

Methodical Performance Troubleshooting

Arup Nanda

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
- 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

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

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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

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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, v.EVENT, v.state, wait_time, seconds_in_wait from v\$session**
- **event** shows the event being waited on
 - However, it's not really only for "waits"
 - It's also for activities such as CPU

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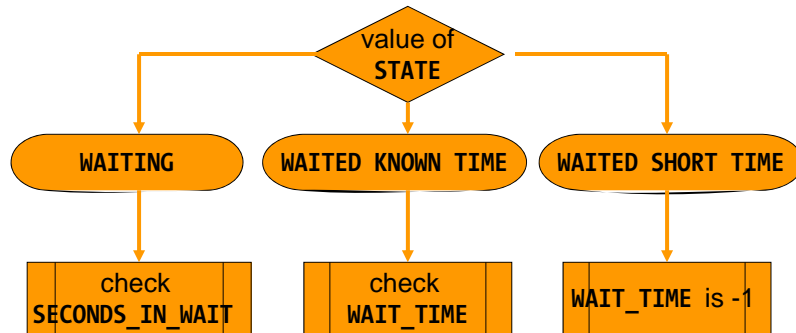
Wait Times

- **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**
 - The column **WAIT_TIME** is not relevant
 - **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

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Wait Time Accounting



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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

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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
```

```
select sid, state, v.event, v.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'
```

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		NUMBER
STATISTIC#		NUMBER
VALUE		NUMBER

Name	Null?	Type
STATISTIC#		NUMBER
NAME		VARCHAR2(64)
CLASS		NUMBER
STAT_ID		NUMBER

```
SQL> desc v$statname
```

Name	Null?	Type
STATISTIC#		NUMBER
NAME		VARCHAR2(64)
CLASS		NUMBER
STAT_ID		NUMBER

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Use of Session Stats

- Find out how much CPU was consumed already

```
select name, value
from v$mystat s, v$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

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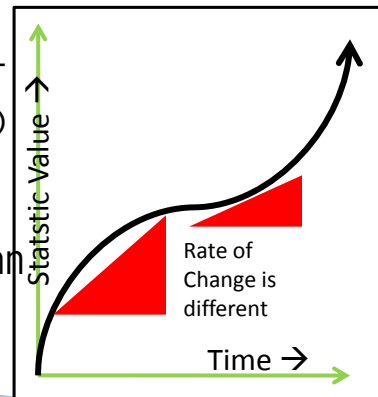
System Statistics

- 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



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Session Events

- What waits the session *has encountered* so far?
- View V\$SESSION_EVENT

```
SQL> desc v$session_event
```

Name	Null?	Type	
-----	-----	-----	
SID		NUMBER	→ Session ID
EVENT		VARCHAR2(64)	→ The wait event, e.g. "library cache lock"
TOTAL_WAITS		NUMBER	→ total number of times this session has waited
TOTAL_TIMEOUTS		NUMBER	→ total no. of times timeouts occurred for this
TIME_WAITED		NUMBER	→ the total time (in 100 th of sec) waited
AVERAGE_WAIT		NUMBER	→ the average wait per wait
MAX_WAIT		NUMBER	→ the maximum for that event
TIME_WAITED_MICRO		NUMBER	→ same as time_waited; but in micro seconds
EVENT_ID		NUMBER	→ the event ID of the event
WAIT_CLASS_ID		NUMBER	→ the class of the waits
WAIT_CLASS#		NUMBER	
WAIT_CLASS		VARCHAR2(64)	V\$EVENT_NAME has the event details joined on EVENT# column

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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
...				

Last 10 Waits

- View V\$SESSION_WAIT_HISTORY
- Shows last 10 waits for active sessions

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

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!

Blog: Arup.Blogspot.Com

Twitter: arupnanda