COLLABORATE 12

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Beginning Performance Tuning
Session 887

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About Me

ORACLE
TECHNOLOGY NETWORK

- Oracle DBA for 16 years and counting
- Speak at conferences, write articles, 4 books, provide trainings, security audits
- Brought up the Global Database Group at Starwood Hotels, in White Plains, NY
- Blog: arup.blogspot.com

Security, Scheduling, Performance & More
Includes Oracle Database 10g
Oracle PL/SQL for DBAs
Feuerstein
THE EXPERT'S VOICE IN ORACLE
RMAN Recipes for Oracle Database 11g
A Problem-Solution Approach
rup Nanda
Apress
ORACLE
Oracle Database 11g
New Features

Agenda

- What this is about?
  - You noticed some degradation of performance
  - What should you do next?
    - Where to start
    - What tool to use
  - How to understand the root issue
  - For BEGINNERS only

Tools

- Nothing to buy
- SQL*Plus and internal Oracle supplied utilities
  - May be extra-cost

Why Most Troubleshooting Fails

- Not systematic or methodical
- Not looking at the right places
- Confusing Symptoms with Causes
- 60% of all issues fall into a pattern

Principle #1

Measure your challenge

Three approaches

- Time Accounting
  - What *happened*
    - e.g. a block was retrieved, 16 blocks were retrieved, no rows were returned, etc.
  - how much *time* was spent on each
- Wait Accounting
  - What is the session *waiting* on
    - e.g. wait for a block to be available, wait for a block to be retrieved from the other instance, etc.
  - How much time it has waited already, or waited in the past
- Resource Accounting
  - What types of resources were consumed
    - e.g. latches, logical I/Os, redo blocks, etc.

All three are vital and will be necessary to assess performance

What's a Wait?

- A process in Oracle can only be in three states
  - Doing something Useful (consuming CPU) ….. **U**
  - Idle, waiting for some work to be assigned ….. **I**
  - Waiting for something, e.g. ….. **W**
    - a block from disk
    - a lock
    - a latch (could be waiting on CPU)
- Response time = U + I + W
- We must accurately measure each component time before we decide what and how to tune

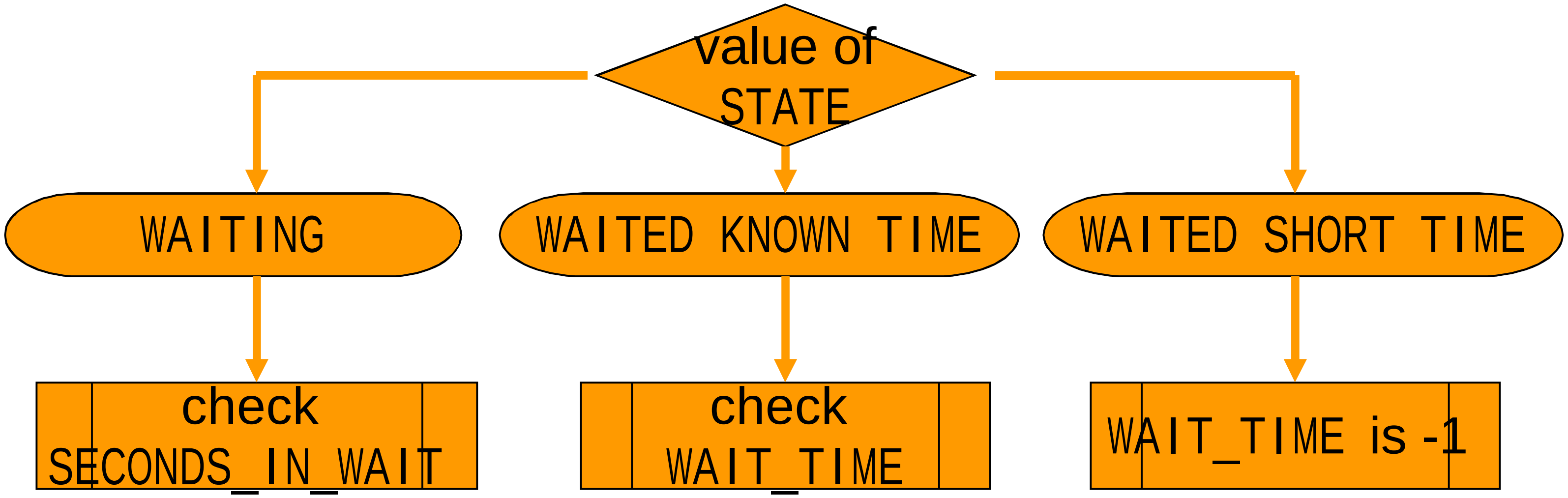
Wait Interface

- Oracle provides an interface to check what these values are – useful work, idle time and waits.
- The information is available in V$SESSION
  - Was in V$SESSION_WAIT in pre-10g
  - `select sid, event, state, wait_time, seconds_in_wait from v$session`
- `event` shows what the session is/was stuck on

Wait Times

- SECONDS_IN_WAIT shows the waits right now
- WAIT_TIME shows the last wait time
- STATE shows what is the session doing now
  - WAITING – the session is waiting on that event *right* now
    - The amount of time it has been waiting so far is shown under SECONDS_IN_WAIT
  - WAITED KNOWN TIME – the session waited for some time on that event, but not just now
    - The amount of time it had waited is shown under WAIT_TIME
  - WAITED SHORT TIME – the session waited for some time on that event, but it was too short to be recorded
    - WAIT_TIME shows -1

Wait Time Accounting



Principle #2

Understand the cause of the delay

Common Waits

- `db file sequential read`
  - Session waiting for an I/O to be complete
- `enq: TX - row lock contention`
  - Session wants a lock held by a different session
- `log file sync`
  - Session waiting for log buffer to be flushed to redo log file
- `latch free`
  - Session is waiting for some latch
- `SQL*Net message from client`
  - Session waiting for work to be given

```
select sid, state, event, state, wait_time,
  seconds_in_wait
from v$session
where event not in
(
  'SQL*Net message from client',
  'SQL*Net message to client',
  'rdbms ipc message'
)
where state = 'WAITING'
```

Locking

Locking Waits

- Find out which session is locking this record

```
select
   blocking_session, blocking_instance,
   seconds_in_wait
from v$session
where sid = <sid>
```

- Find out who is holding the lock

V$SESSION Columns

- SID – the SID
- SERIAL# - Serial# of the session
- MACHINE – the client that created the session
- TERMINAL – terminal of the client
- PROGRAM – the client program, e.g. TOAD.EXE
- STATUS – Active/Inactive
- SQL_ID – the SQL_ID
- PREV_SQL_ID – the previous SQL

Getting the SQL

- You can get the SQL from V$SQL

```
select sql_text, sql_fulltext
from v$sql
where sql_id = <sqlid>
```

- Full Text

```
select SQL_TEXT
from v$sqltext
where sql_id = <sqlid>
order by piece
```

Last 10 Waits

- What events the session has *already* waited on so far?
- View V$SESSION_WAIT_HISTORY
- Shows last 10 waits for active sessions

$SESSION_WAIT_HISTORY

```
SID       -> SID
SEQ#      -> Sequence#
EVENT     -> Wait Event
WAIT_TIME -> The time waited earlier
WAIT_TIME_MICRO -> The time waited (in us)
```

V$SESSION_EVENT

- *All* waits the session encountered so far

SID	?	Session ID
EVENT	?	The wait event, e.g. “library cache lock”
TOTAL_WAITS	?	total number of times this session has waited
TOTAL_TIMEOUTS	?	total no. of times timeouts occurred for this
TIME_WAITED	?	the total time (in 100th of sec) waited
AVERAGE_WAIT	?	the average wait per wait
MAX_WAIT	?	the maximum for that event
TIME_WAITED_MICRO	?	same as time_waited; but in micro seconds
EVENT_ID	?	the event ID of the event
WAIT_CLASS_ID	?	the class of the waits
WAIT_CLASS#		
WAIT_CLASS		

V$EVENT_NAME has the event details joined on EVENT# column

Session Event

- Query

```
select event, total_waits, total_timeouts,
        10*time_waited, 10*average_wait, 10*max_wait
from v$session_event where sid = <SID>
```

- Result

```
EVENT                          TOTAL_WAITS TOTAL_TIMEOUTS 10*TIME_WAITED 10*AVERAGE_WAIT 10*MAX_WAIT
------------------------------ ----------- -------------- -------------- --------------- -----------
db file sequential read                  5              0             30             5.9          10
gc cr grant 2-way                        2              0              0             1.3           0
row cache lock                           1              0              0             1.3           0
library cache pin                        5              0             10             1.2           0
library cache lock                      23              0             20              .8           0
SQL*Net message to client               46              0              0               0           0
SQL*Net more data to client              3              0              0               0           0
SQL*Net message from client             45              0         325100          7224.3       83050
```

- 10 was multiplied to convert the times to milliseconds

System Event

- The V$SYSTEM_EVENT view shows the same waits for the entire instance

```
select event, total_waits, total_timeouts, 10*time_waited, 10*average_wait
from v$system_event
where event like 'gc%‘

EVENT                                    TOTAL_WAITS TOTAL_TIMEOUTS 10*TIME_WAITED 10*AVERAGE_WAIT
---------------------------------------- ----------- -------------- -------------- ---------------
gcs remote message                        3744149220     3391378512     1.2595E+10             3.4
gc buffer busy                               2832149          14048       23739030             8.4
gc cr multi block request                   62607541         120749       32769490              .5
gc current multi block request               2434606             57         775560              .3
gc cr block 2-way                          128246261          19168       77706850              .6
gc cr block 3-way                          126605477          22339      124231140               1
….
```

Active Session History

- Captures the state of all active sessions in memory
- Visible through V$ACTIVE_SESSION_HISTORY
  - Part of diagnostic and tuning pack. Extra cost
- Held for 30 minutes
- Then stored in AWR – DBA_HIST_ACTIVE_SESS_HIST

Tracing

- DBMS_MONITOR

```
begin
    dbms_monitor.session_trace_enable (
        session_id => &sid,
        serial_num => &serial,
        waits => TRUE,
        binds => TRUE
    );
end;
```

Analyze Tracefile

- TKPROF is the tool

```
$ tkprof u/p <inputfile> <outputfile>
```

<*Outputfile*> is a text file

High CPU

- From OS `top` or similar commands find out the process ID
- Find out the session for that process

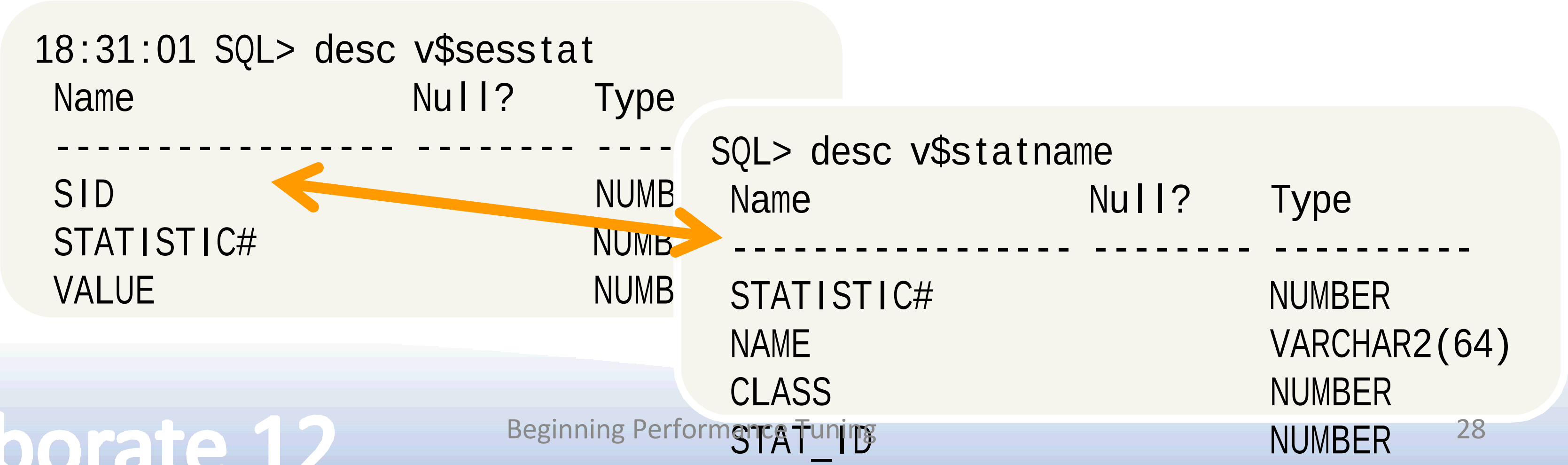
```
select sid, s.username, status, machine, state,
  seconds_in_wait, sql_id
from v$session s, v$process p
where p.spid = &spid
and s.paddr = p.addr;
```

Stats of a Session

- How much CPU the session has consumed
- How much of the came from the session
- View: V$SESSTAT

Understanding Statistics

- V$SESSTAT shows the information except the name, which is shown in V$STATNAME
- V$MYSTAT shows the stats for the current session only



```
18:31:01 SQL> desc v$sesstat
 Name                    Null?    Type
 ----------------- -------- ----
 SID                              NUMB
 STATISTIC#                       NUMB
 VALUE                            NUMB
```

```
SQL> desc v$statname
 Name                    Null?    Type
 ----------------- -------- ----------
 STATISTIC#                       NUMBER
 NAME                             VARCHAR2(64)
 CLASS                            NUMBER
 STAT_ID                          NUMBER
```

Use of Session Stats

- Find out how much CPU was consumed already

```
select name, value
from v$sesstat s, v$statname n
where s.statistic# = n.statistic#
and upper(name) like '%CPU%'
and sid = <SID>;
```

- Some stats:

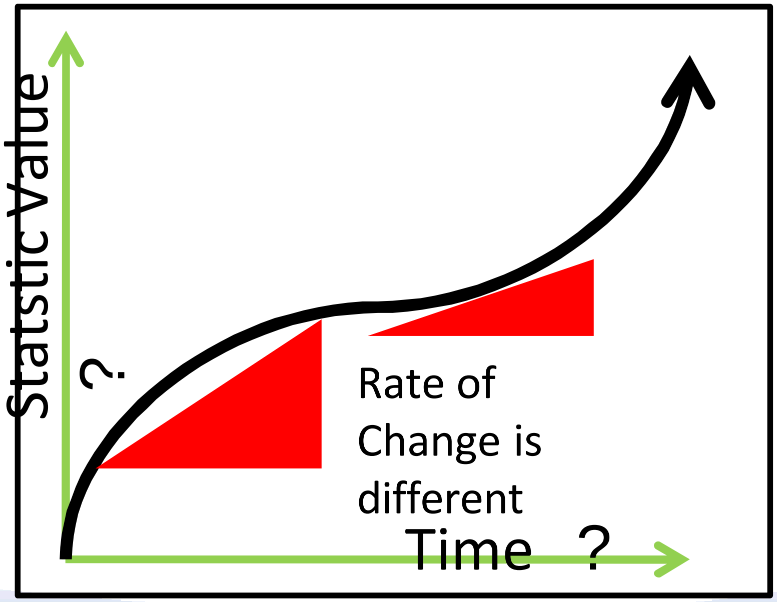
```
session logical reads
CPU used by this session
parse time cpu
```

System Statistics

- Similar to events, there is also another view for system level stats - V$SYSSTAT

```
SQL> desc v$sysstat
 Name                              Null?    Type
 ----------------------------------------- -------- ----------------------------
 STATISTIC#                                         NUMBER
 NAME                                               VARCHAR2(64)
 CLASS                                              NUMBER
 VALUE                                              NUMBER
 STAT_ID                                            NUMBER
```

- Note there is a NAME column
- This is a cumulative value



Summary

- Find out what is the immediate symptom – CPU, I/O running high or a specific session is slow
- Find out who is consuming the most of the resource
- If a specific session is slow, find out what it is waiting on
- Get more information on the session
  - what all the session has been waiting on, what resources it has consumed so far, etc
- Trace to get a timeline of events.

Thank You!

Session 887

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