000	816818826	65997	215991
4	PROCEDURE	ARUP	UPD_INT	15	130000	107564631	999	25998
4	PROCEDURE	ARUP	UPD_INT	16	120000	165960259	999	55997
4	PROCEDURE	ARUP	UPD_INT	19	1	2999	2999	2999
5	PROCEDURE	ARUP	CALC_INT	1	0	145537089	999	34998
5	PROCEDURE	ARUP	CALC_INT	6	120000	107355640	999	29998
5	PROCEDURE	ARUP	CALC_INT	7	120000	218454128	999	106995
5	PROCEDURE	ARUP	CALC_INT	9	120000	108013613	0	45998
6	ANONYMOUS BLOCK	<anonymous>	<anonymous>	1	2	106995	7999	51997
7	ANONYMOUS BLOCK	<anonymous>	<anonymous>	1	1	25998	5999	19999

Detailed Analysis

- Get the Text from the Line#

```
select line, text
from user_source
where name = upper('&name')
order by line;
```

PL/SQL Trace

Steps

- Create the Trace Tables
- As SYS, execute

```
SQL> @OH/rdbms/admin/tracetab.sql
```

- Grant privs and create synonyms

```
create public synonym plsql_trace_runs for
  plsql_trace_runs;
create public synonym plsql_trace_events for
  plsql_trace_events;
create public synonym plsql_trace_runnumber for
  plsql_trace_runnumber;
grant select, insert, update, delete on plsql_trace_runs
  to public;
grant select, insert, update, delete on
  plsql_trace_events to public;
grant select on plsql_trace_runnumber to public;
```

General Steps

- Start Trace

```
dbms_trace.set_plsql_trace
  (dbms_trace.trace_all_calls);
```

- Execute PL/SQL
- Stop Trace

```
dbms_trace.clear_plsql_trace;
```

- Get Trace Run ID
  - Table: PLSQL_TRACE_RUNS
  - Column: RUNID

Check Trace

```
select
        event_seq,
        event_time,
        event_unit_owner,
        event_unit,
        event_unit_kind,
        proc_line,
        event_comment
from    plsql_trace_events
where   runid = &runid
order by event_seq
```

Controlling Trace

- Parameters to SET_PLSQL_TRACE
  - `dbms_trace.trace_all_calls` – trace all the calls
  - `dbms_trace.trace_all_exceptions` – only exceptions
  - `dbms_trace.trace_enabled_calls` – trace all calls to enabled functions
- Enable:

```
SQL> alter procedure p compile debug;
```

Hierarchical Profiler

Create the Tables

- Create the tables for profiler
  - in the schema where you want the testing to be done

```
SQL>$OH/rdbms/admin/dbmshptabs.sql
```

- It creates three tables
  - DBMSHP_FUNCTION_INFO
  - DBMSHP_PARENT_CHILD_INFO
  - DBMSHP_RUNS

Setting Up

- Grant execute on DBMS_HPROF to the user

```
SQL> grant execute on dbms_hprof to arup;
```

- Create a directory to hold the profiler files

```
SQL> create directory plsql_dir as '/u01/pl';
SQL> grant all on plsql_dir to arup;
```

Start / Stop the Profiler

- Start

```
begin
    dbms_hprof.start_profiling (
        location => 'PLSQL_DIR',
        filename => 'prof.trc'
    );
end;
```

- Stop

```
begin
    dbms_hprof.stop_profiling ;
end;
```

General Steps

- Start Profiling
- Run the app
- Stop Profiling

Analyze the Trace

- SQL

```
var r number
begin
  :r := dbms_hprof.analyze(
           location=>'PLSQL_DIR',
           filename=>'prof.trc');
end;
/
print r
```

- This populates the tables

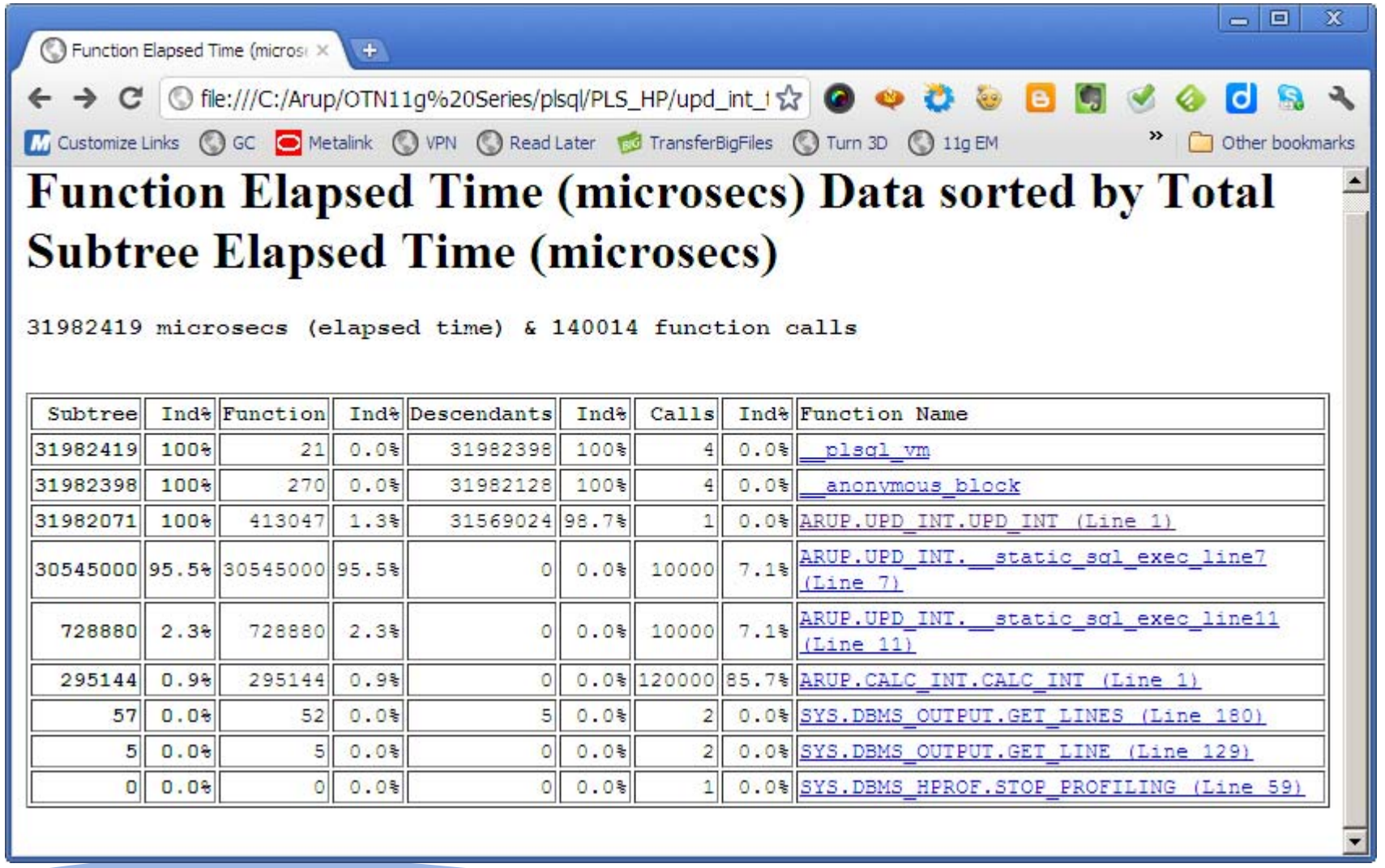
Create the Output Files

- Create the reports as HTML files

```
$ plshprof -output upd_int prof.trc
```

- This creates several html files with prefix upd_int

Example



Function Elapsed Time (microsecs) Data sorted by Total Subtree Elapsed Time (microsecs)

31982419 microsecs (elapsed time) & 140014 function calls

Subtree	Ind%	Function	Ind%	Descendants	Ind%	Calls	Ind%	Function Name
31982419	100%	21	0.0%	31982398	100%	4	0.0%	__plsql_vm
31982398	100%	270	0.0%	31982128	100%	4	0.0%	__anonymous_block
31982071	100%	413047	1.3%	31569024	98.7%	1	0.0%	ARUP.UPD_INT.UPD_INT (Line 1)
30545000	95.5%	30545000	95.5%	0	0.0%	10000	7.1%	ARUP.UPD_INT.__static_sql_exec_line7 (Line 7)
728880	2.3%	728880	2.3%	0	0.0%	10000	7.1%	ARUP.UPD_INT.__static_sql_exec_line11 (Line 11)
295144	0.9%	295144	0.9%	0	0.0%	120000	85.7%	ARUP.CALC_INT.CALC_INT (Line 1)
57	0.0%	52	0.0%	5	0.0%	2	0.0%	SYS.DBMS_OUTPUT.GET_LINES (Line 180)
5	0.0%	5	0.0%	0	0.0%	2	0.0%	SYS.DBMS_OUTPUT.GET_LINE (Line 129)
0	0.0%	0	0.0%	0	0.0%	1	0.0%	SYS.DBMS_HPROF.STOP_PROFILING (Line 59)

Difference

- Pass two prof files for analyzing the differences

```
$ plshprof -output diff <Trace1> <Trace2>
```

Profiling Parameters

- Issue: too many recursive calls

proc1

→ proc2

→ proc3

→Proc4

→ *… and so on*

- Parameter max_depth in start_profiling
- Limits the number it can dive down to

Too many Procedures

- In the ANALYZE procedure, use the TRACE

```
begin
  :r := dbms_hprof.analyze(
           location=> 'PLSQL_DIR',
           filename=> 'prof.trc',
           trace   => '"ARUP"."CALC_INT"."CALC_INT"'
       );
end;
```

- It performs the tracing at the root CALC_INT

Conclusion

- Find out which specific component in a PL/SQL routine is taking the maximum time
- If you have 11g, use Hierarchical Profiler
- Oherwise, Traditional Profiler
- Focus your tuning efforts on that
- Use PL/SQL Tracing to trace the lines of code in the module
- Use Tracing to identify exceptions

Thank You!

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