Toad Workshop Ljubljana 2020

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Performance Management in Oracle Enterprise and Standard Editions

Quest

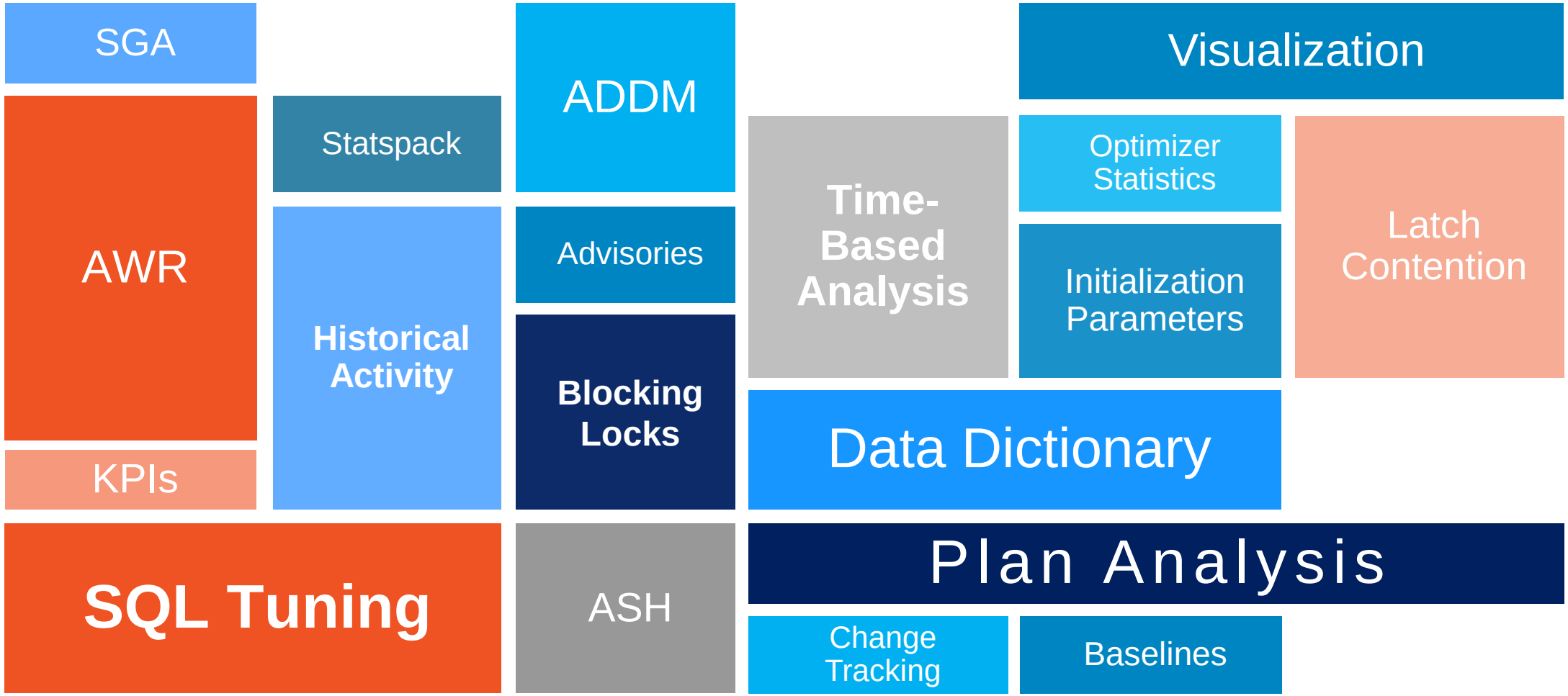
Who am I?

- Started with Oracle V6 in 1991
  - DBA, Forms/Reports Developer
- Oracle Germany 1995
  - RDBMS, Forms, Reports, Designer
- Quest Software since 2005
  - DB Administration and Development – Toad, Spotlight, SQL Optimizer
  - Database Replication – SharePlex
  - Performance Monitoring – Foglight

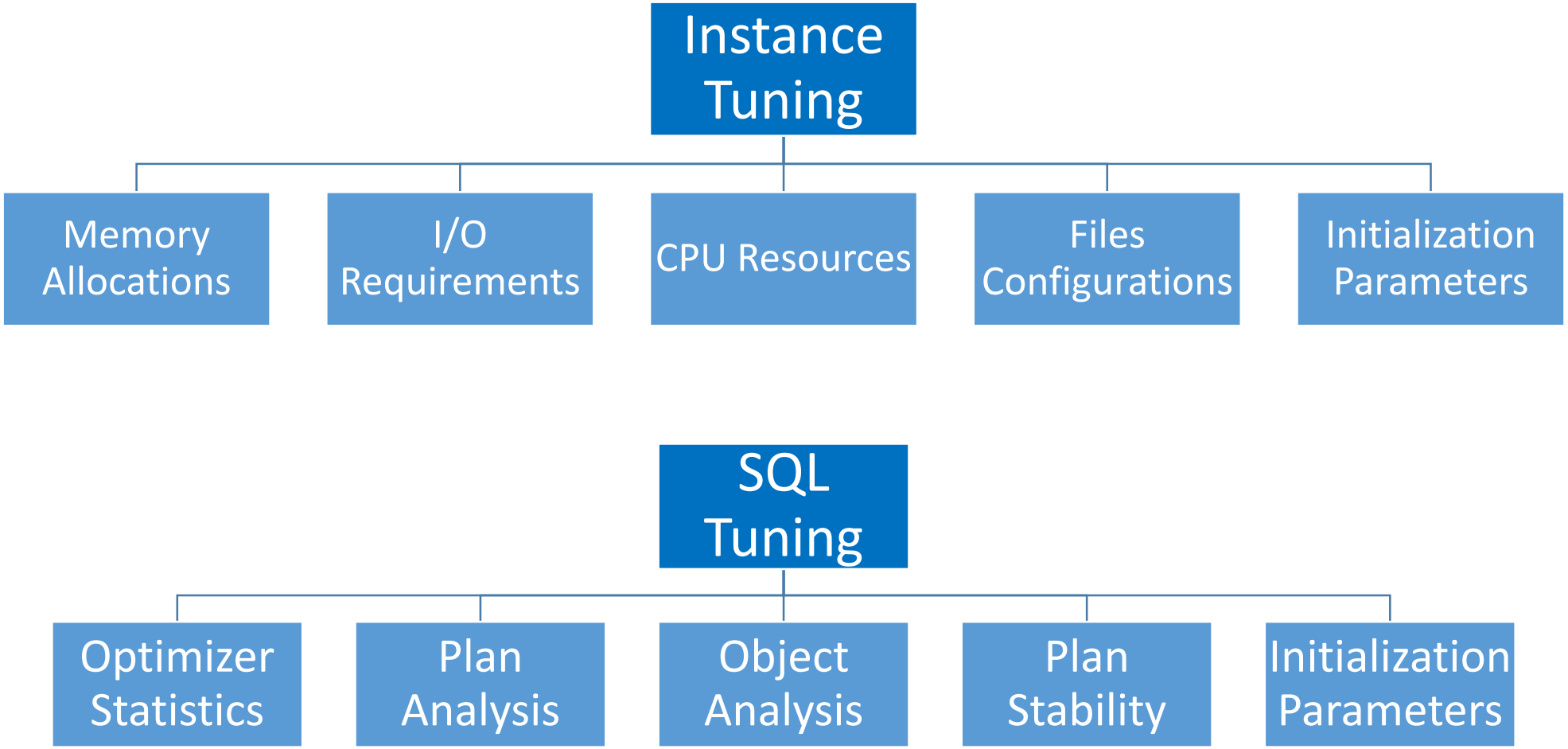
Agenda

- ✓ Introduction to Oracle database performance tuning
- ✓ Common challenges when using standard editions
- ✓ Toad DBA Edition w/ Spotlight
- ✓ Foglight for Databases
- ✓ Q&A

Introduction to Performance Tuning



Common Performance Diagnostics Approaches



Instance Tuning - Common Things to Consider

- **Initialization Parameters** - (such as STATISTICS_LEVEL)
- **Memory structures** - ASMM, AMM, min size for buffer pools
- **Files configuration** - redo logs, undo tablespace
- **Hardware configuration** - memory, storage characteristics, network
- **ASM configuration** - disk groups and failure groups
- **Connection management** - both app level and DB level

SQL Tuning - Common Things to Consider

- **Bad SQLs** - using literals instead of bind variables
- **Object analysis -** Indexes, partitions, materialized views
- **Optimizer statistics** - last analyzed, dynamic statistics (OPTIMIZER_DYNAMIC_SAMPLING)
- **Oracle features** which may impact execution plans
  - SQL Profiles (10g)
  - Adaptive Cursor Sharing (11gR2)
  - Cardinality Feedback (11gR2)
  - Dynamic Statistics (12cR1)
  - Adaptive Plans (12cR1)
- **Plan stability** - SQL plan management (11gR1)

Simplified Performance Tuning Methodology

1. Determine the most significant bottleneck – i.e. best tuning opportunities
2. Improve/Fix it
3. Repeat it until performance is good

Pini Dibask's Blog Post:

http://oracledbpro.blogspot.com/2015/09/simple-performance-tuning-methodology.html

How can we find them with enterprise edition & diagnostics pack?

- ✓ AWR
- ✓ ADDM
- ✓ ASH
- ✓ ASH Analytics
- ✓ SQL Tuning Advisory

WORKLOAD REPOSITORY report for

DB Name	DB Id	Instance	Inst num	Startup Time	Release	RAC
ORCL11	4088687252	orcl11	1	16-Aug-15 10:08	11.2.0.3.0	NO

Host Name	Platform	CPUs	Cores	Sockets
ISRVMPALW06	Microsoft Windows x86 64-bit	4	4	1

	Snap Id	Snap Time	Sessions	Cur
Begin Snap:	9253	30-Aug-15 15:00:02	91	
End Snap:	9254	30-Aug-15 16:00:37	92	
Elapsed:		60.59 (mins)		
DB Time:		179.46 (mins)		

Host CPU (CPUs: 4 Cores: 4 Sockets: 2)

Load Average Begin	Load Average End	%User	%System	%WIO	%Idle
		24.9	4.9		70.2

Instance CPU

%Total CPU	%Busy CPU	%DB time waiting for CPU (Resource Manager)
1.3	4.4	0.0

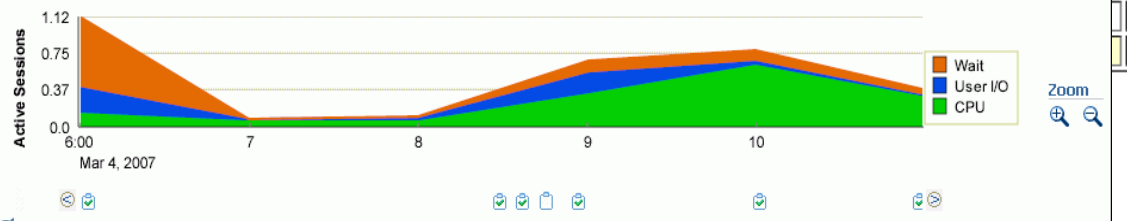
Memory Statistics

	Begin	End
	8,191.6	8,191.6
	1,024.0	1,024.0
	781.3	784.8
	22.04	22.08

Database Activity

Run ADDM | Finding History

The icon selected below the graph identifies the ADDM analysis period. Click on a different icon to select a different analysis period.



TIP For an explanation of the icons and symbols used in this page, see the Icon Key

ADDM Performance Analysis

Task Name ADDM:3216269853_1_56 Time Range

Filters | View Snapshots | View Report

Task Owner SYS | Average Active Sessions 0.8 | Period Start Time Mar 4, 2007 11:00:07 PM PST | Period Duration (minutes) 60.3

Impact (%)	Finding	Occurrences (last 24 hrs)
100	Top SQL by DB Time	11 of 19
77.5	CPU Usage	12 of 19
9.5	Hard Parse	8 of 19
4.9	"Scheduler" Wait Class	12 of 19
1.4	I/O Throughput	11 of 19

Performance Tuning Challenges for DBAs

Feature	No Diagnostics Pack	Diagnostics Pack	Diagnostics & Tuning Packs
Statspack	✓	✓	✓
Dictionary Views	✓* (most of them…)	✓	✓
AWR	x	✓	✓
ASH	x	✓	✓
ASH Analytics	x	✓	✓
ADDM/Compare Period ADDM	x	✓	✓
SQL Tuning Advisor	x	x	✓
SQL Access Advisor	x	x	✓

So what are our options when diagnostics pack is not available?

- **Statspack** - available since Oracle 8i (1998)
- **Dictionary Views (below are my favorites…)**
  - DB statistics – V$SESSTAT, V$SYSSTAT
  - SQL statistics – V$SQLAREA, V$SQL
  - Execution plan information – VSQL_PLAN, VSQL_SHARED_CURSOR
  - Object level statistics – V$SEGMENT_STATISTICS
  - File level statistics – V$FILESTAT
  - Wait events – V$SESSION, V$SESSION_WAIT, V$SYSTEM_EVENT
  - Time model statistics – VSYS_TIME_MODEL, VSES_TIME_MODEL

Statspack

- Oracle 8i and above
- "Poor man's AWR"
- Text based report - no easy navigation, no visualization
- Less comprehensive than AWR

```
Database    DB Id    Instance     Inst Num  Startup Time   Release     RAC
~~~~~~~~ ---------- ------------ -------- --------------- ----------- ---
         2915477242 prm11               1 15-Sep-18 01:37 11.2.0.3.0  NO

Host Name             Platform                CPUs Cores Sockets   Memory (G)
~~~~ ---------------- ---------------------- ----- ----- ------- ------------
     ISRVMN879        Microsoft Windows x86      4     4       2           8.0

Snapshot       Snap Id     Snap Time      Sessions Curs/Sess Comment
~~~~~~~~    ---------- ------------------ -------- --------- -------------------
Begin Snap:          1 04-Oct-18 16:38:36       92       2.3
  End Snap:          3 04-Oct-18 16:39:52       90       2.4
   Elapsed:       1.27 (mins) Av Act Sess:       0.2
   DB time:       0.19 (mins)       DB CPU:      0.09 (mins)

Cache Sizes            Begin        End
~~~~~~~~~~~       ---------- ----------
    Buffer Cache:       368M              Std Block Size:         8K
     Shared Pool:       592M                  Log Buffer:     7,400K

Load Profile              Per Second    Per Transaction    Per Exec    Per Call
~~~~~~~~~~~~~~       ------------------  ---------------- ----------- -----------
      DB time(s):                 0.2               0.9        0.00        0.01
       DB CPU(s):                 0.1               0.4        0.00        0.01
       Redo size:            94,708.5           553,680.3
   Logical reads:               446.2             2,608.3
   Block changes:               182.8             1,068.5
  Physical reads:                18.0               105.2
 Physical writes:                 3.8                22.0
      User calls:                13.4                78.3
          Parses:                 4.8                28.0
     Hard parses:                 1.9                10.9
W/A MB processed:                 1.6                 9.6
          Logons:                 0.1                 0.5
        Executes:                31.6               184.9
       Rollbacks:                 0.0                 0.0
    Transactions:                 0.2

Instance Efficiency Indicators
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
            Buffer Nowait %:   99.99       Redo NoWait %:  100.00
            Buffer  Hit   %:   99.84  Optimal W/A Exec %:  100.00
            Library Hit   %:   90.57        Soft Parse %:   61.26
         Execute to Parse %:   84.85         Latch Hit %:  100.00
Parse CPU to Parse Elapsd %:   57.38     % Non-Parse CPU:   94.06

 Shared Pool Statistics        Begin   End
                               ------  ------
                Memory Usage %:   90.31   90.63
    % SQL with executions>1:   72.31   74.63
  % Memory for SQL w/exec>1:   86.45   87.60
```

Using Dictionary Views - Example

```
2 •  SELECT *
3      FROM v$segment_statistics
4    WHERE object_name = 'ORDERS'
```

Data Grid

Messages | Data Grid | Trace | DBMS Output | Query Viewer | Explain Plan | Script Output

OWNER	OBJECT_NAME	SUBOBJECT_NAME	TABLESPACE_NAME	TS#	OBJ#	DATAOBJ#	OBJECT_TYPE	STATISTIC_NAME	STATISTIC#	VALUE
SALES	ORDERS	OL200112	USERS	4	357057	357057	TABLE PARTITION	logical reads	0	0
SALES	ORDERS	OL200112	USERS	4	357057	357057	TABLE PARTITION	buffer busy waits	1	0
SALES	ORDERS	OL200112	USERS	4	357057	357057	TABLE PARTITION	gc buffer busy	2	0
SALES	ORDERS	OL200112	USERS	4	357057	357057	TABLE PARTITION	db block changes	3	0
SALES	ORDERS	OL200112	USERS	4	357057	357057	TABLE PARTITION	physical reads	4	4
SALES	ORDERS	OL200112	USERS	4	357057	357057	TABLE PARTITION	physical writes	5	0
SALES	ORDERS	OL200112	USERS	4	357057	357057	TABLE PARTITION	physical read requests	6	4
SALES	ORDERS	OL200112	USERS	4	357057	357057	TABLE PARTITION	physical write requests	7	0
SALES	ORDERS	OL200112	USERS	4	357057	357057	TABLE PARTITION	physical reads direct	8	0
SALES	ORDERS	OL200112	USERS	4	357057	357057	TABLE PARTITION	physical writes direct	9	0
SALES	ORDERS	OL200112	USERS	4	357057	357057	TABLE PARTITION	optimized physical reads	11	0
SALES	ORDERS	OL200112	USERS	4	357057	357057	TABLE PARTITION	gc cr blocks received	12	0
SALES	ORDERS	OL200112	USERS	4	357057	357057	TABLE PARTITION	gc current blocks received	13	0
SALES	ORDERS	OL200112	USERS	4	357057	357057	TABLE PARTITION	ITL waits	14	0
SALES	ORDERS	OL200112	USERS	4	357057	357057	TABLE PARTITION	row lock waits	15	0
SALES	ORDERS	OL200112	USERS	4	357057	357057	TABLE PARTITION	space used	17	0
SALES	ORDERS	OL200112	USERS	4	357057	357057	TABLE PARTITION	space allocated	18	0
SALES	ORDERS	OL200112	USERS	4	357057	357057	TABLE PARTITION	segment scans	20	1
SALES	ORDERS	OL200111	USERS	4	357056	357056	TABLE PARTITION	logical reads	0	0
SALES	ORDERS	OL200111	USERS	4	357056	357056	TABLE PARTITION	buffer busy waits	1	0

```
1 •  SELECT * FROM v$sys_time_model
```

Data Grid

Messages | Data Grid | Trace | DBMS Output | Query Viewer | Explain Plan

STAT_ID	STAT_NAME	VALUE
3649082374	DB time	168205069903
2748282437	DB CPU	61760658004
4157170894	background elapsed time	141748129666
2451517896	background cpu time	15588771771
4127043053	sequence load elapsed time	882877
1431595225	parse time elapsed	2005849591
372226525	hard parse elapsed time	1440327126
2821698184	sql execute elapsed time	97699603724
1990024365	connection management call elapsed time	607789686
1824284809	failed parse elapsed time	534275694
4125607023	failed parse (out of shared memory) elapsed time	0
3138706091	hard parse (sharing criteria) elapsed time	450439555
268357648	hard parse (bind mismatch) elapsed time	9147827
2643905994	PL/SQL execution elapsed time	2449991737
290749718	inbound PL/SQL rpc elapsed time	0
1311180441	PL/SQL compilation elapsed time	89323501
751169994	Java execution elapsed time	0
1159091985	repeated bind elapsed time	9978508
2411117902	RMAN cpu time (backup/restore)	0

What are the challenges with these approaches?

- **Statspack**
  - Text format - less intuitive to navigate compared to AWR html format
  - Not as feature-rich as AWR
- **Dictionary Views**
  - Limited history
  - Cumulative statistics - since startup

But most importantly… no visualization

What do these three things have in common?

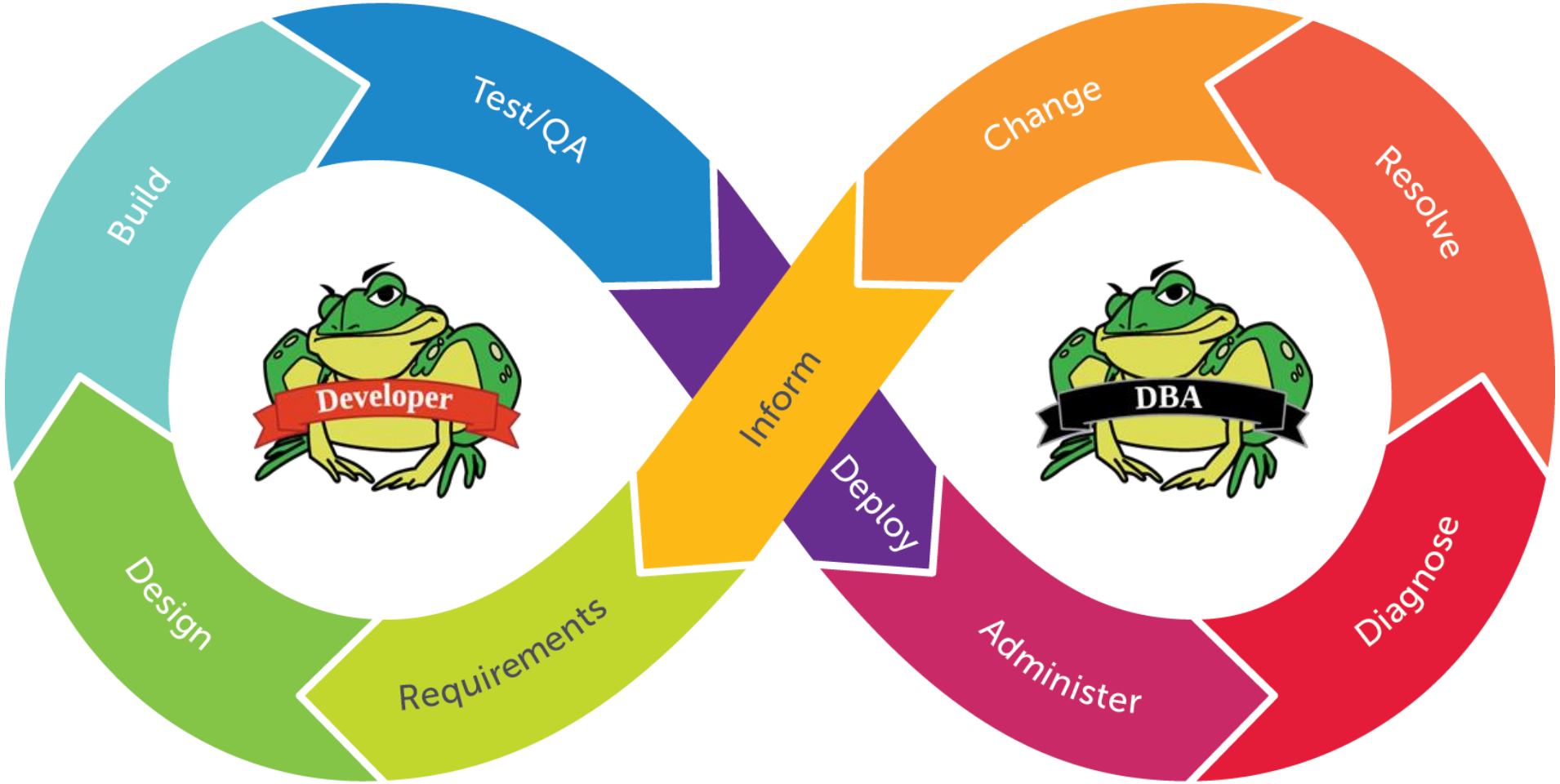
They all provide a clearer perspective -

You can’t fix what you don’t see!

What if you could…

Gain complete visibility into the health and performance of your database environments

Toad for Oracle supports the database application lifecycle



Quest

Toad for Oracle Editions for DBAs

Toad for Oracle DB Admin Module:
Maintain database health and security, while minimizing the impact of changes. Perform database compare and synch, and schema compare across two databases simultaneously. Also, conduct database health checks (see Oracle options, packs , RAC and Exadata), objects and data.

What's included:
- Any Edition of Toad for Oracle is ***required***
- Configurable database health checks

Toad DBA Edition for Oracle:
Assure maintenance, performance and change with a proactive approach through this complete comprehensive database administration toolset. Simplify administration tasks, and predict, diagnose and resolve database performance issues before end users are impacted.

What's included:
- Toad for Oracle Xpert Edition+DB Admin Module
- Spotlight™ on Oracle, Spotlight on MySQL, Spotlight on Unix/Linux , Windows, and Oracle Data Guard
- Toad Data Modeler
- Benchmark Factory (Oracle Edition)

Toad DBA Edition for Oracle – RAC Edition:
Simplify Oracle RAC administration and solve RAC performance bottlenecks quickly. Provides complete visibility of Oracle RAC architecture for effective real-time diagnostics and RAC scalability testing. Provides visibility into Oracle RAC at node, cluster and interconnect levels.

What's included:
- Toad for Oracle Xpert Edition + DB Admin Module
- Spotlight on Oracle RAC, Spotlight on MySQL, Spotlight on Unix/Linux, Windows, and Oracle Data Guard
- Toad Data Modeler
- Benchmark Factory (Oracle Edition)

Toad DBA Edition for Oracle – Exadata Edition:
Provides unique insight into Exadata. It's the only solution that shows a complete view of the entire environment. It allows you to identify and diagnose potential performance issues and bottlenecks before end users are impacted. This edition also provides checks to ensure optimal Exadata configuration.

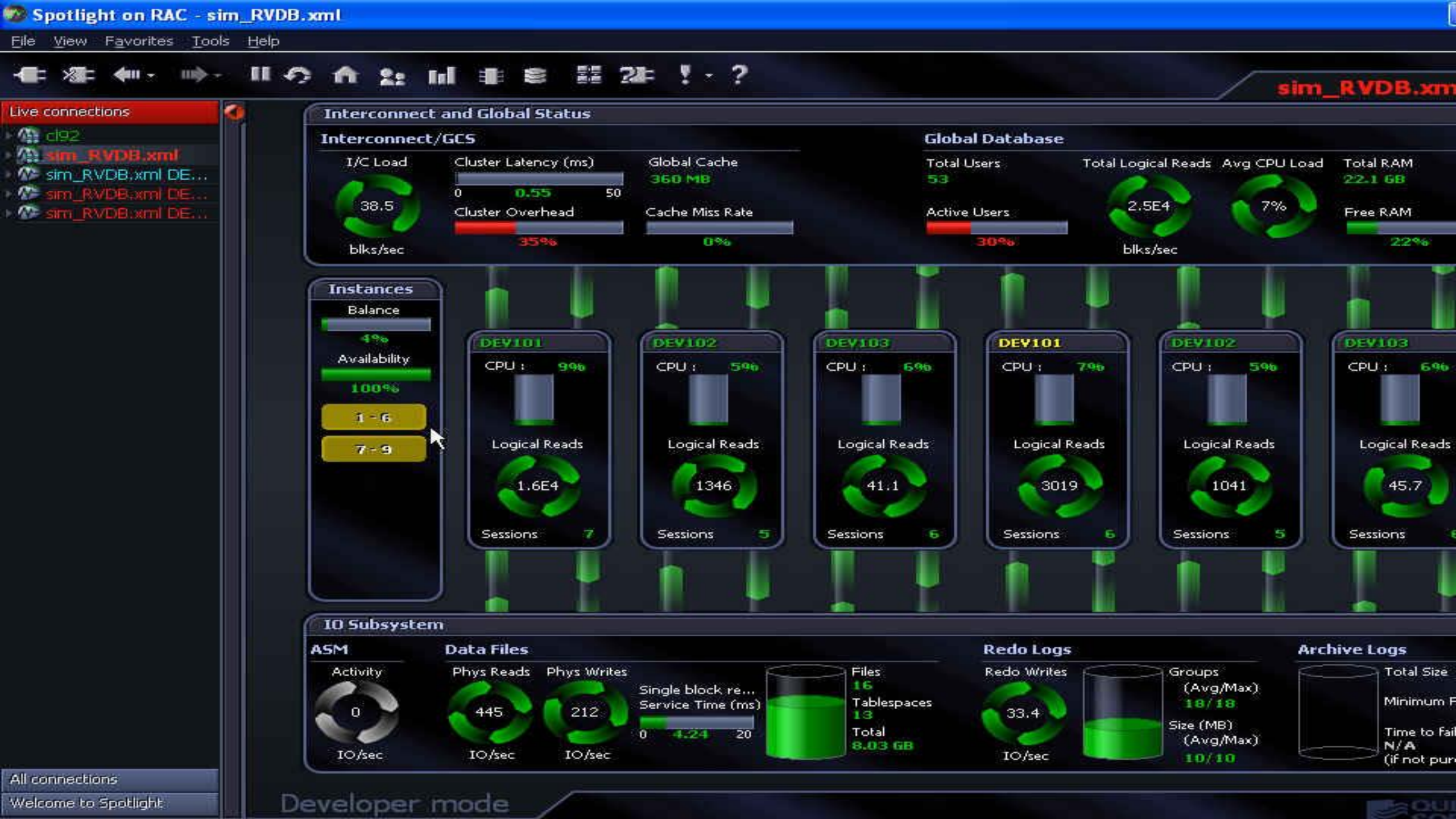
What's included:
- Toad for Oracle Xpert Edition + DB Admin Module
- Spotlight on Oracle Exadata, Spotlight on MySQL, Spotlight on Unix/Linux, Windows, and Oracle Data Guard
- Toad Data Modeler
- Benchmark Factory (Oracle Edition)

Quest

Performance Management

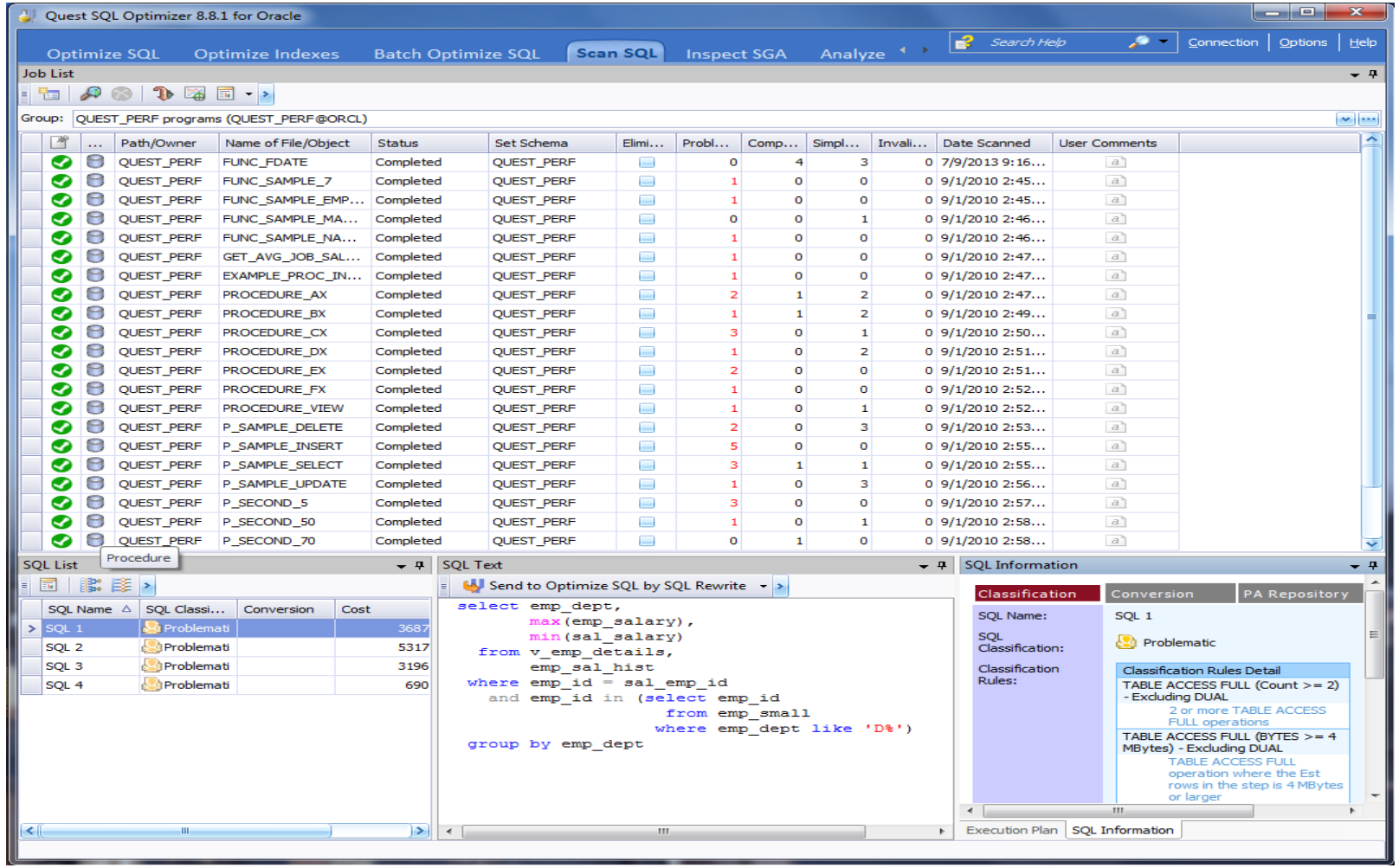
- Highly visual representation of Oracle database architecture
- Detailed diagnostics screens enable full visibility of problems, together with immediate resolution

Quest


Spotlight on RAC - sim_RVDB.xml
File View Favorites Tools Help
sim_RVDB.xml
Live connections
cl92
sim_RVDB.xml
sim_RVDB.xml DE...
sim_RVDB.xml DE...
sim_RVDB.xml DE...
All connections
Welcome to Spotlight
Interconnect and Global Status
Interconnect/GCS
I/C Load
38.5
blks/sec
Cluster Latency (ms)
0
0.55
50
Cluster Overhead
35%
Global Cache
360 MB
Cache Miss Rate
0%
Global Database
Total Users
53
Active Users
30%
Total Logical Reads
2.5E4
blks/sec
Avg CPU Load
7%
Total RAM
22.1 GB
Free RAM
22%
Instances
Balance
4%
Availability
100%
1 - 6
7 - 9
DEV101
CPU : 9%
Logical Reads
1.6E4
Sessions 7
DEV102
CPU : 5%
Logical Reads
1346
Sessions 5
DEV103
CPU : 6%
Logical Reads
41.1
Sessions 6
DEV101
CPU : 7%
Logical Reads
3019
Sessions 6
DEV102
CPU : 5%
Logical Reads
1041
Sessions 5
DEV103
CPU : 6%
Logical Reads
45.7
Sessions
IO Subsystem
ASM
Activity
0
IO/sec
Data Files
Phys Reads
445
IO/sec
Phys Writes
212
IO/sec
Single block re...
Service Time (ms)
0
4.24
20
Files
16
Tablespaces
13
Total
8.03 GB
Redo Logs
Redo Writes
33.4
IO/sec
Groups
(Avg/Max)
18/18
Size (MB)
(Avg/Max)
10/10
Archive Logs
Total Size
Minimum F
Time to fail
N/A
(if not pur
Developer mode

Performance Management – SQL Optimizer

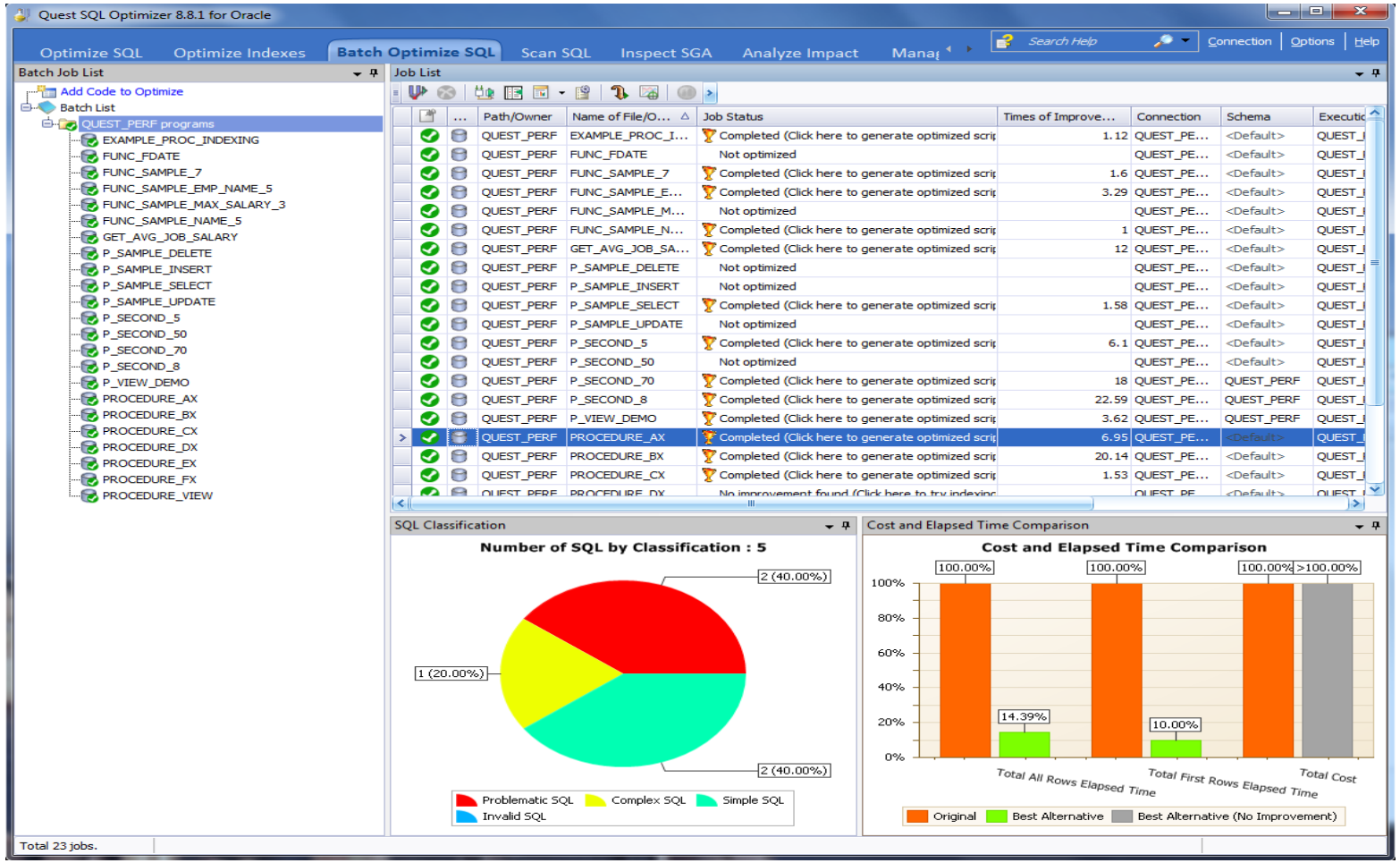
- Proactively scan, identify and classify problematic application SQL directly from the source code



Quest

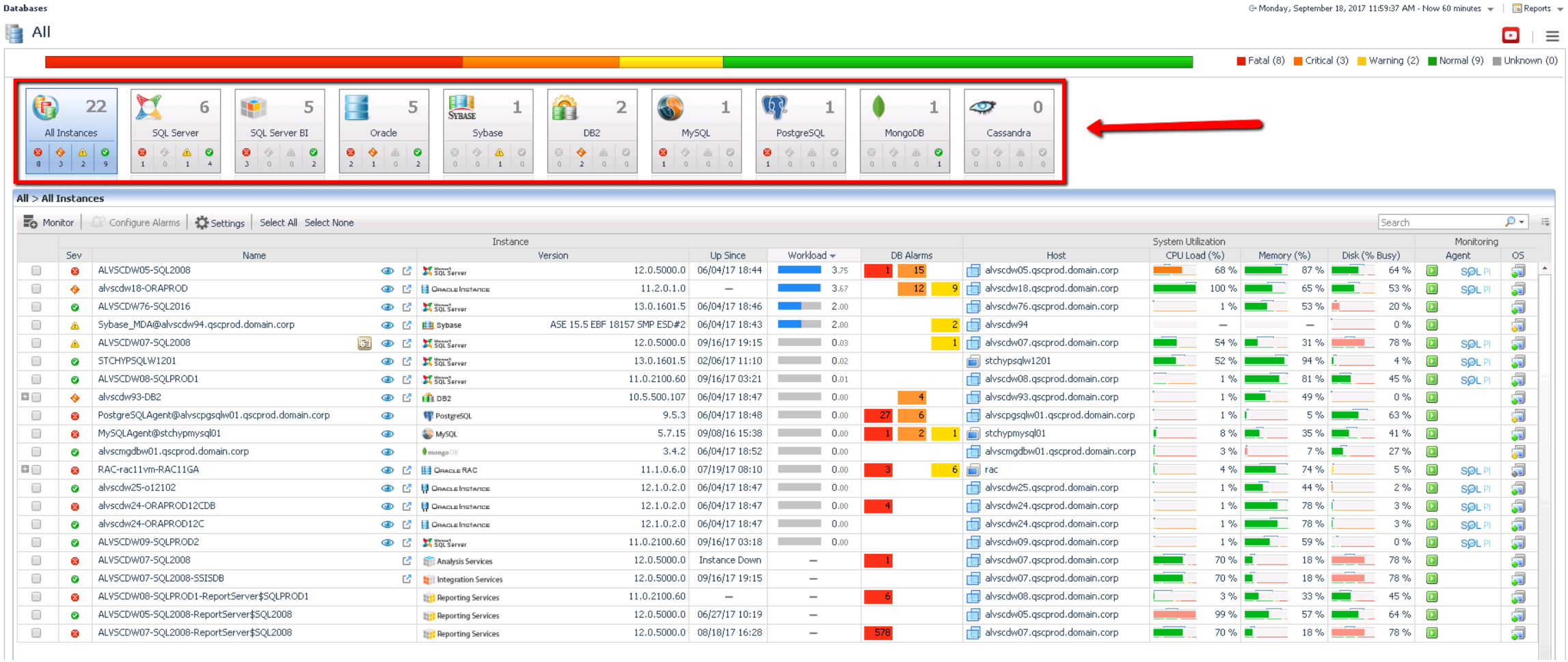
Performance Management – SQL Optimizer

- Simple and automatic re-writing of SQL statements
- Optimized code is returned directly to the Toad Editor



Quest

Foglight for Databases: Cross Platform Visibility

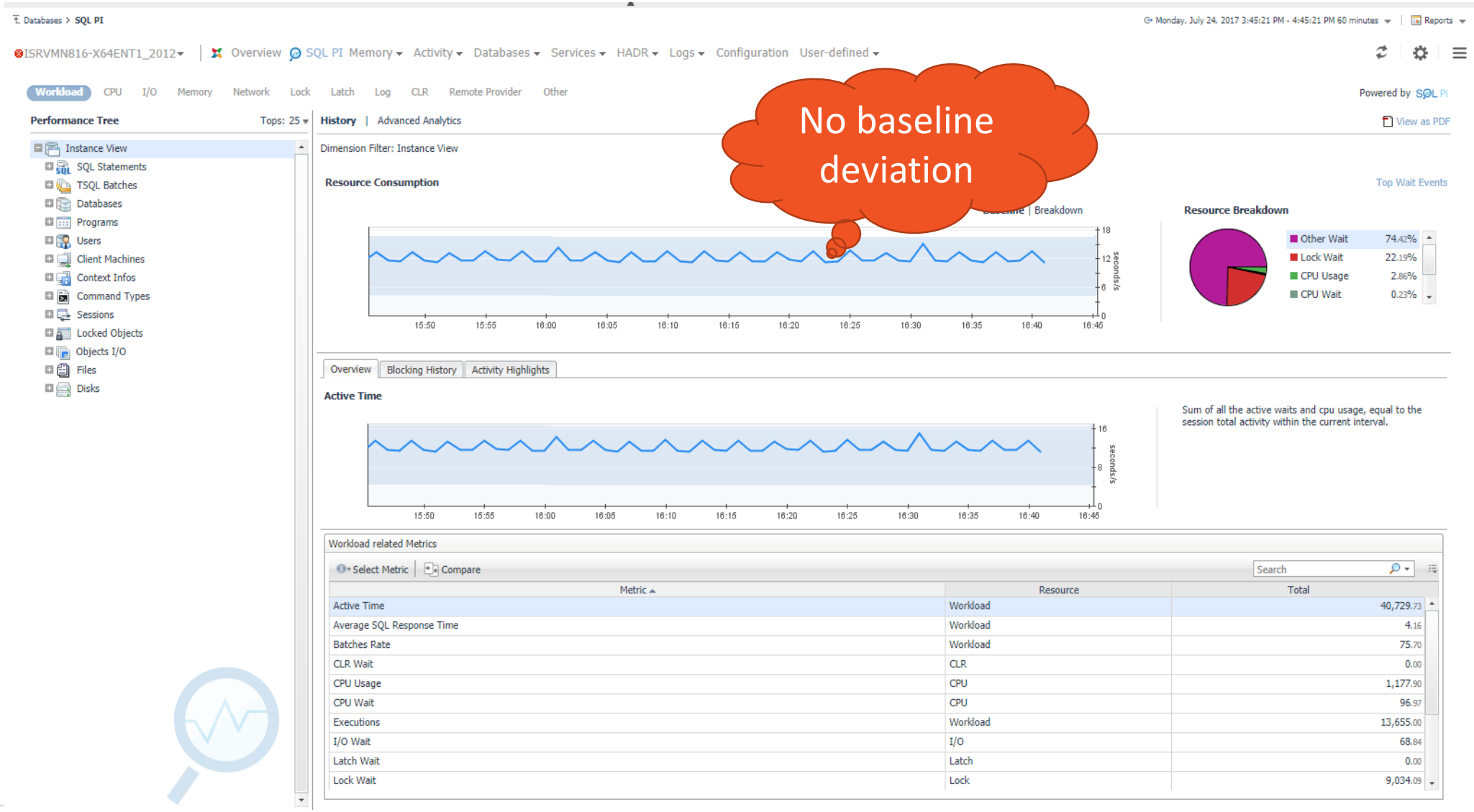


Get Performance Diagnostics Without Spending a Fortune!

- ✓ Foglight for Oracle - the Oracle Diagnostics pack alternative
- ✓ Analysis tool-set for deep visibility into database performance
- ✓ Supports all editions and configurations
- ✓ Remote (“agentless”) collector

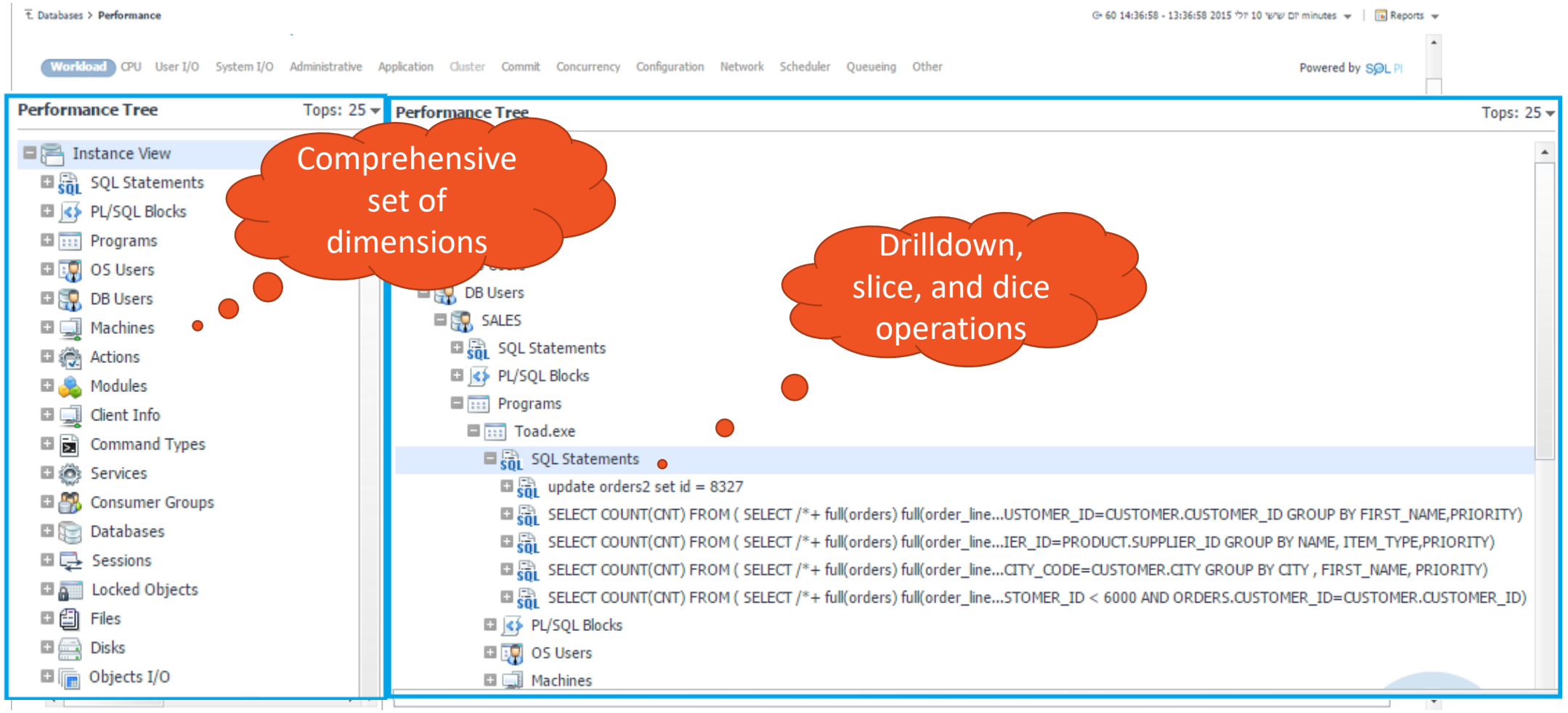
Supports all database editions and configurations!

Baseline visualization in Foglight

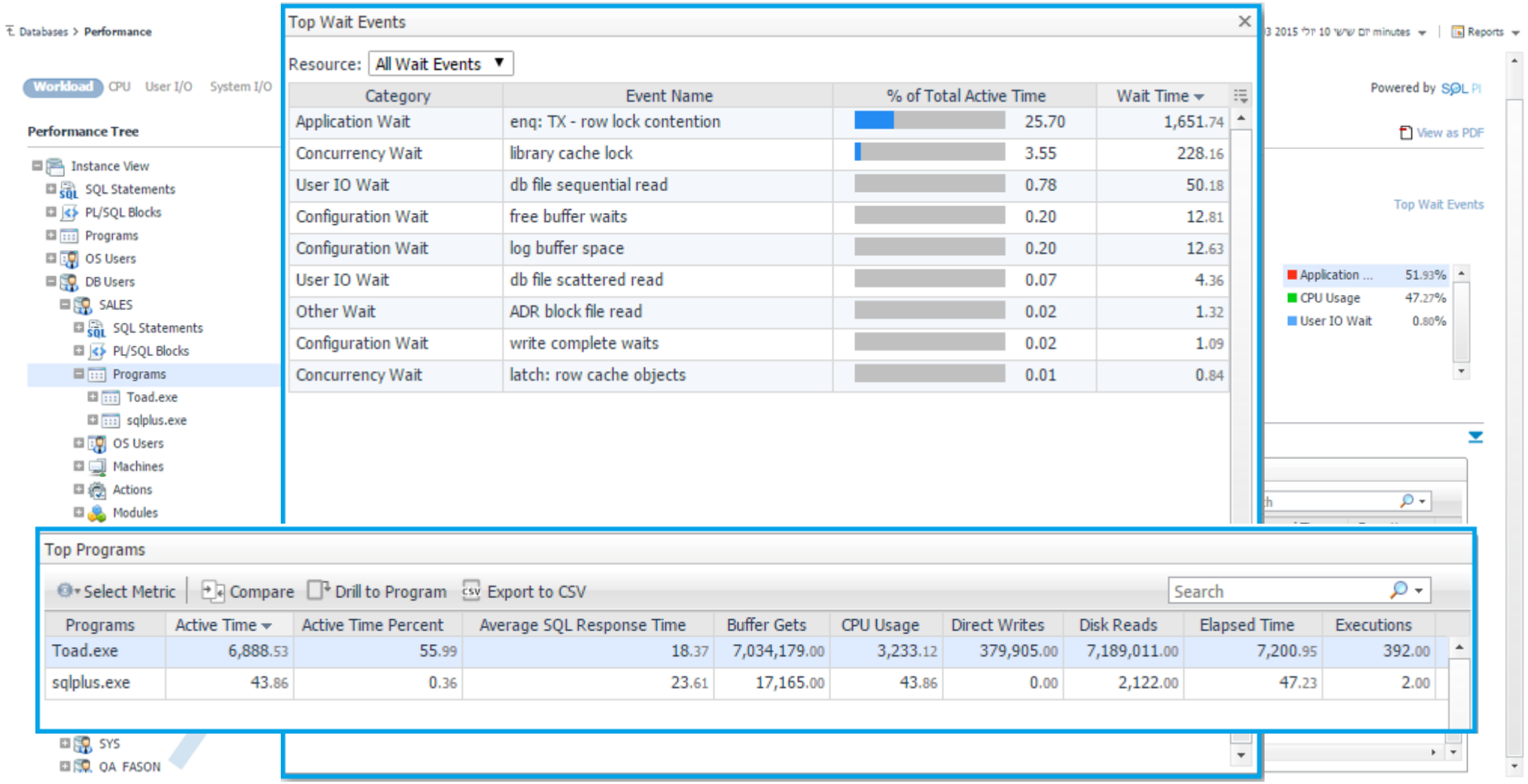


Deep-dive Multi-Dimensional workload analysis

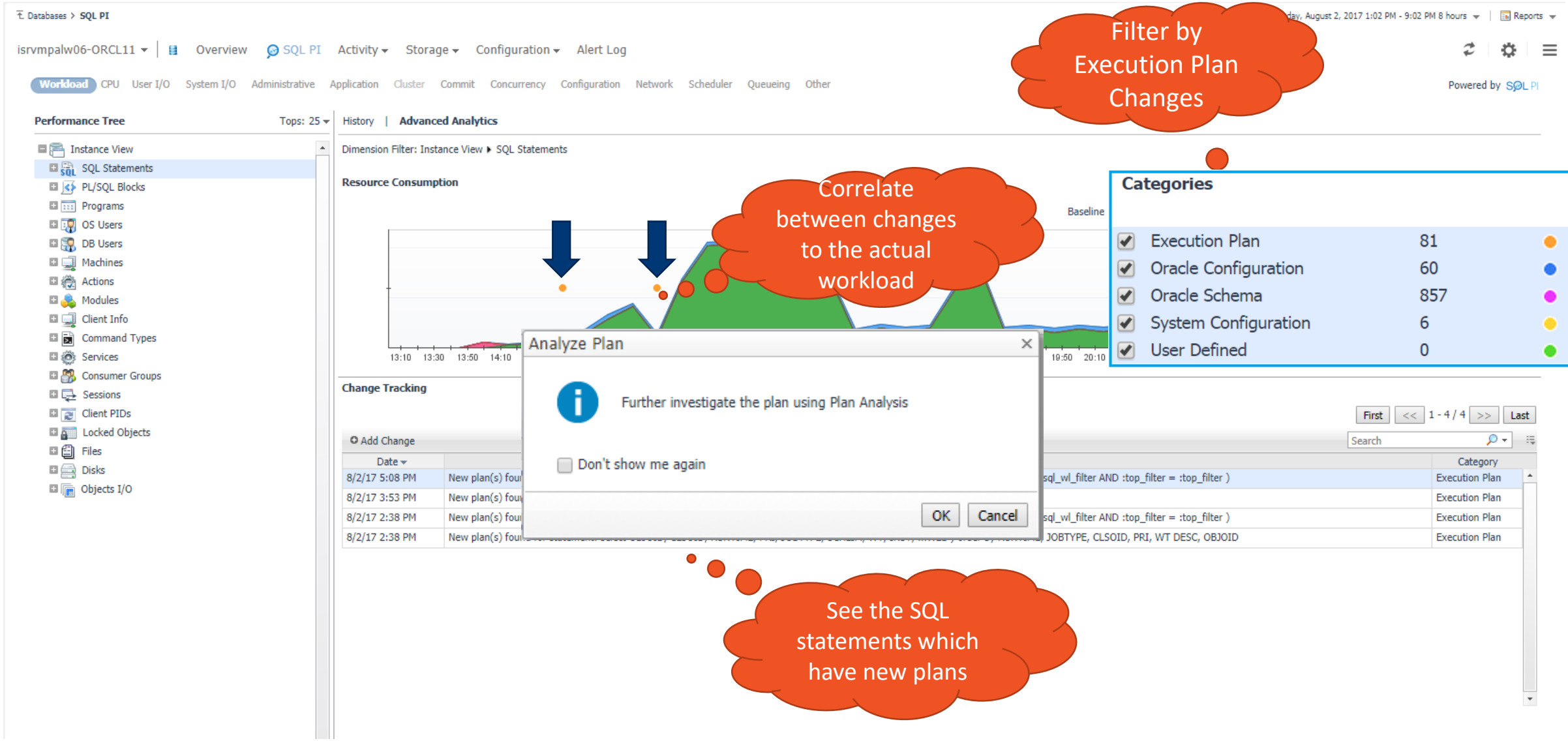
The alternative to OEM Active Session History Analytics



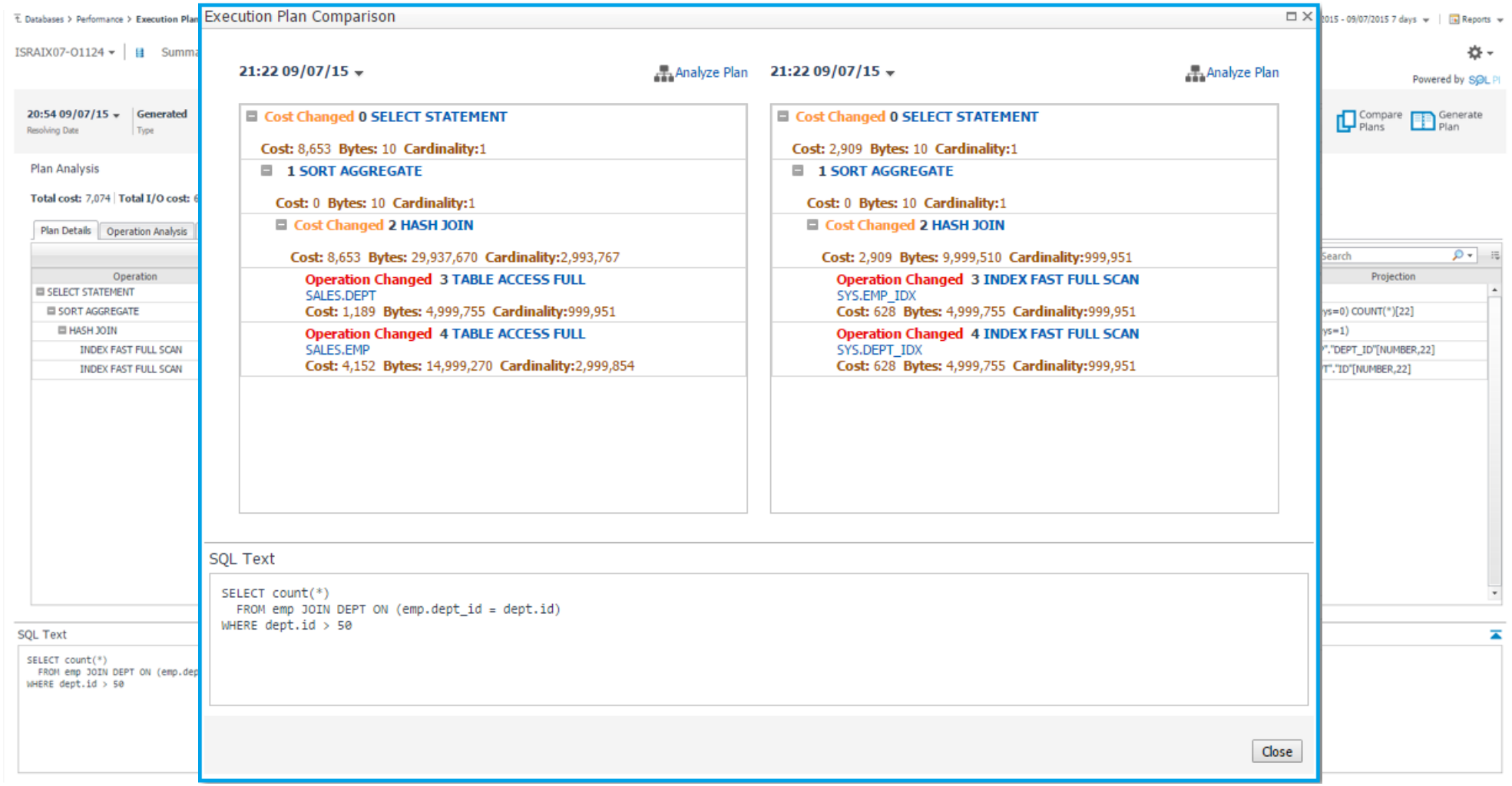
Investigate Multi-Dimensional wait-events & statistics



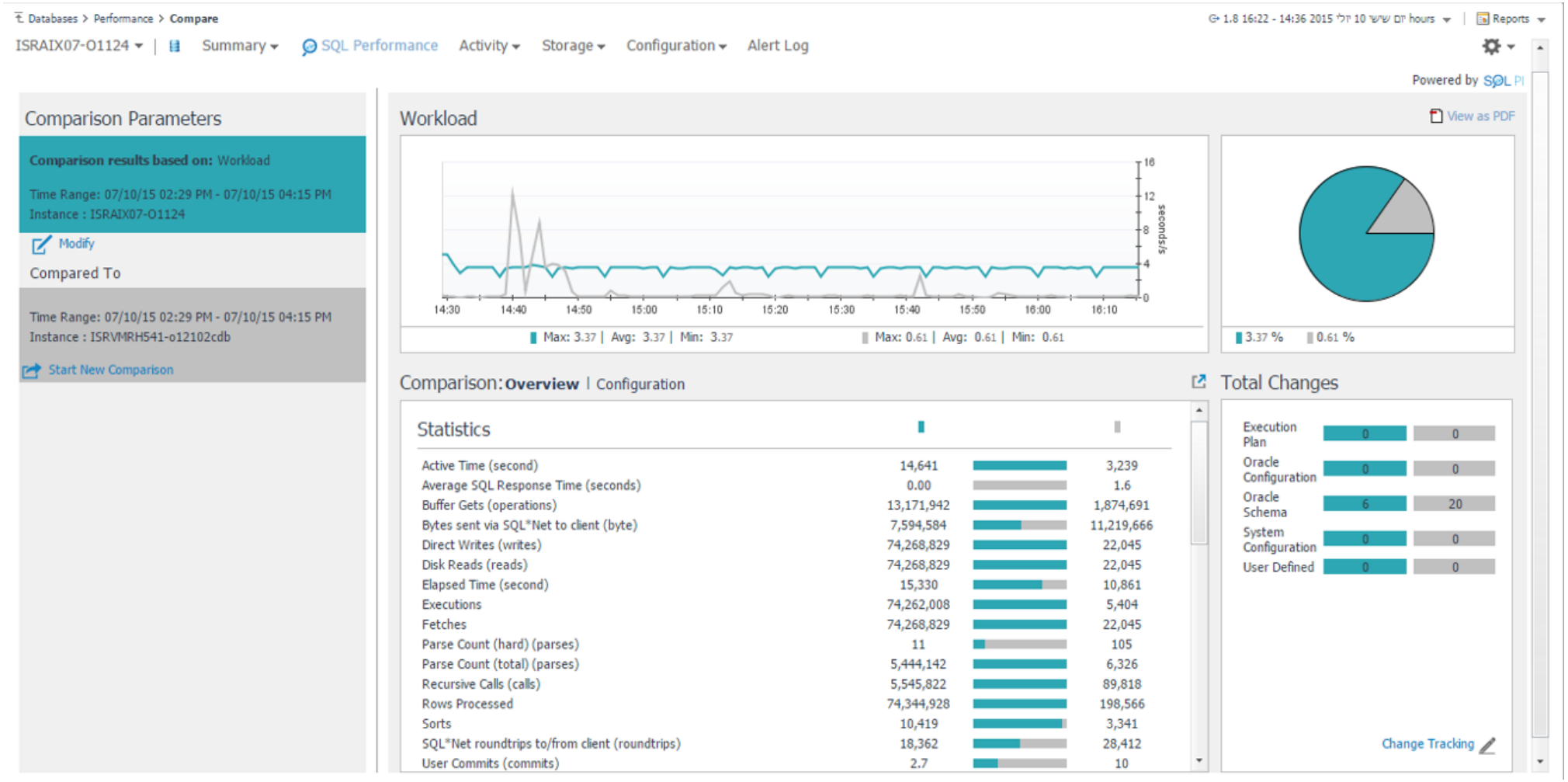
Track Changes & Correlate them with your workload



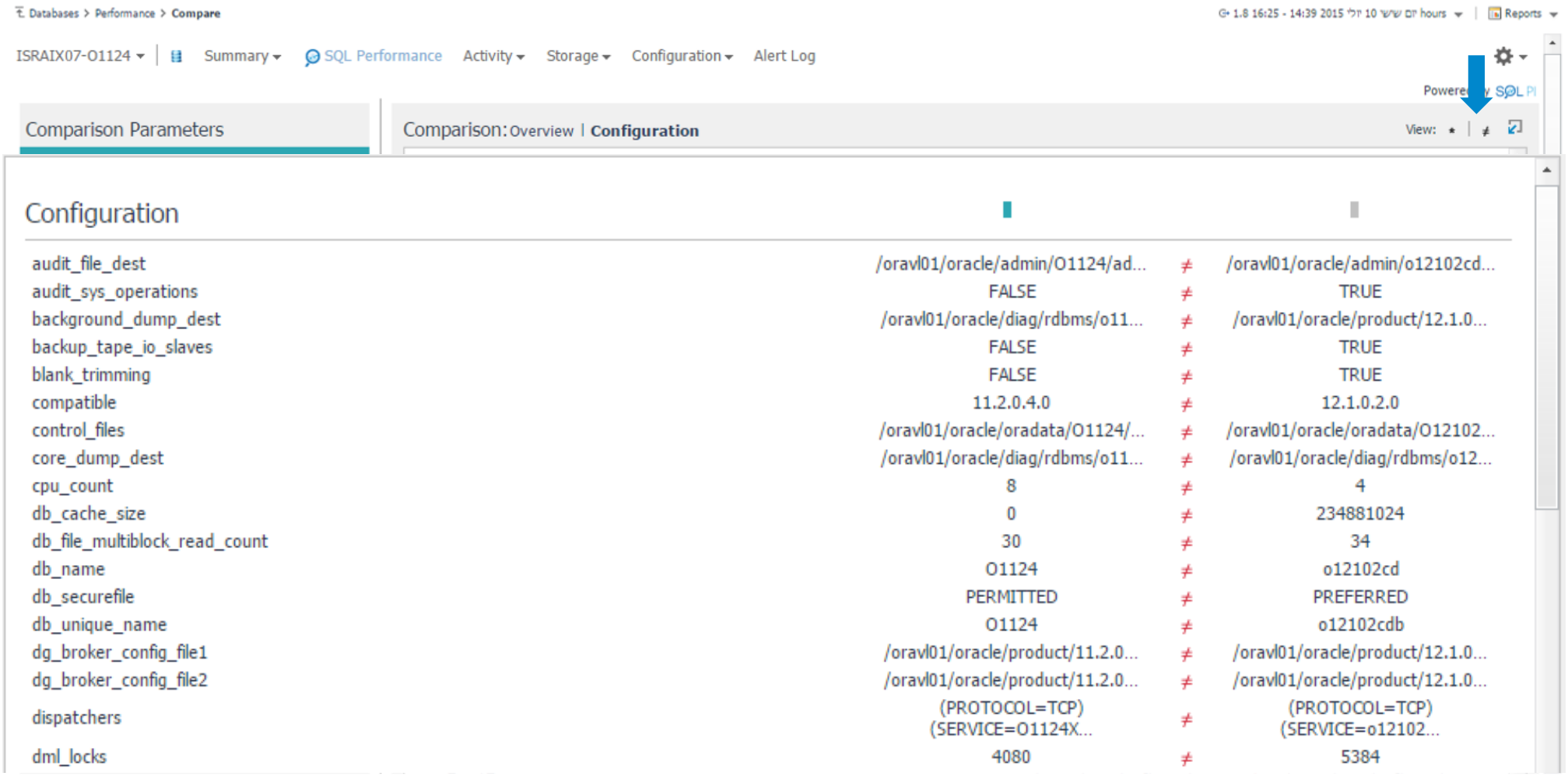
Compare between different Execution Plans



Compare different Instances or Dimensions



Compare different Instances or Dimensions



Advisories

Workload Deviation

Workload Deviation

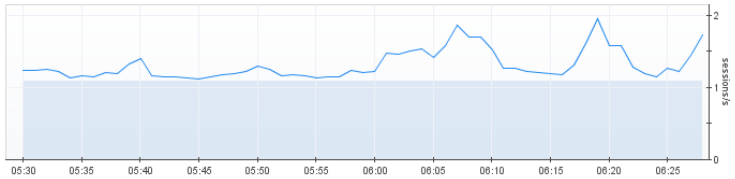
Name

Overall workload consumption exceeds the baseline

Description

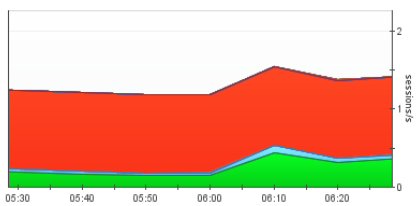
Overall, the total workload exceeded the baseline range by 11.60%. Although this deviation does not necessarily indicate a performance problem, the performance history should be reviewed. Unexpected performance changes to the system should be analyzed to determine whether the deviation detected is problematic.

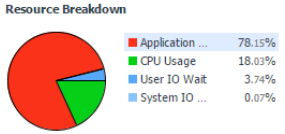
Figure 1 illustrates the total activity (workload) for the monitored Oracle instance as compared to the typical range (baseline) for the timeframe. This image provides an indication of the database system's performance during the specified timeframe, relative to a calculated baseline. Deviations outside the baseline range suggest abnormal or unexpected activity and should be investigated to determine whether they suggest a performance problem.



Additional information

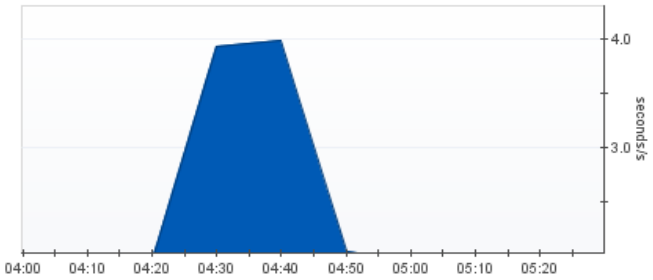
Figure 2 illustrates how each resource category contributed to the overall workload. Focusing performance tuning efforts on the largest portions of the workload should yield the most significant gains.

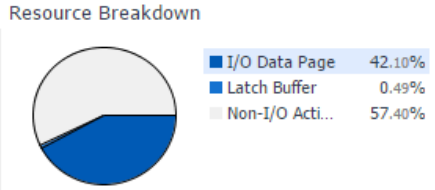




Metrics

Table 1 displays how certain key performance metric deviated during the timeframe selected. Analyzing this metric allows for a more thorough understanding of the Oracle instance's behavior:





Use the following information to determine the root cause of the I/O contention observed during the analysis period.

Table 1: Top SQL Statements producing I/O Contention

Analyze Plan | Tune SQL

SQL Statements	Number of Executions	Average Active Time (seconds)	% of Active Time	I/O Wait (%)	I/O Data Page Wait (%)
insert into #Quest_fragmented_indexes select si . name as IndexN... = @1 and si . type < > @2 order by AverageFragmentation desc	-	0.00	39.87	81.02	80.36
insert into #Dell_fragmented_indexes select si . name as IndexNa... = @1 and si . type < > @2 order by AverageFragmentation desc	-	0.00	12.86	18.81	18.41

Click on a SQL Statement to find out more about the operation of the specific statement.
Press "Analyze Plan" to see information about the execution plan of the statement.
Press "Tune" to launch SQL Tuning for the statement, maintaining database context (if it is installed).

Table2: Top missing indexes

Each SQL Server maintains a list of the indexes considered to be missing from each database. The list is updated whenever a query is executed. The table below lists indexes identified in the analyzed timeframe, which are ranked based on the relative improvement they would yield if they existed. The relative impact of each index is based on <average cost of the query(s)> * <average cost-improvement of the query(s)> * <Number of seeks+scans that could have utilized the index>.

Database	Schema	Object name	Relative Impact	Avg User Impact (%)	Avg Cost	User Seeks	User Scans	Last Noticed Missing	Statement
SpotlightPlaybackDatabase_batchen	dbo	spotlight_playback_alarms	88,268.17	15.04	167.68	35.00	0.00	2/9/17 2:20 AM	CREATE INDEX missi...
SpotlightPlaybackDatabase_batchen	dbo	spotlight_playback_alarms	87,798.66	14.96	167.68	35.00	0.00	2/9/17 2:20 AM	CREATE INDEX missi...

Click on the statement to get the full command for creating the index.
Note: Adding indexes adds overhead of maintaining that index. Before creating an index, ensure the overhead is negligible compared to the improvement. You can use the Database Tuning Advisor (DTA) for that.

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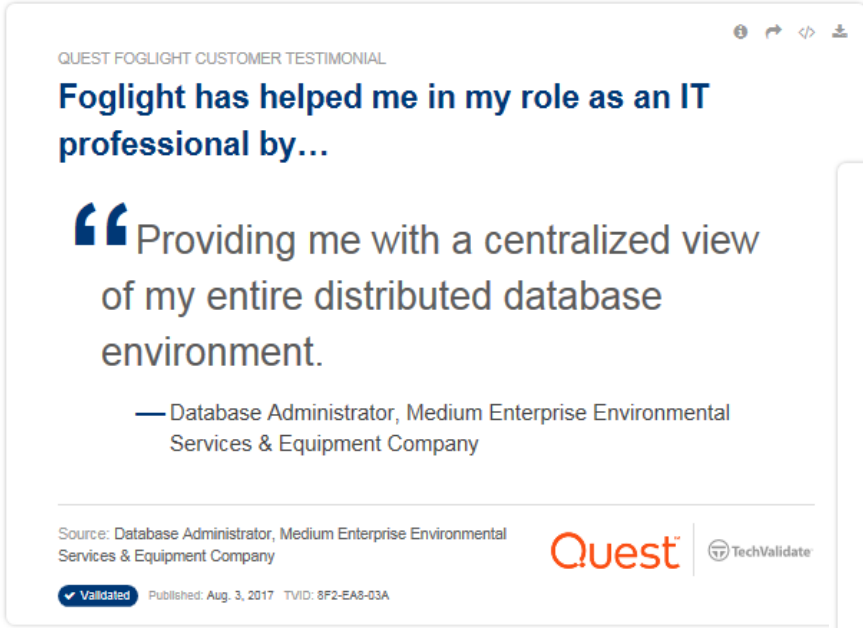
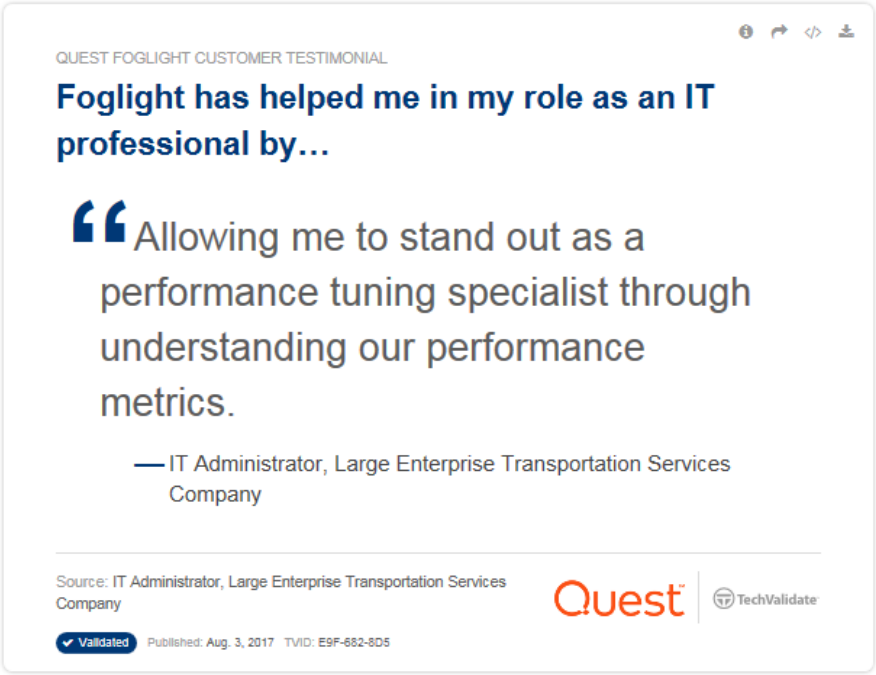
What our customers say?





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Additional Resources

Foglight for Oracle Website

https://www.quest.com/products/foglight-for-oracle/

Foglight for Oracle Product Overview Video

https://youtu.be/J9olUZx3YaQ

Questions?

Thank you

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