

How To Diagnose Random Oracle Cloud Performance Incidents Using ASH

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This presentation was given by Craig Shallahamer (craig@orapub.com) at the February 2019 RMOUG Conference in Denver, Colorado USA.
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Top 10 Foreground Events by Total Wait Time

Event	Waits	Total Wait Time (sec)	Wait Avg(ms)	% DB time	Wait Class
DB CPU		25.3K		29.4	
db file sequential read	8,985,494	23.2K	3	26.9	User I/O
db file scattered read	777,030	3680.9	5	4.3	User I/O
enq: IV - contention	1,141,414	3308.3	3	3.8	Other
enq: TX - row lock contention	2,985	2762.2	925	3.2	Application
db file parallel read	293,362	1868.2	6	2.2	User I/O
read by other session	571,368	1791	3	2.1	User I/O
log file sync	242,193	1328.4	5	1.5	Commit
direct path read	89,134	240.2	2.7	0.9	User I/O
reliable message	38,617	20.4	533	0.1	Other

“My screen froze
this morning for
about 30 seconds!”

A photograph of a wheat field under a clear blue sky. A large, yellow thought bubble is overlaid on the image, containing the text "My screen froze this morning for about 30 seconds!".

AWR report says
CPU consumption
and physical read IO
is the heart of the
issue.

Users say their
screen randomly
locks for a minute.

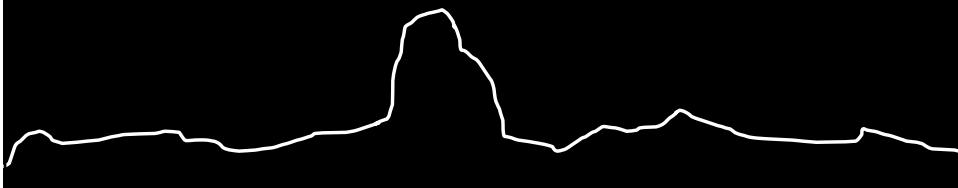
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Incident Analysis



The Challenge

Incident Analysis

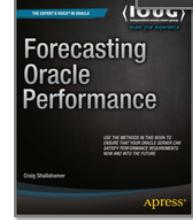


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About Me...

- Long time Oracle DBA
- Specialize in Oracle Database performance and performance engineering
- Performance researcher
- Blogger: A Wider View About Oracle Performance Tuning
- Author: Oracle Performance Firefighting and Forecasting Oracle Performance.
- Conference speaker
- Teacher and mentor
- Oracle ACE Director
- IOUG DBA Track Manager



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Image the questions I can ask!

Each piece of paper is like an active Oracle session.
Each stack contains all the active sessions captures during a single ASH sample, such as at 15:25:06.

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The types of questions can we ask

- **Summarize/Profile** anything. instance, sql_id, module, session, program, state,...
- **Interval timeline** by instance, module, etc.
- **Top** anything (on cpu or waiting). instance, sql_id, module, force matching signature, session,...
- **Timeline** a session... sample by sample
- **Visualize** a complex situation at a given time

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Different kinds of questions we may need to answer.

- When did the incident begin?
- When did the incident end?
- How many sessions were involved?
- How many people or processes were affected?
- Is there a genesis session?
- Is there a key SQL, module, program, action,...?
- Has it happened before? If so, how often?
- Will it happen again? If so, when? how often?

Solution Process

- Be aware when the instance profile doesn't match a user(s) experience... the needle...
- The incident can also be a BIG needle.
- Use clues to direct us into the incident:
 - Date and time range
 - User experience; random, functional, repeatable
 - Think: merge user experience, wait events, OS and application situation
 - Logs of all kinds, especially the Alert Log file.
- Increasingly converge towards the incident core
- Timeline linear situations
- Chart complex relationships

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Demos!

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This demo is part of one of my live FREE member webinars.

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There are also other FREE ASH webinars.



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The Situation

Some users said when they got back from lunch around 2pm the EBS batch processing queue was stuck and building up.

The Situation

The database time is set 9 hours ahead of user location because of the data center location. So we are looking for incident time at around 11pm.

One of the DBAs said that the Oracle alert log had a deadlock message posted at 11:12pm.

While not widely discussed, the truth is the DBAs have seen row locks in the batch system throughout the day and they have been killing the sessions.

But this time, something went wrong and batch processing effectively froze.

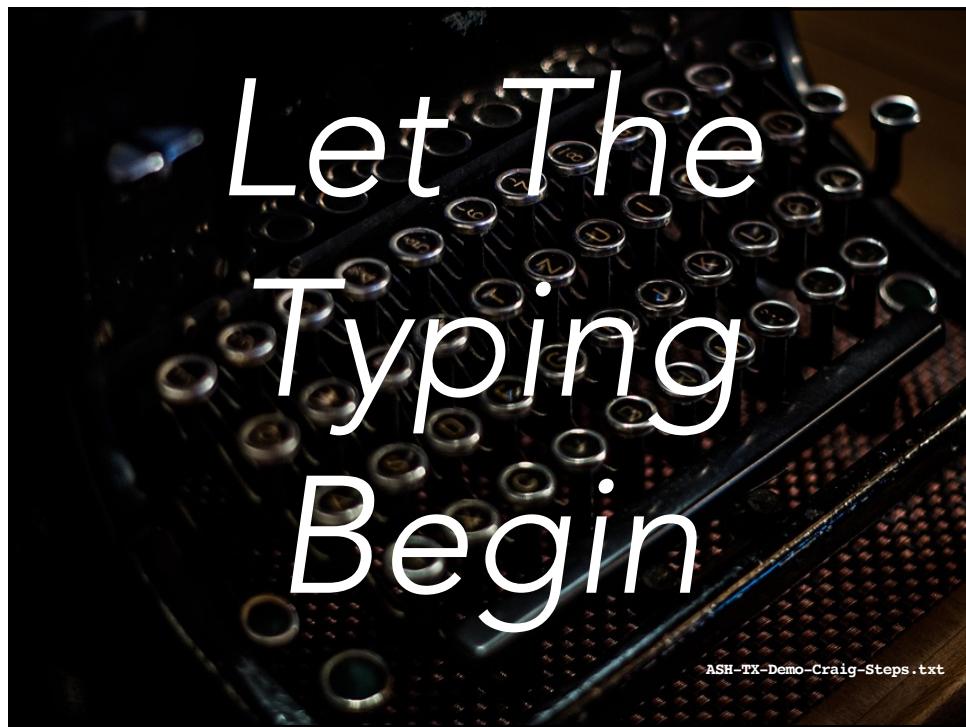
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Oh Oh... Never a good thing...

```
...
Sun May 15 23:09:48 2016
LNS: Standby redo logfile selected for thread 1 sequence 20101 for destination LOG
Sun May 15 23:09:53 2016
Archived Log entry 130818 added for thread 1 sequence 20100 ID 0xd839d567 dest 1:
Sun May 15 23:09:54 2016
ARC5: Standby redo logfile selected for thread 1 sequence 20100 for destination LOG
Sun May 15 23:10:00 2016
Completed checkpoint up to RBA [0x4e85.2.10], SCN: 6479478976626
Sun May 15 23:12:20 2016
Global Enqueue Services Deadlock detected. More info in file
/u01/app/orapi/admin/diag/rdbms/prodi/PRODI1/trace/PRODI1 ora_3836.trc.
Sun May 15 23:12:20 2016
Dumping diagnostic data in directory=[cdmp_50160321131223], requested by (instance
Sun May 15 23:15:45 2016
Auto-tuning: Shutting down background process GTX2
Sun May 15 23:19:56 2016
Auto-tuning: Starting background process GTX2
Starting background process GTX2
...

```

Oracle's Alert Log



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Demo Failure Slides

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First, set the analysis window

```

SQL> @bhset
Spooling to bh-2016-10-15-01-44.txt

OraPub's BloodHound scripts reference only ASH data from an ASH-like table.

You can set and reset the setting details to whatever you want and whenever you want.

The settings remain until you disconnect, which means with each re-connect you must re-set.

The CONTROL_MANAGEMENT_PACK_ACCESS parameter is "DIAGNOSTIC+TUNING"
From what we have heard, to legally access ASH data, the CONTROL_MANAGEMENT_PACK_ACCESS
value, need to be at least DIAGNOSTIC.

ENTER the maximum of PQ slaves used by these tools. (default:0) : 2
ENTER the minimum reporting percentage threshold. (1-1%, default: 0.5) :
ENTER: Is the ASH data source local or remote? (default:local or remote):

The BH scripts all pull data from an ASH-like table.
Most DBAs will use either v$active_session_history or dba_hist_active_sess_history or a copy.

ENTER the local ASH reporting data source (default:v$active_session_history): BH2016MAYTXLOCK
ENTER the reporting window type (default:fixed or relative):

Will gather DBA_HIST related ASH information from BH2016MAYTXLOCK.

```

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Looking at summary session activity.

DB/Inst: 1942798052/1		BloodHound by OraPub									
Report: bhtick.sql		Tick Profile - ASH Sample Based Analysis Report (10 second ticks, top columns: blocking_session)									
Begin Date	Begin Sample ID	Total AS	Average AS	CPU %	WAIT %	IO %	OTHER %	Event Name	Most Active SQL (non blank)	blocking_sessi	
15 22:46:51	29738362	3	3.0	33	67	50	50	eng: TX - row lock contention	aypfycv3tpg90		
15 22:47:01	29738372	6	6.0	17	83	40	60	log file parallel write	f2ardbv8ahnkz		
15 22:47:21	29738392	22	22.0	23	77	6	94	go buffer busy acquire	62hh5hp4nn4qu		
15 22:50:02	29738552	115	115.0	10	90	2	98	go buffer busy acquire	88vxvj661knzh	2629	
15 22:50:52	29738602	7	7.0	29	71	80	20	utl_file I/O	gj77e5nn6rf7		
15 22:51:42	29738652	6	6.0	17	83	25	75	eng: TX - row lock contention	aypfycv3tpg90		
15 22:52:02	29738672	5	5.0	20	80	50	75	eng: TX - row lock contention	aypfycv3tpg90		
15 22:52:12	29738682	4	4.0	25	75	33	67	eng: TX - row lock contention	aypfycv3tpg90		
15 22:52:32	29738702	95	95.0	57	43	2	98	latch: cache buffers chains	88vxvj661knzh		
15 22:52:42	29738712	98	98.0	55	45	2	98	latch: cache buffers chains	62hh5hp4nn4qu		
15 22:53:02	29738732	98	98.0	56	44	2	98	latch: cache buffers chains	62hh5hp4nn4qu		
15 22:53:12	29738742	103	103.0	40	60	2	98	latch: cache buffers chains	62hh5hp4nn4qu		
15 22:54:32	29738822	94	94.0	50	50	2	98	latch: cache buffers chains	88vxvj661knzh		
15 22:54:53	29738842	54	54.0	63	37	5	95	latch: cache buffers chains	88vxvj661knzh		
15 22:55:13	29738862	13	13.0	69	31	33	67	log file parallel write	62hh5hp4nn4qu		
15 22:55:23	29738872	48	48.0	40	60	3	97	latch: cache buffers chains	62hh5hp4nn4qu		
15 23:00:33	29739182	6	6.0	17	83	60	40	direct path read	c8mut9kr5t27h		
15 23:06:14	29739522	4	4.0	50	50	50	50	library cache pin	f0g62u51d4bp9		
15 23:09:35	29739722	8	8.0	25	75	17	83	DFS lock handle	39c3gyvun83f9		
15 23:09:45	29739732	52	52.0	44	56	93	7	db file sequential read	0fgp0j4n76w		
15 23:10:05	29739752	7	7.0	43	57	25	75	eng: TX - row lock contention	4a9wv2vc5waz		
15 23:10:15	29739762	5	5.0	40	60	50	50	eng: TX - row lock contention	f31tjn67t2bxz		
15 23:10:25	29739772	8	8.0	38	63	20	80	eng: TX - row lock contention	995j3q9836x3d		
15 23:10:35	29739782	10	10.0	30	70	14	86	eng: TX - row lock contention	7brhuv7xy43q5		
15 23:17:06	29740172	16	16.0	25	75	92	8	direct path read	4anzdgpmb2sd		
15 23:18:06	29740232	20	20.0	25	75	93	7	db file sequential read	67k55z33j7rgf		

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Looking detailed session activity.

DB Inst: 1942798052/1
Report: bht1.sql

BloodHound by OraPub

Session Timeline - ASH Sample Based Analysis Report

Sample ID	Sample Time	SID	User ID	Sess	State	SQL_ID	Wait Type	Wait Event Name	Wait Event Parameters	BLOCKING_SESSION
29739742	15 23:09:55	250	80	ON CPU	4puckpk6q9tf	-	-	..:..		
29739752	15 23:10:05	478	80	ON CPU	g206rgrfafasjg	-	-	..:..		
29739752	15 23:10:05	250	80	ON CPU	4puckpk6q9tf	-	-	..:..		
29739752	15 23:10:05	479	80	WAITING	4a9ww2vc5wa2z	other	enq: TX - row lock content	1415053318:26542110:11032	2535	
29739752	15 23:10:05	1747	80	WAITING	4a9ww2vc5wa2z	other	enq: TX - row lock content	1415053318:28835866:18405	479	
29739752	15 23:10:05	1976	0	WAITING	NO SQL	io(S)	log file parallel write	1:281:1		
29739752	15 23:10:05	2535	80	WAITING	7np3vxa7j43	other	enq: TX - row lock content	1415053318:28835866:18405	479	
29739752	15 23:10:05	2555	80	ON CPU	4mpkyhka45h5g	-	-	..:..		
29739762	15 23:10:15	238	0	WAITING	NO SQL	other	ARCH wait on SENDREQ	0:0:0		
29739762	15 23:10:15	250	80	ON CPU	4puckpk6q9tf	-	-	..:..		
29739762	15 23:10:15	406	80	WAITING	5530twpvys01	other	enq: TX - row lock content	1415053318:2162698:102716	1747	
29739762	15 23:10:15	1747	80	ON CPU	f31j:na67210xx	-	-	..:..		
29739762	15 23:10:15	2535	80	WAITING	adv56vp4zmpvr	io(U)	db file sequential read	161:3871616:1		
29739772	15 23:10:25	238	0	ON CPU	NO SQL	-	-	..:..		
29739772	15 23:10:25	250	80	ON CPU	4puckpk6q9tf	-	-	..:..		
29739772	15 23:10:25	408	80	ON CPU	995j3q9836x3d	-	-	..:..		
29739772	15 23:10:25	475	0	WAITING	NO SQL	other	process diagnostic dump	0:0:0		
29739772	15 23:10:25	1192	80	WAITING	4a9ww2vc5wa2z	other	enq: TX - row lock content	1415053318:27066370:17464	2535	
29739772	15 23:10:25	1747	80	WAITING	5530twpvys01	other	enq: TX - row lock content	1415053318:27066370:17464	2535	
29739772	15 23:10:25	1976	80	WAITING	5530twpvys01	io(U)	db file sequential read	110:2721406:1		
29739772	15 23:10:25	2535	80	WAITING	7bshu7zy3g5	other	enq: TX - row lock content	1415053318:27394069:17905	1747	
29739782	15 23:10:35	238	0	ON CPU	NO SQL	-	-	..:..		
29739782	15 23:10:35	250	80	ON CPU	4puckpk6q9tf	-	-	..:..		
29739782	15 23:10:35	475	0	WAITING	NO SQL	other	process diagnostic dump	0:0:0		
29739782	15 23:10:35	949	0	WAITING	NO SQL	other	ges LMD suspend for test	200:0:0		
29739782	15 23:10:35	1192	80	WAITING	4a9ww2vc5wa2z	other	enq: TX - row lock content	1415053318:27066370:17464	2535	
29739782	15 23:10:35	1672	0	WAITING	NO SQL	other	enq: TQ - TM contention	141459466:4769772:0		
29739782	15 23:10:35	1747	80	WAITING	5530twpvys01	other	enq: TX - row lock content	1415053318:27066370:17464	2535	
29739782	15 23:10:35	1976	80	WAITING	5530twpvys01	io(U)	db file sequential read	120:383100:1		
29739782	15 23:10:35	2535	80	WAITING	7bshu7zy3g5	other	enq: TX - row lock content	1415053318:27394069:17905	1747	
29739782	15 23:10:35	3714	0	ON CPU	NO SQL	-	-	..:..		
29739792	15 23:10:45	238	0	WAITING	NO SQL	io(S)	Log archive I/O	1:256:2147483647		
29739792	15 23:10:45	250	80	ON CPU	4puckpk6q9tf	-	-	..:..		
29739792	15 23:10:45	1747	80	ON CPU	4238h21n8mrax	-	-	..:..		

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Detailed visualization

SQL> @bhvisual
See readme.txt file about how to use this data to visualize with R
You will be prompted for all parameters.
The analysis scope does NOT need to be set and has NO affect on this script.
ENTER data source type (V=V\$, D=DBA_Hist, default: D) :
ENTER data source name IF DBA_Hist like, otherwise 0 (default: BH2016MAYTXLOCK) :
ENTER DBID IF data source is DBA_Hist like, otherwise 0 (default: 540190404) : 1942798052
ENTER Single node or Multi-Node (RAC) report (S=Single, M=Multi, default: S) : M
ENTER instance number If single node AND IF source is DBA_Hist, otherwise 0 (default: 0) :
ENTER date/time (format: DD-Mon-YYYY HH24:MI:SS , default: 15-Oct-2016 02:13:07) : 15-May-2016 23:10:05
ENTER output delimiter (R:- , Mathematica: -> , default: -) :
ENTER visualization level (1:summary, 2:detail, default 1) : 2
mydata <- graph.formula(
"3:23"~"aqwm0g6gbry5a", "3:23"~"CPU 3",
"1:2555"~"4mpkyhka45h5g", "1:2555"~"CPU 1",
"1:238"~"NO_SQL 1", "1:238"~"CPU 1",
"3:3714"~"NO_SQL 3", "3:3714"~"CPU 3",
"2:954"~"1xk43qbdavp6g", "2:954"~"CPU 2",

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R Console

[Workspace restored from /Users/cshallah/.RData]
[History restored from /Users/cshallah/.Rapp.history]

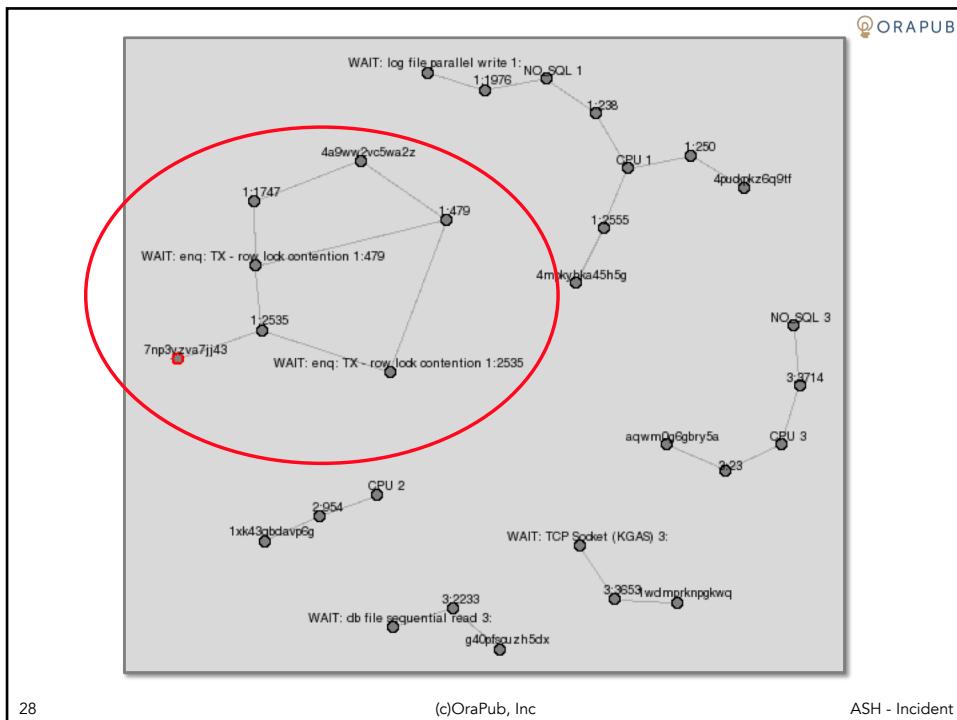
```

> library('igraph')
>
> mydata <- graph.formula(
+ "3:23"~"aqwm06gbry5a", "3:23"~"CPU 3",
+ "1:2555"~"4mpkyhka45h5g", "1:2555"~"CPU 1",
+ "1:238"~"NO_SQL 1", "1:238"~"CPU 1",
+ "3:3714"~"NO_SQL 3", "3:3714"~"CPU 3",
+ "2:954"~"1xk43qbdavp6g", "2:954"~"CPU 2",
+ "1:250"~"4puckpkz6q9tf", "1:250"~"CPU 1",
+ "1:2535"~"7np3vza7jj43", "1:2535"~"WAIT: log file parallel write 1:",
+ "1:1747"~"4a9ww2vc5wa2z", "1:1747"~"WAIT: enq: TX - row lock contention 1:479",
+ "1:479"~"4a9ww2vc5wa2z", "1:479"~"WAIT: enq: TX - row lock contention 1:479",
+ "1:479"~"4puckpkz6q9tf", "1:479"~"CPU 1",
+ "1:2535"~"7np3vza7jj43", "1:2535"~"WAIT: enq: TX - row lock contention 1:2535",
+ "1:1976"~"NO_SQL 1", "1:1976"~"WAIT: log file parallel write 1:",
+ "3:2233"~"g40pfscuzh5dx", "3:2233"~"WAIT: db file sequential read 3:",
+ "3:3653"~"1wdmprknpgkwq", "3:3653"~"WAIT: TCP Socket (KGAS) 3:",
+ "WAIT: enq: TX - row lock contention 1:479"~"1:479",
+ "WAIT: enq: TX - row lock contention 1:479"~"1:479",
+ "WAIT: enq: TX - row lock contention 1:2535"~"1:2535"
> tkplot(mydata, layout=layout.kamada.kawai, vertex.size=4,
+ vertex.label.dist=0.5, vertex.color="grey", edge.arrow.size=0.5,
+ vertex.label.family="sans", vertex.label.cex=0.6, vertex.label.color="black",
+ vertex.shape="circle")
Loading required package: tcltk

```

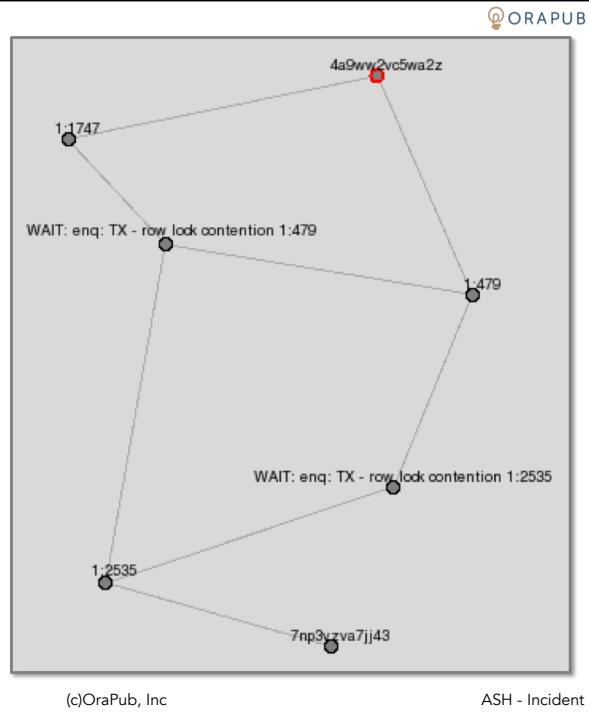
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Read like this:
 Session 1747 is running SQL a2z and waiting on a TX lock held by session 479. Session 479 running SQL same SQL a2z and waiting on a TX lock held by session 2535. Keep doing until you notice the problem!

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Observations

- No table level locks, only row
- Lock duration not crazy long
- Sessions are not blocked by the same session
- The same couple SQL IDs are involved
- Dead lock is clearly seen three times!
- I visually displayed one of the deadlocks
- Perfect storm: batch process dependencies, killing sessions and row locks from SQL in a custom module.

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Lessons learned

- Be extremely careful about killing sessions, especially in a batch environment when programs may automatically be set to restart.
- Why locks occurring? Look at sql_id, module, program and bind variables for clues.
- ASH data is invaluable for seeing detail not shown anywhere else.
- An Oracle time-based analysis would not have solved this mystery.

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Demo
#2



The Situation

On June 22 around 1400 a huge spike occurred in OEM.

The operations team doesn't understand what happened.

No users called!

Management is very concerned about a big spike that is not understood and with no users calling!

Find out what happened...

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Time Stamp	Level	Message Text
Jun 22 10:57:31	16	Tns error struct:
Jun 22 10:57:31	16	WARNING: inbound connection timed out (ORA-3136)
Jun 22 14:03:05	16	ORA-00020: numero massimo di processi (2500) superato
Jun 22 14:03:05	16	ORA-20 errors will not be written to the alert log for
Jun 22 14:03:05	16	the ORA-20 errors.
Jun 22 14:03:05	8	Process PE78 submission failed with error = 20
Jun 22 14:03:05	8	Process PE78 submission failed with error = 20
Jun 22 14:03:17	8	Process J001 submission failed with error = 20
Jun 22 14:04:24	16	ORA-00020: maximum number of processes (2500) exceeded
Jun 22 14:04:24	16	ORA-20 errors will not be written to the alert log for
Jun 22 14:04:24	16	the ORA-20 errors.
Jun 22 17:04:15	16	Errors in file /u01/app/orapi/admin/diag/rdbms/bla-bla/trace/1 ORA-12012: error on auto execute of job "SYS"."UTL_RECOMP_SLAVE" ORA-00942: table or view does not exist

Let The Typing Begin

ASH-TX-Spike-Demo-Steps.txt #3

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BLOOD HOUND Toolkit

Tuning Oracle Using ASH Strategies

ASH Scratch Pad

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Thank You!

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How To Diagnose Random Oracle Cloud Performance Incidents Using ASH

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