

Advanced Oracle Troubleshooting in 60 minutes

Tanel Põder

<http://www.tanelpoder.com>



Introduction

- About me:
 - Occupation: DBA, researcher, consultant
 - Expertise: Oracle internals geek,
End-to-end performance & scalability, troubleshooting
 - Oracle experience: 14+ years as DBA
 - Certification: OCM (2002) OCP (1999)
 - Professional affiliations: OakTable Network
Oracle ACE Director
 - Blog: <http://blog.tanelpoder.com>



Introduction

- About this presentation:
 - Systematic *approach*, rather than *methodology*
 - Use *right* tools for *right* problems
 - Break complex problems down to simple problems
 - Then use simple tools for fixing these simple problems
 - In other words, use a *systematic approach* and life will be easier!
- All scripts used here are freely available:
 - <http://tech.e2sn.com/oracle-scripts-and-tools>

Metalink forum thread example:

Query is taking long time to complete--Need urgent help

From: 05-Jun-08 08:40

Subject: Re : Query is taking long time to complete--Need urgent help

Posting TKPROF may help.

From: 05-Jun-08 21:33

Subject: Re : Query is taking long time to complete--Need urgent help

Just a hunch, but try changing optimizer mode to FIRST_ROWS.

From: 06-Jun-08 03:08

Subject: Re : Query is taking long time to complete--Need urgent help

Hi,

Please try using the HINTS like FIRST_ROWS or USE_HASH. This may solve the problem.

Simple (but common) question:

What the \$#*&%! is that session doing?

Non-systematic troubleshooting

- Check alert.log...
- Check for disk and tablespace free space...
- Check for locks...
- Check for xyz...

"We did a healthcheck and everything looks OK!"

?????!

Semi-systematic troubleshooting

- Quick check for *usual suspects*
 - System load, locks, etc...
- Look into Statspack (or AWR)...
- Enable sql_trace...

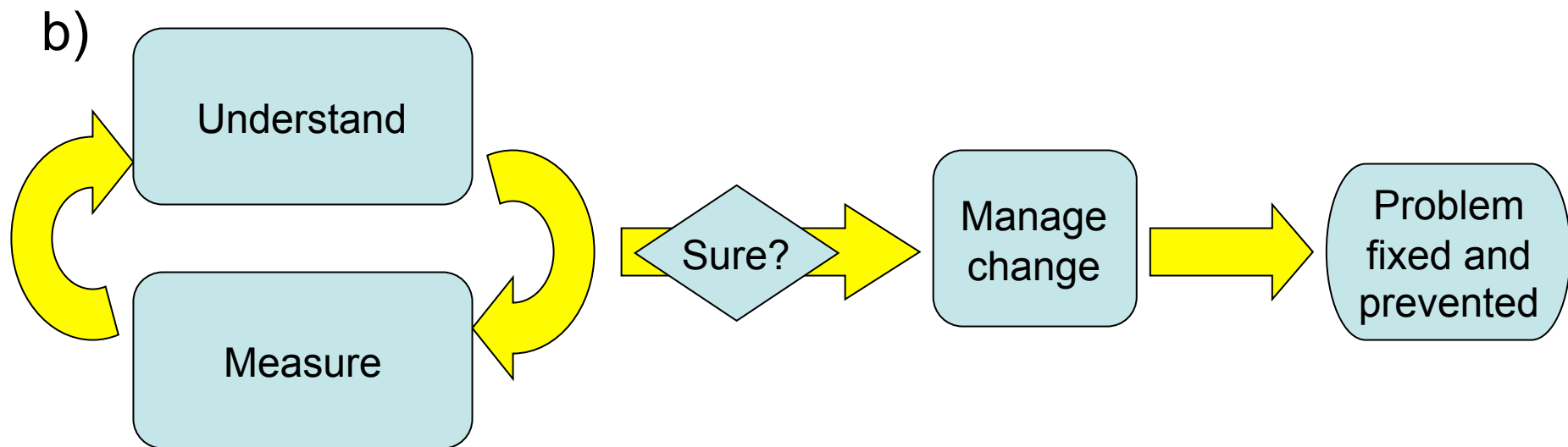
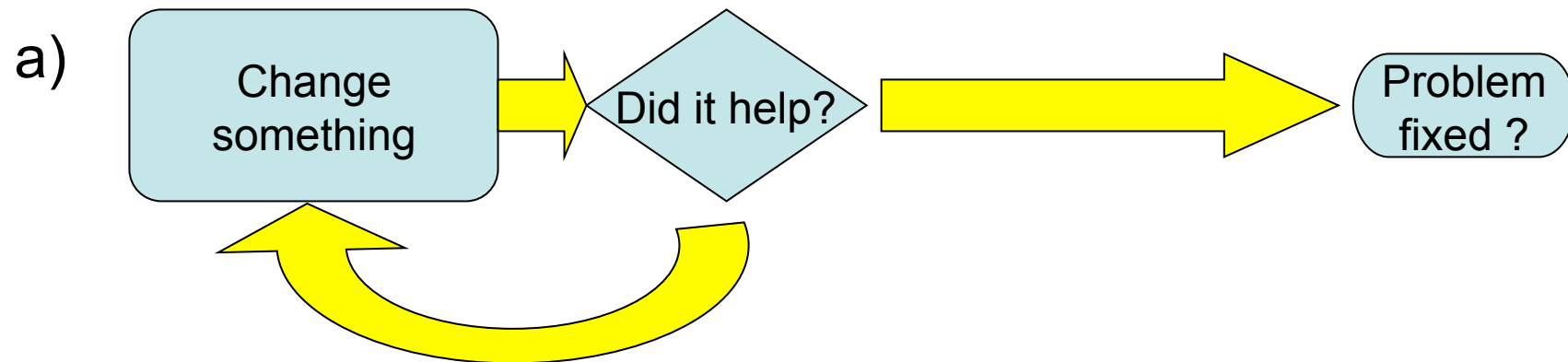
...then what?

Systematic troubleshooting

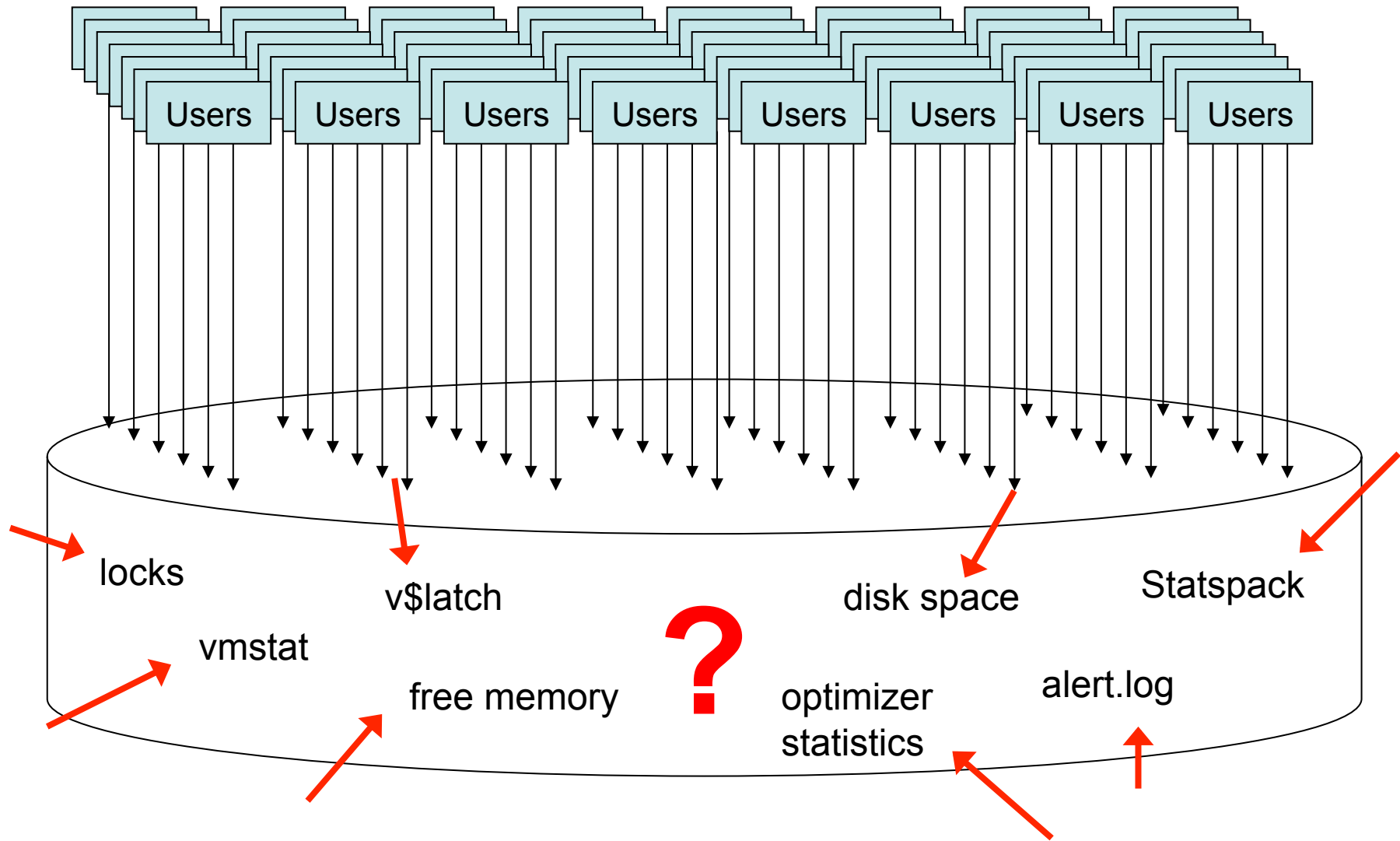
Demo

Troubleshooting approaches

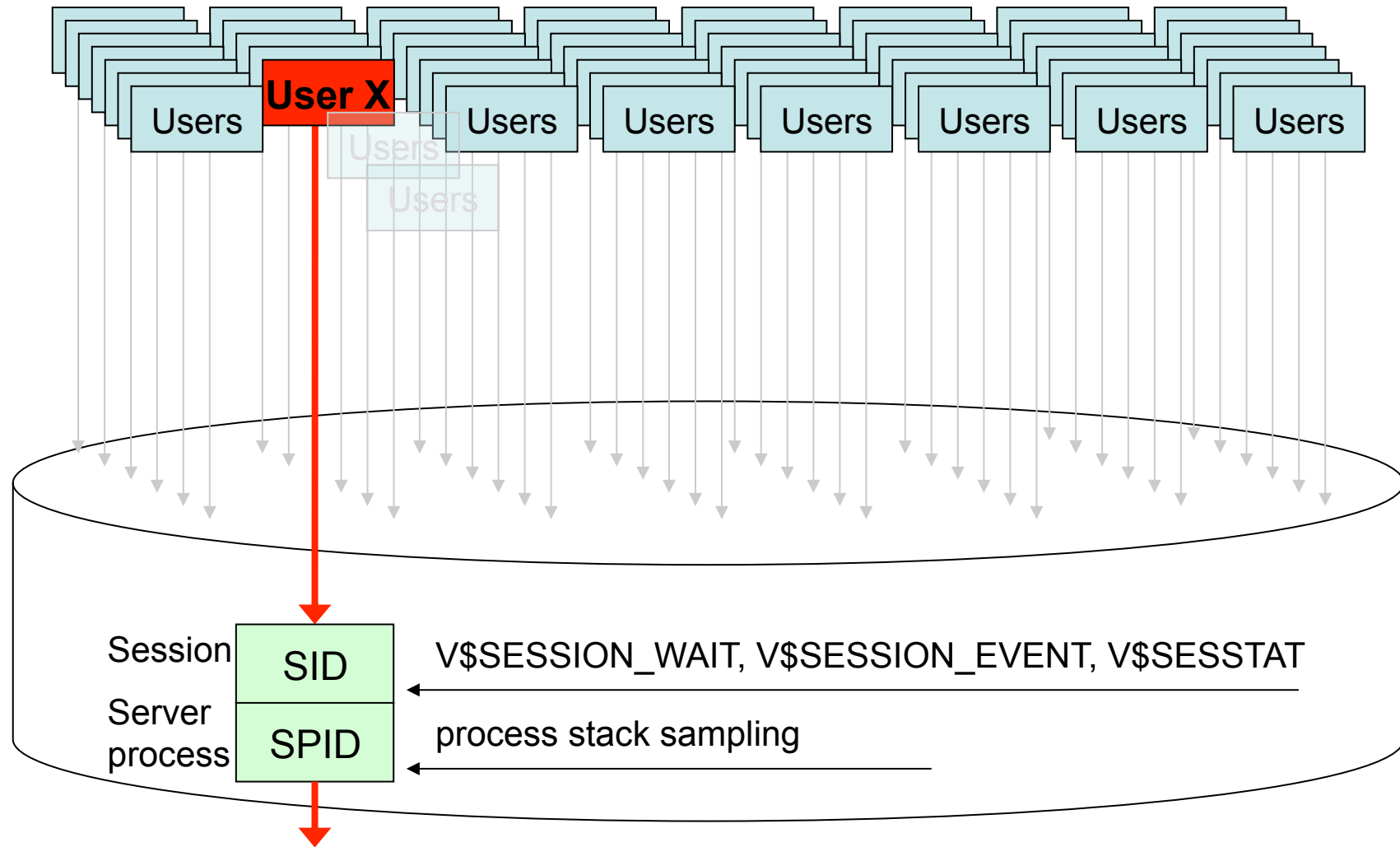
- How do you solve problems?



Non-Systematic approach!

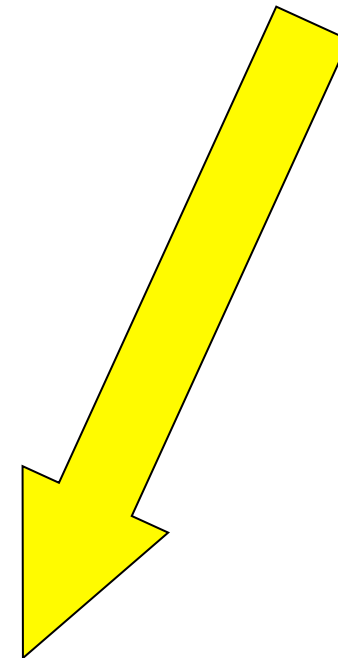


Systematic approach!

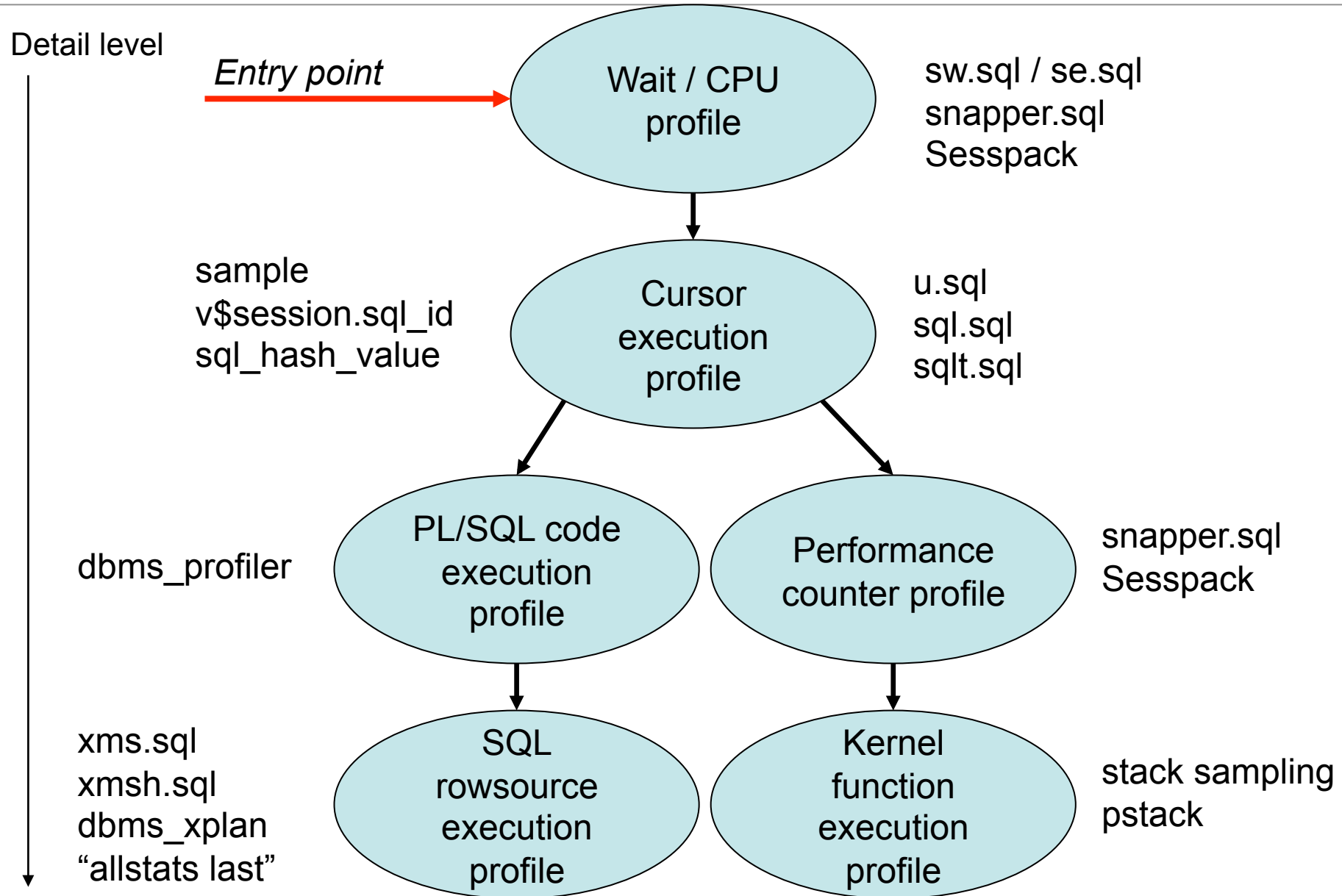


Systematic troubleshooting

- Understand the "flow" of a server process
- ...and how to measure it
- ...then measure it
- ...step by step
- ...using right tool at right step
- ...fix the problem *once you understand it*



Right tools for *measuring* right problems



sw.sql and Snapper demo

```
SQL> @sw 114
```

SID	STATE	EVENT	SEQ#	SEC_IN_WAIT	P1	P2	P3	P1TRANSL
114	WAITING	enq: TX - row lock contention	21	9	1415053318	131081	2381	0x54580006: TX mode 6

```
SQL> @sw &mysid
```

SID	STATE	EVENT	SEQ#	SEC_IN_WAIT	P1	P2	P3	P1TRANSL
107	WORKING	On CPU / runqueue	89	0	1413697536	1	0	

```
SQL>
```

```
SQL> @sn 5 &mysid
```

```
-- Session Snapper v1.06 by Tanel Poder ( http://www.tanelpoder.com )
```

HEAD,	SID,	SNAPSHOT START	, SECONDS,	TYPE,	STATISTIC	, DELTA,	DELTA/SEC,	HDELTA,	HDELTA/SEC
DATA,	9,	20080221 22:05:08,	5,	STAT,	recursive calls	, 1,	0,	1,	.2
DATA,	9,	20080221 22:05:08,	5,	STAT,	recursive cpu usage	, 1,	0,	1,	.2
DATA,	9,	20080221 22:05:08,	5,	STAT,	session pga memory max	, 25292,	5058,	25.29k,	5.06k
DATA,	9,	20080221 22:05:08,	5,	STAT,	calls to get snapshot scn: kcmgss	, 1,	0,	1,	.2
DATA,	9,	20080221 22:05:08,	5,	STAT,	workarea executions - optimal	, 18,	4,	18,	3.6
DATA,	9,	20080221 22:05:08,	5,	STAT,	execute count	, 1,	0,	1,	.2
DATA,	9,	20080221 22:05:08,	5,	STAT,	sorts (memory)	, 11,	2,	11,	2.2
DATA,	9,	20080221 22:05:08,	5,	STAT,	sorts (rows)	, 1904,	381,	1.9k,	380.8
DATA,	9,	20080221 22:05:08,	5,	WAIT,	PL/SQL lock timer	, 4999649,	999930,	5s,	999.93ms

```
-- End of snap 1
```

```
PL/SQL procedure successfully completed.
```

If this doesn't help...

...Where to look next?

Session troubleshooting sequence

1. Oracle Wait Interface - *response **TIME!***

?

2. v\$sesstat performance counters - *hints, indicators*

?

3. Process stack - *truth about process execution*

!!!

Process stack demos

```
$ pstack 5855
#0  0x00c29402 in __kernel_vsyscall ()
#1  0x005509e4 in semtimedop () from /lib/libc.so.6
#2  0x0e5769b7 in sskgpwwait ()
#3  0x0e575946 in skgpwwait ()
#4  0x0e2c3adc in ksliwat ()
#5  0x0e2c3449 in kslwaitctx. ()
#6  0x0b007261 in kjusuc ()
#7  0x0c8a7961 in ksipgetctx ()
#8  0x0e2d4dec in ksqcmi ()
#9  0x0e2ce9b8 in ksqgtlctx ()
#10 0x0e2cd214 in ksqqelctx. ()
#11 0x08754afa in ktcwit1 ()
#12 0x0e39b2a8 in kdddgb ()
#13 0x08930c80 in kdddel ()
#14 0x0892af0f in kaudel ()
#15 0x08c3d21a in delrow ()
#16 0x08e6ce16 in qerdlFetch ()
#17 0x08c403c5 in delexe ()
#18 0x0e3c3fa9 in opiexe ()
#19 0x08b54500 in kpoal8 ()
#20 0x0e3be673 in opiodr ()
#21 0x0e53628a in ttcpip ()
#22 0x089a87ab in opitsk ()
#23 0x089aaa00 in opiino ()
#24 0x0e3be673 in opiodr ()
#25 0x089a4e76 in opidrv ()
#26 0x08c1626f in sou2o ()
#27 0x08539aeb in opimai_real ()
#28 0x08c19a42 in ssthrdmain ()
#29 0x08539a68 in main ()
```

Where to look up the meaning of Oracle kernel function names?

1) Metalink:

175982.1 ORA-600 Lookup Error Categories

453521.1 ORA-04031 “KSFQ Buffers” ksmkgpalloc

Search: <function> "executable entry point"

2) Oracle views

v\$latch_misses (lm.sql)

v\$latchholder (latchprofx.sql)

v\$fixed_view_definition (d.sql, f.sql)

3) Internet search

Getting stack traces

- OS stack dumper
 - pstack - Solaris, Linux, HP-UX
 - procstack - AIX
 - gdb bt, mdb \$c
 - Procwatcher (Metalink note: 459694.1)
- Windows
 - windbg, procexp - but no symbolic function names in oracle.exe :(
- Oracle internal
 - oradebug short_stack
 - oradebug dump errorstack 1
 - alter session set events '942 trace name errorstack'

Diagnosing PL/SQL execution

- V\$SESSION new columns from 10.2.0.3
 - PLSQL_ENTRY_OBJECT_ID
 - PLSQL_ENTRY_SUBPROGRAM_ID
 - PLSQL_OBJECT_ID
 - PLSQL_SUBPROGRAM_ID
- Dump errorstack shows PL/SQL line number info:

```
*** 2008-12-05 11:43:17.781
ksedmp: internal or fatal error
Current SQL statement for this session:
BEGIN dbms_lock.sleep(100); END;
----- PL/SQL Call Stack -----
   object      line  object
   handle      number name
20496E0C       201  package body SYS.DBMS_LOCK
204E46E8        1  anonymous block
```

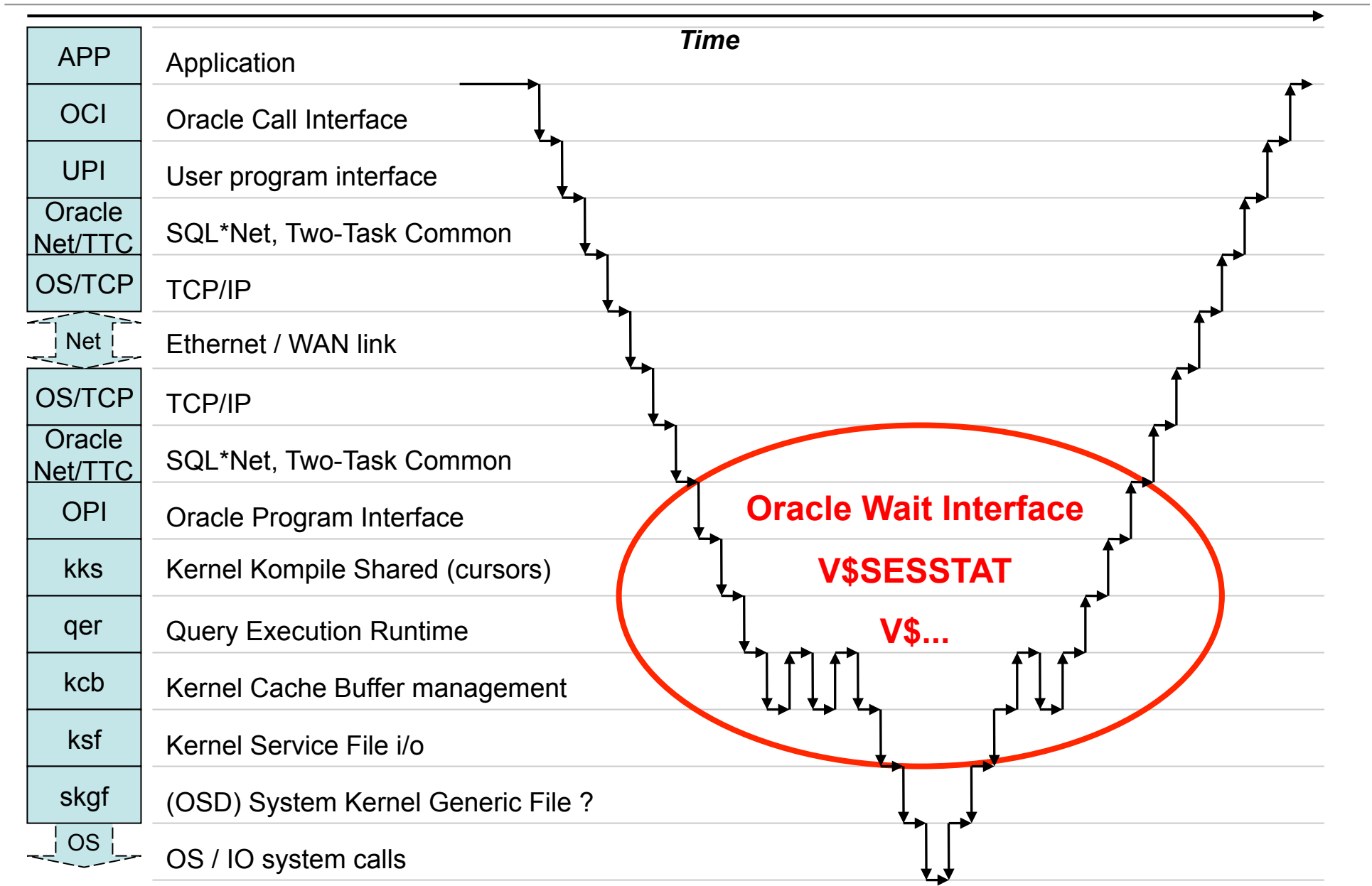
Scripts for low-level Oracle diagnosis - demos

- dstackprof
 - DTrace based stack profiler
- ostackprof
 - oradebug short_stack based stack profiler
- latchprofx
 - session level latch holder profiling script
 - plain SQL!
 - includes info in which function in Oracle kernel the latch get was invoked

What if my problem lies outside Oracle?

...Where to look next?

Oracle internal process flow



Oracle internal process flow

APP	Application	Application instrumentation , ltrace, truss -u"libcIntsh:*
OCI	Oracle Call Interface	\$OH/rdbms/demo/ociucb.mk, OCITrace
UPI	User program interface	-
Oracle Net/TTC	SQL*NET, TNS, Two-Task Common	SQL*Net trace, Wireshark TNS protocol digester
OS/TCP	TCP/IP	Wireshark TCP protocol digester, truss, strace
Net	Ethernet / WAN link	snoop, tcpdump, Wireshark
OS/TCP	TCP/IP	Wireshark TCP protocol digester, truss, strace
Oracle Net/TTC	SQL*NET, TNS, Two-Task Common	SQL*Net trace, Wireshark, Event 10079
OPI	Oracle Program Interface	Event 10051
kks	Kernel Kompile Shared (cursors)	sql_trace, Event 10046, 10270, cursortrace
qer	Query Execution Runtime	v\$sql_plan_statistics, v\$sql_plan_statistics_all, sql_trace
kcb	Kernel Cache Buffer management	x\$kcbsw, Event 10200,10812, _trace_pin_time
ksf	Kernel Service File i/o	v\$filestat, v\$tempstat, v\$session_wait, Event 10298
skgf	(OSD) System Kernel Generic File ?	-
OS	OS / IO system calls	DTrace, strace, truss, tusc, filemon.exe, procmon.exe

Repeat: Session troubleshooting sequence

1. Oracle Wait Interface - *response **TIME!***

?

2. v\$sesstat performance counters - *hints, indicators*

?

3. Process stack - *truth about process execution*

!!!

Session-level troubleshooting tools

1. Profile session wait / CPU breakdown - ***TIME!***

- `V$SESSION_WAIT`
- `V$SESSION_EVENT`, `V$SESS_TIME_MODEL` (10g+)
- *Snapper, Sesspack, Statspack session mode*

2. Profile session performance counters - *occurrences*

- `V$SESSTAT`

3. Profile session's process stack - *statistical sample*

- *pstack, procstack, ostackprof, dstackprof*
- *procmon.exe, procexp.exe*
- *oradebug short_stack, oradebug errorstack*

References

- Metalink notes:
 - 459694.1 - Procwatcher: Script to Monitor and Examine Oracle and CRS Processes
 - 175982.1 - ORA-600 Lookup Error Categories
- Web:
 - <http://blog.tanelpoder.com>
 - <http://tech.e2sn.com>
- Seminar:
 - If you like this stuff, you'll definitely like my online seminars!
 - <http://tech.e2sn.com/oracle-training-seminars>

Thank you!

Tanel Põder

tanel@tanelpoder.com

<http://blog.tanelpoder.com>