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NoCOUG Winter Conference

Feb 14, 2006

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Performance Diagnosis Usage Model in Oracle Database 10g

Agenda

- Oracle DB 10g Performance Monitoring and Diagnostics: Architecture
- Automatic Database Diagnostic Monitor (ADDM)
- Performance Diagnosis: Usage Model
- Best Practices (* time permitting)

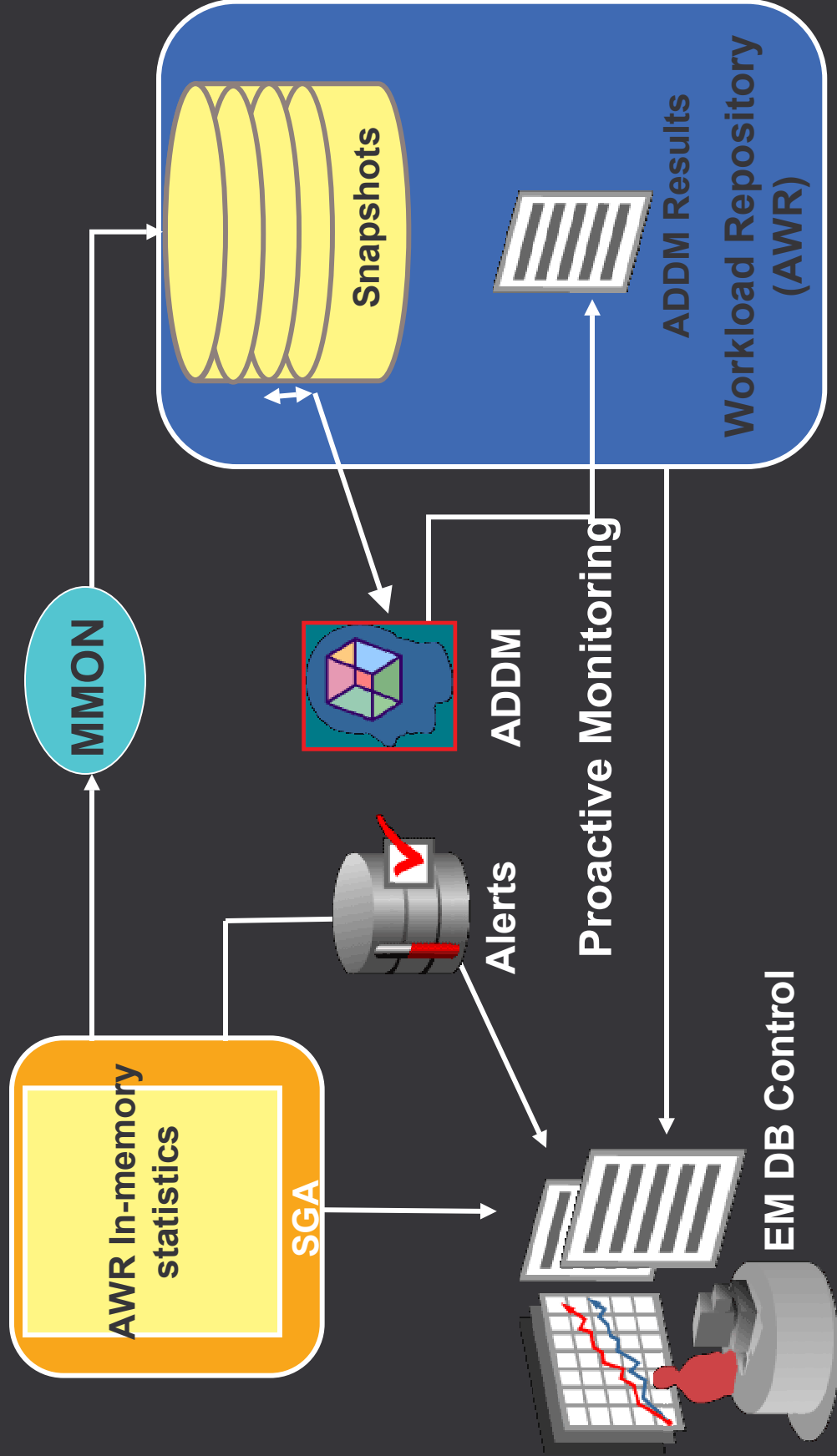
Performance Diagnosis – Life Before Oracle 10g

- Performance Diagnosis & Tuning is Complex
- Diagnosis often requires additional data capture
- Data overload rather than information
- Database wide view of operations is lacking
- Misguided tuning efforts waste time & money

Oracle DB 10g Performance Monitoring and Diagnostics: Architecture

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Performance Monitoring and Diagnostics: Architecture

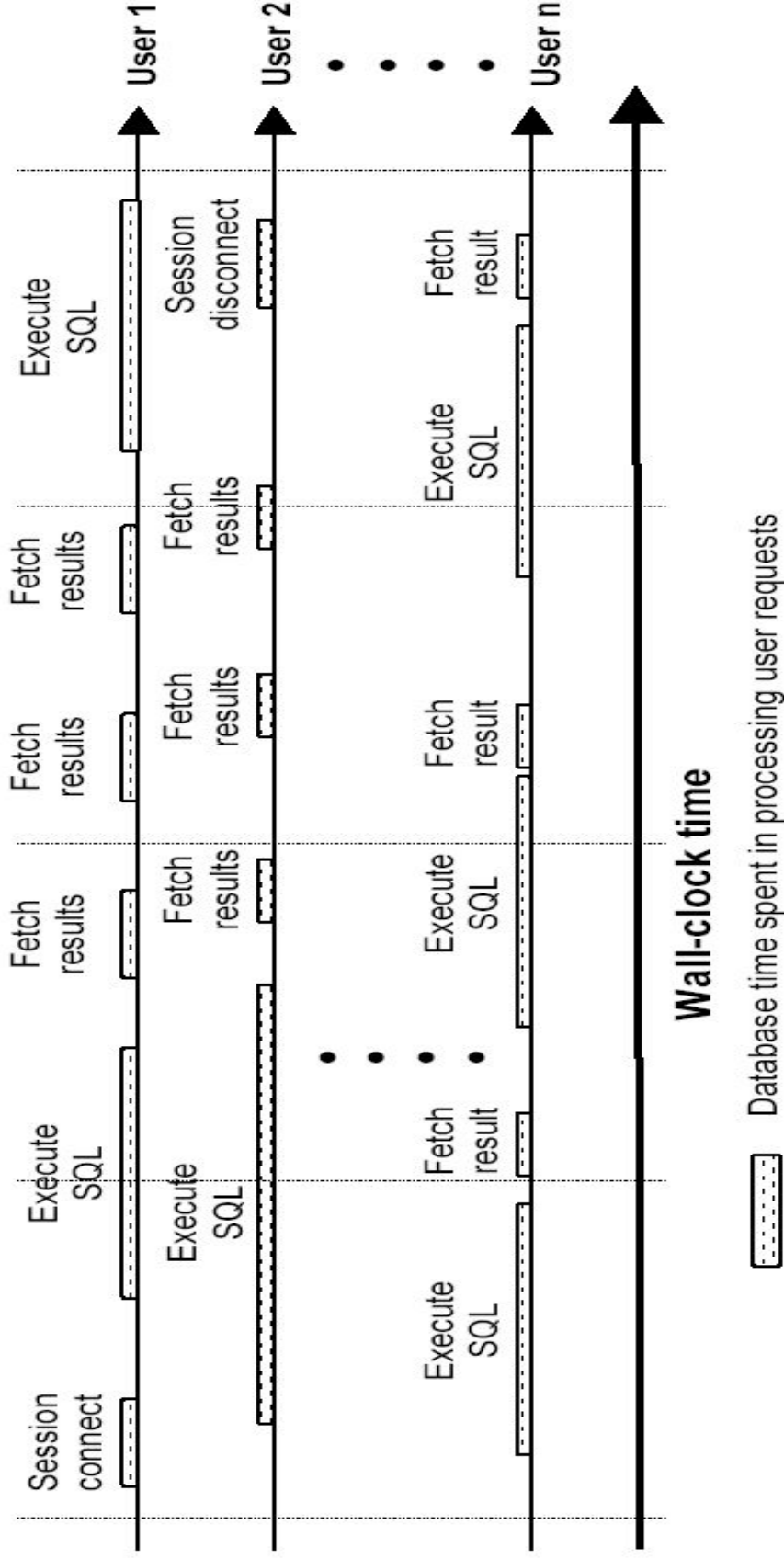


Reactive Monitoring

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AWR and In Memory Statistics

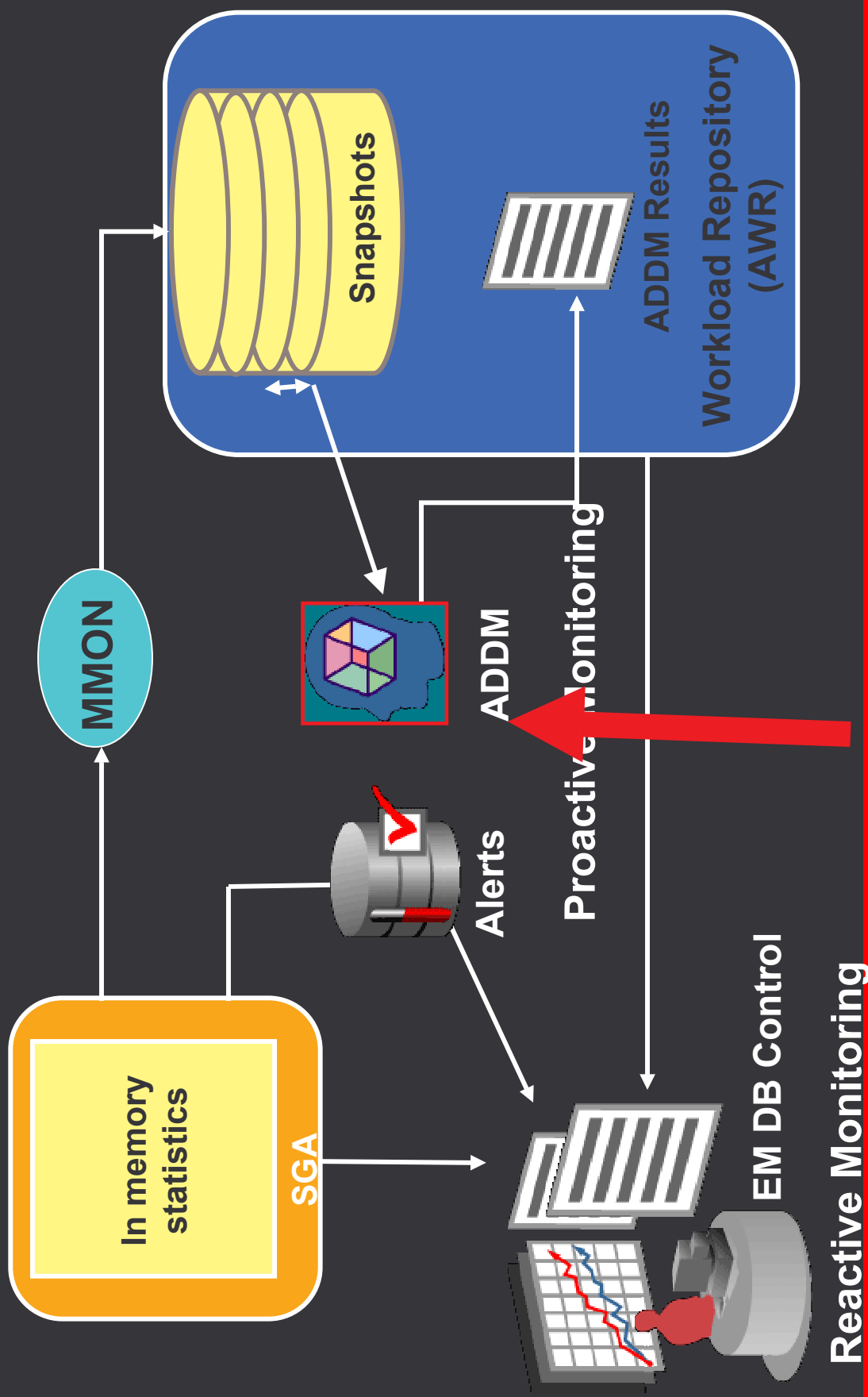
- OOW 2005 Session: Oracle DB 10g Self-Management Framework Internals: Exploring the AWR: Will be posted on OTN shortly
- AWR
 - a.k.a. STATSPACK++, Efficient, Space automatically managed, Snapshot every 1 hr
 - Foundation for Self-Learning and Managing DB
 - Various Statistics: Base, SQL, Metrics, OS Stats, ASH, etc.
- Enhanced Time and Wait Model
 - Enables Tracking Components through Common Currency “Time” , *DB Time*
 - Events (800+) Classified into 12 Solution Areas
- Active Session History
 - Sampled History of all Active Sessions (analogous to V\$SESSION_WAIT sampling)



1. Total DB Time = Sum of Time Spent Processing All User Requests
 = Sum of Time (Running on CPU + Waiting for Resources)

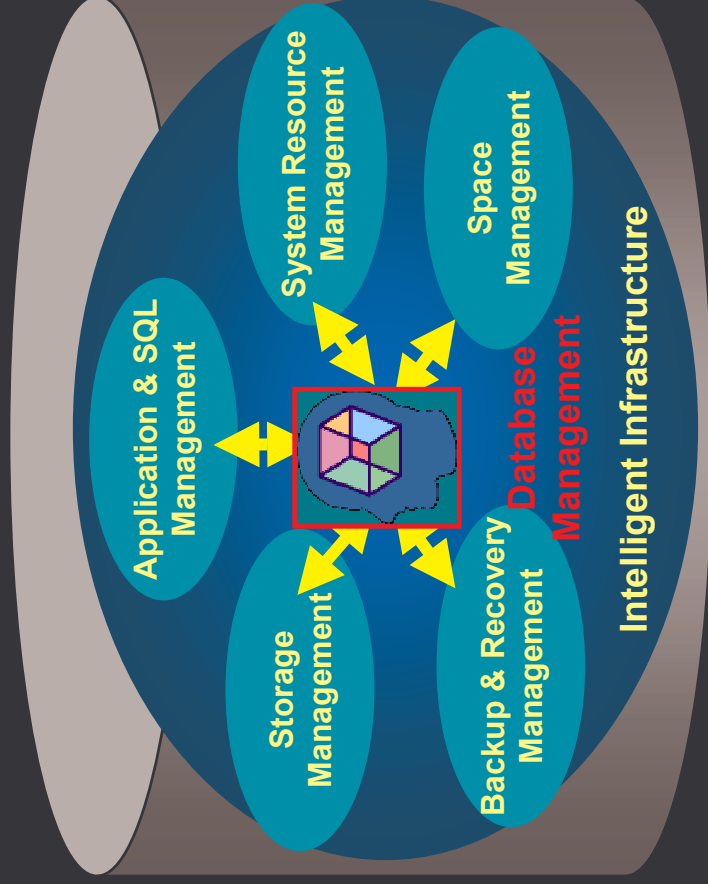
2. DB Time/Sec (Avg. Active Sessions) = Total DB Time / Wall Clock Time

Performance Monitoring and Diagnostics: Architecture

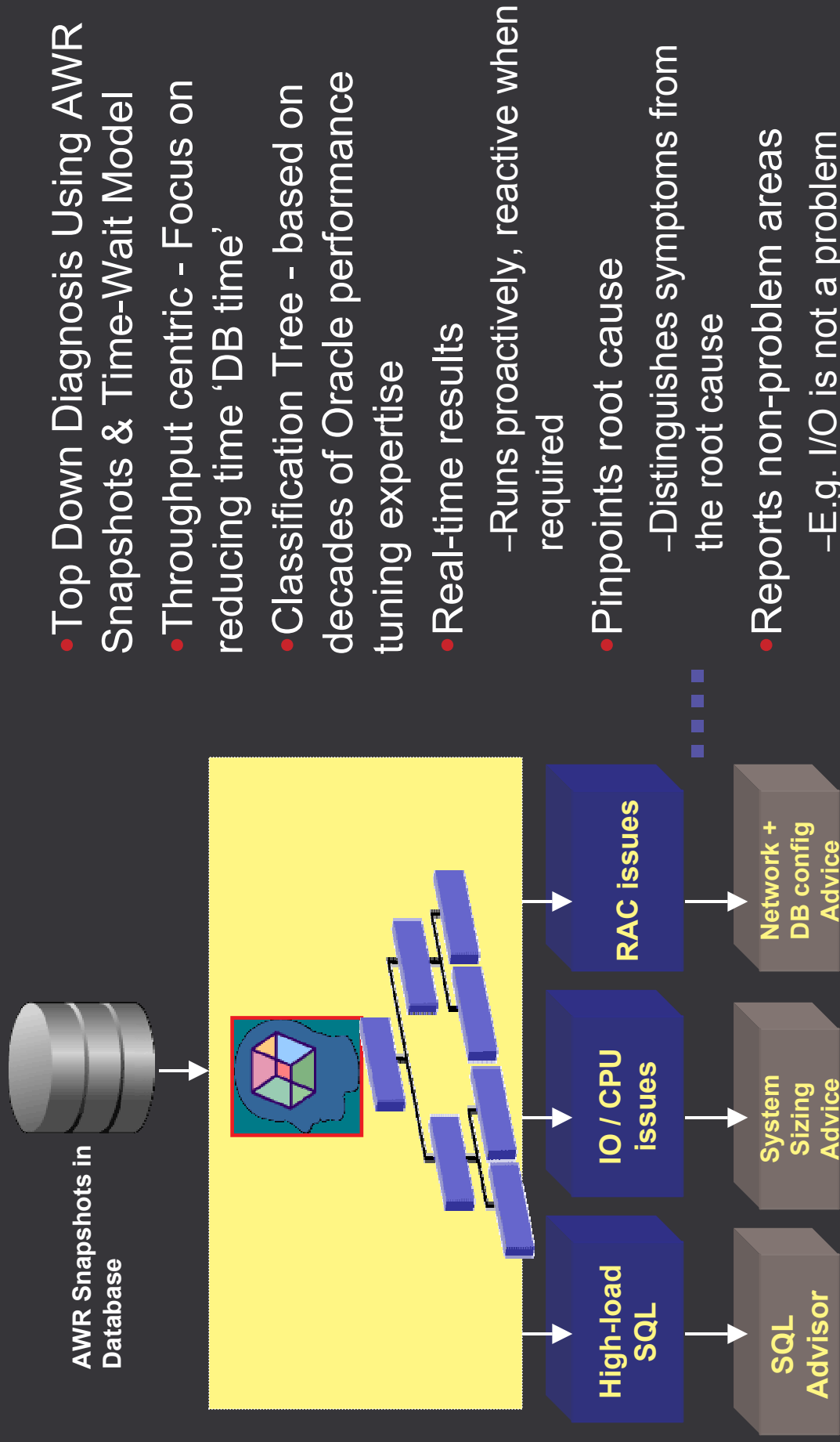


Automatic Database Diagnostic Monitor (ADDM)

- Integrates all DB components together: DB Time Currency
- Automatic database-wide performance diagnostic, including RAC, Streams...
- Emphasis on Root Cause Analysis vs. Symptoms
- Provides impact and benefit analysis
- ADDM gives recommendations in context of workload running on your system

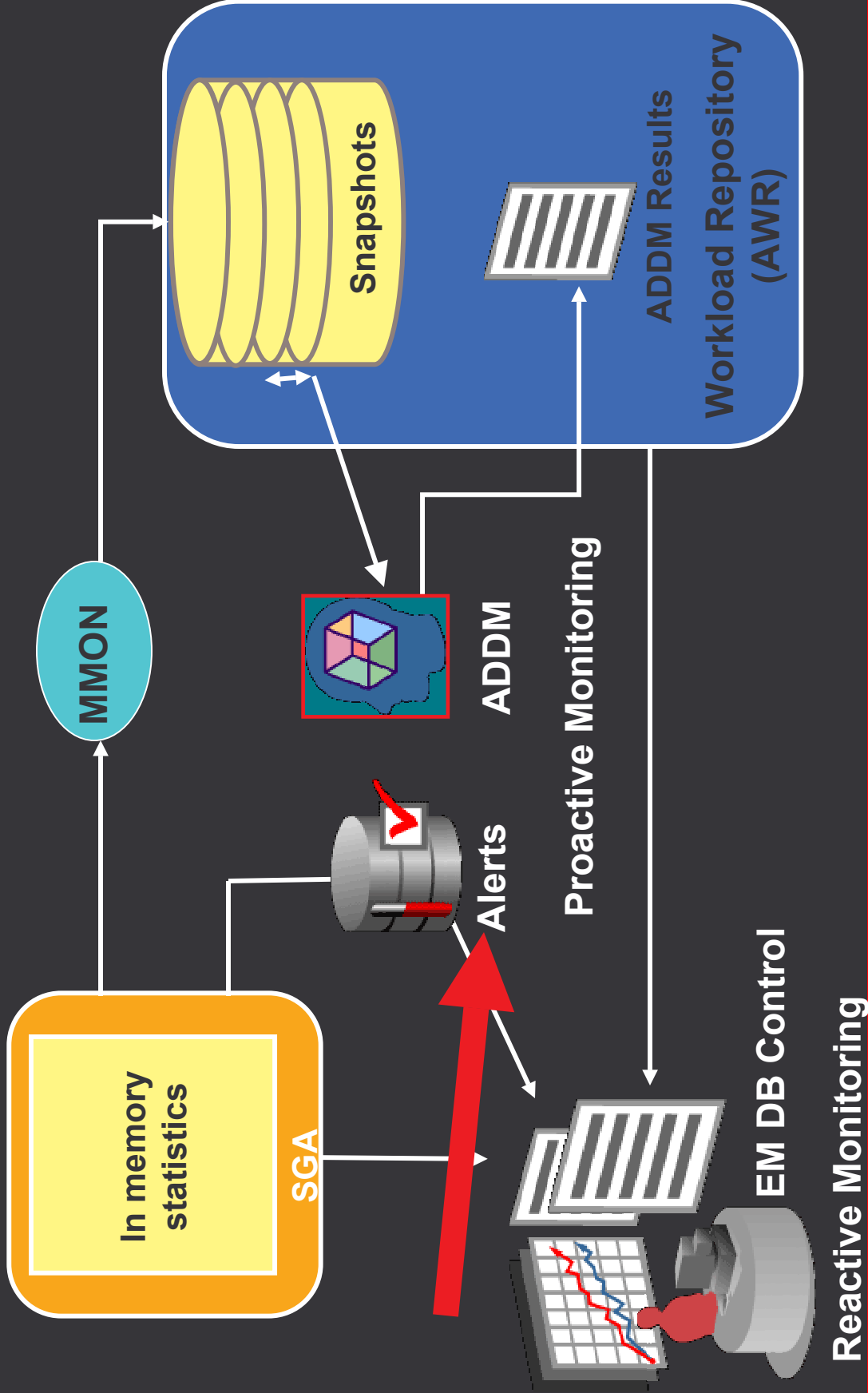


ADDM's Architecture



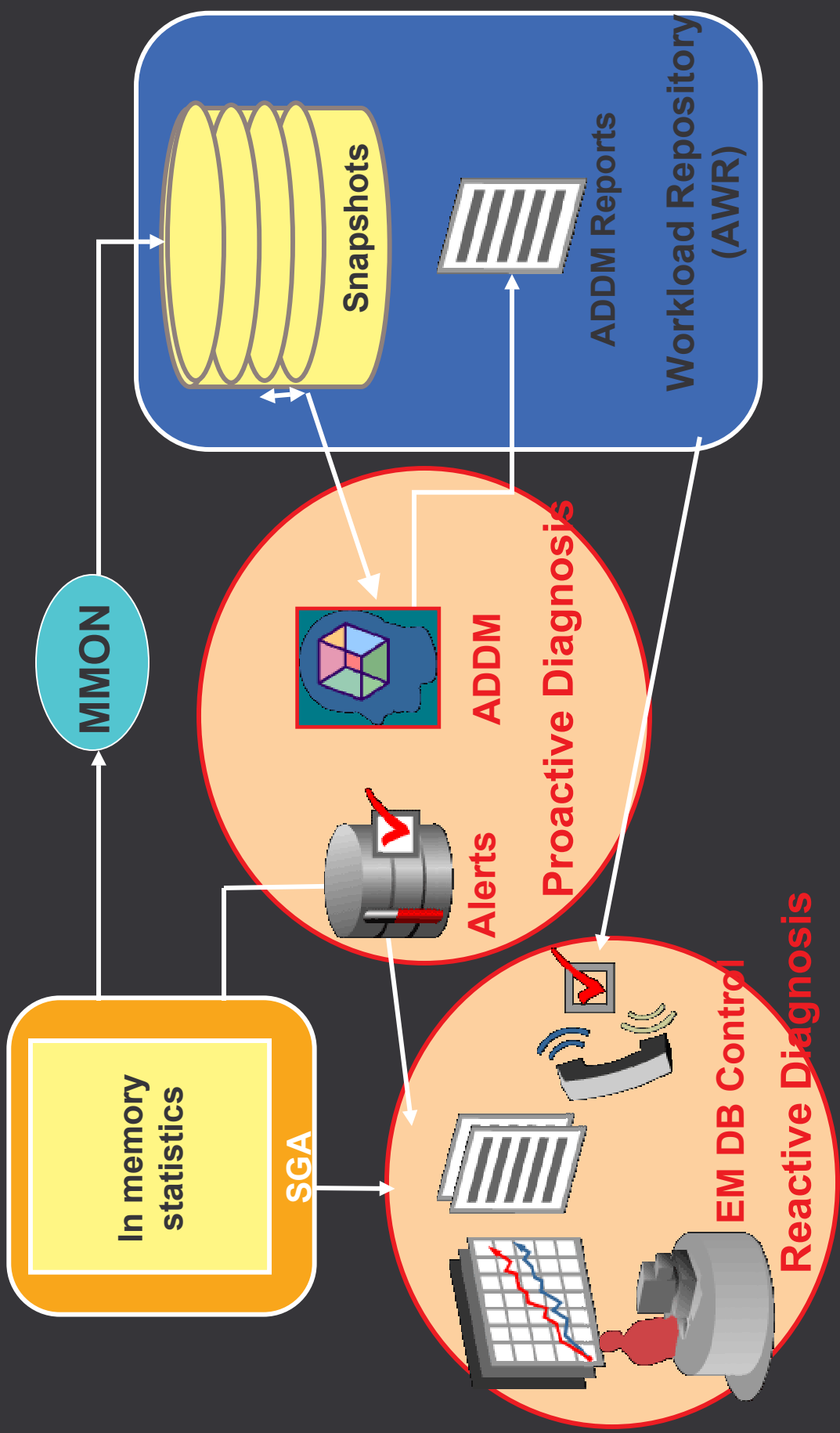
- Top Down Diagnosis Using AWR Snapshots & Time-Wait Model
- Throughput centric - Focus on reducing time 'DB time'
- Classification Tree - based on decades of Oracle performance tuning expertise
- Real-time results
 - Runs proactively, reactive when required
- Pinpoints root cause
 - Distinguishes symptoms from the root cause
- Reports non-problem areas
 - E.g. I/O is not a problem

Performance Monitoring and Diagnostics: Architecture

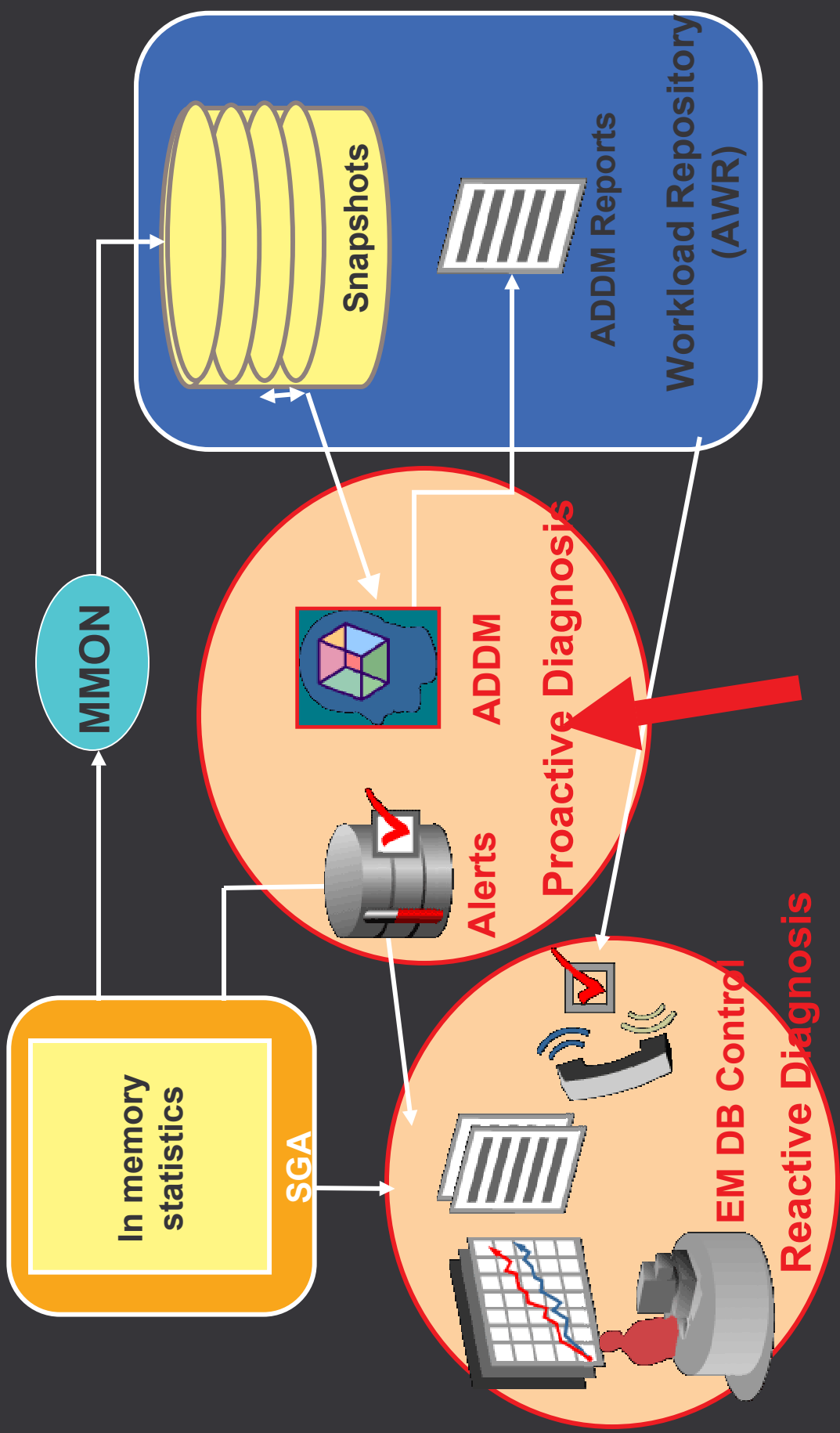


Performance Diagnosis: Usage Model

Performance Diagnosis: Usage Model



Performance Diagnosis: Usage Model



Proactive Performance Diagnosis

- Database performs proactive diagnosis periodically
 - ADDM findings are stored in Advisory Framework
 - Enables historical performance analysis
 - Can be invoked manually
- EM Interface provides guided problem resolution

Proactive Performance Diagnosis

ORACLE Enterprise Manager 10g Database Control

Setup Preferences Help Logout Database

Database Home Page

Logged in As SYS

Database Instance: database

Home Performance Administration Maintenance

Page Refreshed May 9, 2005 5:14:04 PM [Refresh](#) [View Data](#) Automatically (60 sec) ▾

General

[Shutdown](#)

Status [Up](#)
Up Since **Apr 28, 2005 10:40:41 PM PDT**
Instance Name **sr2e**
Version **10.2.0.0.0**
Host [stacs36.us.oracle.com](#)
Listener [LISTENER_stacs36.us.oracle.com](#)

Host CPU

Category	Value
Other	~50%
sr2e	~50%

Load [1.71](#) Paging [0.00](#)

Active Sessions

Category	Value
Wait	~1.5
User	~1.0
I/O	~0.5
CPU	~0.5

Maximum CPU 2

SQL Response Time

Category	Value
SQL	~25
Response Time (%)	~25

[Reset Baseline](#)

Diagnostic Summary

[view All Properties](#)

ADDM Findings	2
Period Start Time	May 9, 2005 5:00:06 PM
All Policy Violations	222
Alert Log	May 9, 2005 12:26:44 PM

Space Summary

Database Size (GB)	20.708
Problem Tablespace	1
Segment Advisor Recommendations	Details
Space Violations	217
Dump Area Used (%)	60

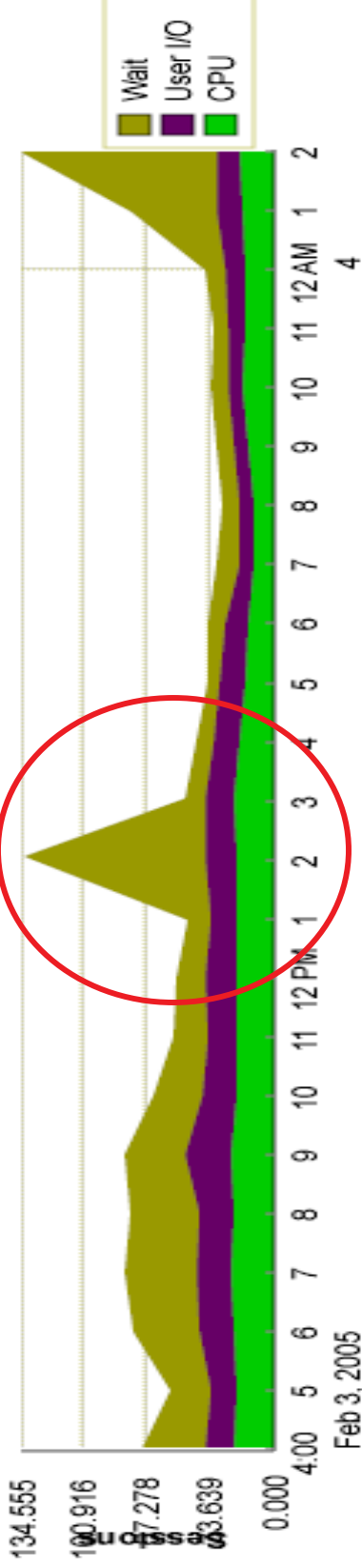
High Availability

Instance Recovery Time (sec)	23
Last Backup	n/a
Flashback Logging	Disabled

Database Activity

Create ADDM Task

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



Real-Life Example: ADDM identified the problem around noon

Performance Analysis

Task Name **ADDM:31772662_3_363**

Database Time (minutes) **8,165.33** Period Start Time **Feb 3, 2005 1:00:26 PM** Period Duration (minutes) **63.2**

Task Owner **SYS** Average Active Sessions **129.2**

View Snapshots

View Report

Impact (%)	Finding	Recommendations
98.7	SQL statements consuming significant database time were found.	2 SQL Tuning
49.92	Wait event "row cache lock" in wait class "Concurrency" was consuming significant database time.	3 Application Analysis
49.34	Sequence cache misses were consuming significant database time.	1 Application Analysis

Proactive Performance Diagnosis

Cluster: crs_qlsap > Cluster Database: GSIAP_US_ORACLE.COM > Cluster Database Instance: GSI3AP_AGSIDBS3 > Advisor Central > Automatic Database Diagnostic Monitor (ADDM) > Performance Finding Details

Logged in As GWOOD

Performance Finding Details

Database Time (minutes) **8,165.33** Period Start Time **Feb 3, 2005 1:00:26 PM** Period Duration (minutes) **63.2**
Task Owner **SYS** Task Name **ADDM:31772662_3_363** Average Active Sessions **129.2**

Finding **SQL statements consuming significant database time were found.**

Impact (minutes) **8,059.1**
Impact (%) **98.7**

Recommendations

...the offending SQL statement.

Select Item(s) and...

Select All | [Select None](#) | [Show All Details](#) | [Hide All Details](#)

Select	Details	Category	Benefit (%) ▾
<input checked="" type="checkbox"/>	Hide	SQL Tuning	49.35
SQL ID 8bicca4mhhdhd			
Action Tune the PL/SQL block with SQL_ID "8bicca4mhhdhd" . Refer to the "Tuning PL/SQL Applications" chapter of Oracle's "PL/SQL User's Guide and Reference"			
<input checked="" type="checkbox"/>	Hide	SQL Tuning	49.35
SQL Text SELECT WWSEC RNDM SEQ.NEXTVAL FROM DUAL			
Action Run SQL Tuning Advisor on the SQL statement with SQL_ID "7mpw3hrfy54s" . Run Advisor Now			

Proactive Performance Diagnosis

View Sequence: SSOSDK.WWSEC_RNDM_SEQ

Edit OK

General

Name **WWSEC_RNDM_SEQ**

Schema **SSOSDK**

Type **Ascending**

Values

Maximum **Unlimited**

Minimum **1**

Interval **1**

Last Number **1723385**

Cache

No Cache

Root Cause of the problem...

Reactive Performance Diagnosis

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Reactive Performance Diagnosis

- Perform General Manual Analysis
 - React to an alert or validate tuning action
 - Use EM Perf. Page drill-downs

Reactive Performance Diagnosis

- Perform General Manual Analysis
 - React to an alert or validate tuning action
 - Use EM Perf. Page drill-downs
- Diagnosing Transient or Targeted problems
 - Transient performance analysis (few min.)
 - Targeted Analysis: Time, session, module, SQL , etc. or their combination
 - Use ASH report

Reactive Performance Diagnosis

- Perform General Manual Analysis
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 - Use ASH report
- Diagnosing problems due to db workload or configuration changes
 - Compare Performance to “Baseline”
 - Use Compare Periods Report

Reactive Performance Diagnosis

- Perform General Manual Analysis
 - React to an alert or validate tuning action
 - Use EM Perf. Page drill-downs
- Diagnosing Transient or Targeted problems
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 - Targeted Analysis: Time, session, module, SQL , etc. or their combination
 - Use ASH report
- Diagnosing problems due to db workload or configuration changes
 - Compare Performance to “Baseline”
 - Use Compare Periods Report
- Diagnosing Slow Moving / Hung databases
 - Use EM Memory Access Mode

Reactive Perf. Diagnosis: EM Drill-Down

ORACLE Enterprise Manager 10g Database Control

Setup Preferences Help Logout Database

Database Instance: database

Home Performance Administration Maintenance

Page Refreshed May 10, 2005 5:04:29 PM (Refresh) View Data Automatically (60 sec)

Logged in As SYS

Database Home Page

6 **General** Shut down

Status **Up**

Up Since **Apr 28, 2005 10:40:41 PM PDT**

Instance Name **sr2e**

Version **10.2.0.0.0**

Host **stacs36.us.oracle.com**

Listener **LISTENER_stacs36.us.oracle.com**

[View All Properties](#)

1 **Host CPU**

Other: 8.9%
sr2e: 6.7%
User I/O: 4.4%
CPU: 2.2%

2 **Active Sessions**

Wait: 132%
SQL: 99%
Response: 66%
Time (%): 33%

3 **SQL Response Time**

Wait: 132%
SQL: 99%
Response: 66%
Time (%): 33%

Load **9.99** Paging **0.00** Maximum CPU **2** Reset Baseline

Diagnostic Summary **4**

ADDM Findings **3**

Period Start Time **May 10, 2005 4:50:43 PM**

All Policy Violations **222**

Alert Log **May 6, 2005 12:26:44 PM**

Space Summary

Database Size (GB) **20.71**

Problem Tablespaces **1**

Segment Advisor **Details**

Recommendations **217**

Space Violations **60**

Dump Area Used (%) **60**

High Availability

Instance Recovery Time (sec) **28**

Last Backup **n/a**

Flashback Logging **Disabled**

Alerts

Category	All	Go	Critical	Warning	Alert Triggered
5 Tablespaces Full	1		1	7	Message
Tablespaces Used (%)	Tablespace USERS is 96 percent full				
	May 5, 2005 1:19:22 PM				

Reactive Perf. Diagnosis: EM Drill-Down

ORACLE Enterprise Manager 10g Database Control

Setup Preferences Help Logout Database

Database Instance: database

Home Performance Administration Maintenance

Page Refreshed May 10, 2005 5:04:29 PM (Refresh) View Data Automatically (60 sec)

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Database Home Page

6 [General](#) [Shut down](#)

Status **Up**
Up Since **Apr 28, 2005 10:40:41 PM PDT**
Instance Name **sr2e**
Version **10.2.0.0.0**
Host **stacs36.us.oracle.com**
Listener **LISTENER_stacs36.us.oracle.com**

[View All Properties](#)

1 **Host CPU**

Category	Value
Other	8.9
sr2e	6.7
User I/O	4.4
CPU	2.2

Load **9.99** Paging **0.00** Maximum CPU **2**

2 **Active Sessions**

Category	Value
SQL	132%
Response Time	99
Time (%)	66

3 **SQL Response Time**

4 **Diagnostic Summary**

Category	Count	Details
ADDM Findings	3	
Period Start Time		May 10, 2005 4:50:43 PM
All Policy Violations	222	
Alert Log		May 6, 2005 12:26:44 PM

5 **Alerts**

Category	All	Critical	Warning	Message
Alert Triggered		1	7	

Space Summary

Category	Value
Database Size (GB)	20.71
Problem Tablespaces	1
Segment Advisor	Details
Recommendations	217
Space Violations	60
Dump Area Used (%)	60

Space Summary

Category	Value
Instance Recovery Time (sec)	28
Last Backup	n/a
Flashback Logging	Disabled

6 **Alerts**

Category	Name	Message
Tablespaces Full	Tablespace Space Used (%)	Tablespace USERS is 96 percent full

Alert Triggered: May 5, 2005 1:19:22 PM

Reactive Perf. Diagnosis: EM Drill-Down

ORACLE Enterprise Manager 10g Database Control

Setup Preferences Help Logout Database

Database Performance Page

Database Instance: database

Home Performance Administration Maintenance

View Data Real Time: 15 Second Refresh

Logged in As SYS

1

2

3

4

5

Click on an area of a graph or legend to get more detail.

Average Active Sessions

Runnable Processes

Maximum CPU

Active Sessions

Instance Disk I/O

Per Second

Instance Throughput

Per Second

Logons

Transactions

Physical Reads (KB)

Redo Size (KB)

Other Writes (KB)

Physical Writes (KB)

Other Reads (KB)

Physical Reads (KB)

Legend:

- Other
- Network
- Administrative
- Configuration
- Commit
- Application
- Concurrency
- System I/O
- User I/O
- Scheduler
- CPU Used
- Top Activity

Run ADDM Now Run ASH Report

Instance Throughput Rate Per Second Per Transaction

Reactive Perf. Diagnosis: EM Drill-Down

ORACLE Enterprise Manager 10g Database Control

Setup Preferences Help Logout Database

Database Performance Page

Database Instance: database

Home Performance Administration Maintenance

View Data Real Time: 15 Second Refresh

Logged in As SYS

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Click on an area of a graph or legend to get more detail.

Average Active Sessions

Runnable Processes

Maximum CPU

Active Sessions

Instance Disk I/O

Per Second

Instance Throughput

Per Second

Instance Throughput Rate

Per Second

Per Transaction

Other Writes (KB)

Physical Writes (KB)

Other Reads (KB)

Physical Reads (KB)

Logons

Transactions

Physical Reads (KB)

Redo Size (KB)

Top Activity

- Other
- Network
- Administrative
- Configuration
- Commit
- Application
- Concurrency
- System I/O
- User I/O
- Scheduler
- CPU Used

Reactive Perf. Diagnosis: EM Drill-Down

Database Control Database

Database Instance: database > Active Sessions Waiting: Concurrency Logged in As SYS

Active Sessions Waiting: Concurrency

Drag the shaded box to change the time period for the detail section below

View Data Real Time: 15 Second Refresh

Wait Category Drill down

Detail for Selected 5 Minute Interval
Start Time May 10, 2005 5:00:43 PM PDT

Top SQL: Concurrency

Select All	Select None	SQL ID	SQL Type
<input type="checkbox"/>	<input checked="" type="checkbox"/>	54.46 drajyvt2718u9	INSERT
<input type="checkbox"/>	<input checked="" type="checkbox"/>	45.54 apw4h02zd7y5s	UPDATE

Total Sample Count: 1,941

Top Sessions: Concurrency

Activity (%)	Top Sessions	User Name	Program
8.44	246	ORDER_ENTRY	sqlplus@stacs36 (TNS V1-V3)
7.93	240	ORDER_ENTRY	sqlplus@stacs36 (TNS V1-V3)
7.77	257	ORDER_ENTRY	sqlplus@stacs36 (TNS V1-V3)
7.62	223	ORDER_ENTRY	sqlplus@stacs36 (TNS V1-V3)
7.57	241	ORDER_ENTRY	sqlplus@stacs36 (TNS V1-V3)
7.46	225	ORDER_ENTRY	sqlplus@stacs36 (TNS V1-V3)
7.21	247	ORDER_ENTRY	sqlplus@stacs36 (TNS V1-V3)

Reactive Perf. Diagnosis: EM Drill-Down

Database Control

Database Instance: database > Active Sessions Waiting: Concurrency

Active Sessions Waiting: Concurrency

Drag the shaded box to change the time period for the detail section below

View Data Real Time: 15 Second Refresh

Wait Category Drill down

Detail for Selected 5 Minute Interval

Start Time May 10, 2005 5:00:43 PM PDT

Top SQL: Concurrency

Select All	Select None	SQL ID	SQL Type
<input type="checkbox"/>	<input type="checkbox"/>	54.46 rjyyt2718u9	INSERT
<input type="checkbox"/>	<input type="checkbox"/>	45.54 w4h02zd7y5s	UPDATE

Total Sample Count: 1,941

Top Sessions: Concurrency

Activity (%)	Top Sessions	User Name	Program
8.44	246	ORDER_ENTRY	sqlplus@stacs36 (TNS V1-V3)
7.93	240	ORDER_ENTRY	sqlplus@stacs36 (TNS V1-V3)
7.77	257	ORDER_ENTRY	sqlplus@stacs36 (TNS V1-V3)
7.62	223	ORDER_ENTRY	sqlplus@stacs36 (TNS V1-V3)
7.57	241	ORDER_ENTRY	sqlplus@stacs36 (TNS V1-V3)
7.46	225	ORDER_ENTRY	sqlplus@stacs36 (TNS V1-V3)
7.21	247	ORDER_ENTRY	sqlplus@stacs36 (TNS V1-V3)

Reactive Perf. Diagnosis: EM Drill-Down

Logged in As SYS

Database Instance: database > Top Activity > SQL Details: drajyyt2718u9

SQL Details: drajyyt2718u9

Switch to SQL ID: View Data

Text

`INSERT INTO PARTS_ORDER_VALUES (PARTS_ORDER_SEQ, NEXTVAL, 'X')`

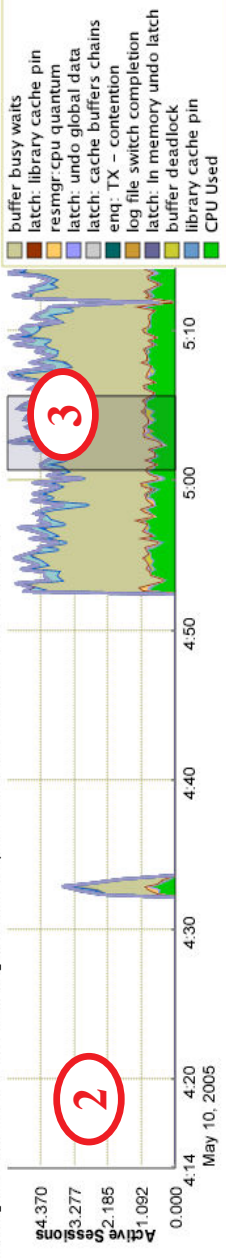
Details

Select the plan hash value to see the details below. Plan Hash Value

[Statistics](#) [Activity](#) [Plan Tuning Information](#)

Summary

Drag the shaded box to change the time period for the detail section below.



Detail for Selected 5 Minute Interval

Start Time **May 10, 2005 5:00:43 PM**

Activity (%)	SID	User	Program	Service	Plan Hash Value
13.67	225	ORDER_ENTRY	sqlplus@stacs36 (TNS V1-V3)	SYS\$USERS	1524734718
13.67	257	ORDER_ENTRY	sqlplus@stacs36 (TNS V1-V3)	SYS\$USERS	1524734718
13.15	252	ORDER_ENTRY	sqlplus@stacs36 (TNS V1-V3)	SYS\$USERS	1524734718
12.48	236	ORDER_ENTRY	sqlplus@stacs36 (TNS V1-V3)	SYS\$USERS	1524734718
12.26	224	ORDER_ENTRY	sqlplus@stacs36 (TNS V1-V3)	SYS\$USERS	1524734718
12.18	254	ORDER_ENTRY	sqlplus@stacs36 (TNS V1-V3)	SYS\$USERS	1524734718
11.81	230	ORDER_ENTRY	sqlplus@stacs36 (TNS V1-V3)	SYS\$USERS	1524734718
10.77	234	ORDER_ENTRY	sqlplus@stacs36 (TNS V1-V3)	SYS\$USERS	1524734718

[Statistics](#) [Activity](#) [Plan Tuning Information](#)

Reactive Perf. Diagnosis: EM Drill-Down

Database Instance: database > Top Activity > SQL Details: drajyyt2718u9 Logged in As SYS

SQL Details: drajyyt2718u9

Switch to SQL ID: View Data | Real Time: Manual Refresh | Refresh | Schedule SQL Tuning Advisor

1 **SQL Details Page**

Text
 INSERT INTO PARTS ... VALUES (PARTS_ORG_ID, SEQ.NEXTVAL, 'X')

Details
 Select the Plan Hash Value to see the details below. Plan Hash Value: 1524734718

2 **Summary**
 Drag the shaded box to change the time period for the detail section below.

3

4

5

Detail for Selected 5 Minute Interval
 Start Time: May 10, 2005 5:00:43 PM

Activity (%)	SID	User	Program	Service	Plan Hash Value
13.67	225	ORDER_ENTRY	sqlplus@stacs36 (TNS V1-V3)	SYS\$USERS	1524734718
13.67	257	ORDER_ENTRY	sqlplus@stacs36 (TNS V1-V3)	SYS\$USERS	1524734718
13.15	252	ORDER_ENTRY	sqlplus@stacs36 (TNS V1-V3)	SYS\$USERS	1524734718
12.48	236	ORDER_ENTRY	sqlplus@stacs36 (TNS V1-V3)	SYS\$USERS	1524734718
12.26	224	ORDER_ENTRY	sqlplus@stacs36 (TNS V1-V3)	SYS\$USERS	1524734718
12.18	254	ORDER_ENTRY	sqlplus@stacs36 (TNS V1-V3)	SYS\$USERS	1524734718
11.81	230	ORDER_ENTRY	sqlplus@stacs36 (TNS V1-V3)	SYS\$USERS	1524734718
10.77	234	ORDER_ENTRY	sqlplus@stacs36 (TNS V1-V3)	SYS\$USERS	1524734718

Statistics | **Activity** | **Plan Tuning Information** Schedule SQL Tuning Advisor

Reactive Perf. Diagnosis: EM Drill-Down

ORACLE Enterprise Manager 10g Database Control

Setup Preferences Help Logout Database

Database Performance Page

Database Instance: database

Home Performance Administration Maintenance

Click on an area of a graph or legend to get more detail.

View Data Real Time: 15 Second Refresh

Host

1

The image displays three performance graphs for the Oracle database instance 'database' on May 10, 2005. The top graph, 'Average Active Sessions', shows a significant spike in sessions starting around 4:40pm, peaking at approximately 8.0 sessions per second. A red dashed line labeled 'Maximum CPU' is positioned at the 4:40pm mark. The middle graph, 'Instance Disk I/O', shows a corresponding spike in disk activity, with a peak of about 1500 I/O operations per second. The bottom graph, 'Instance Throughput', shows a spike in transactions, reaching about 50 transactions per second. A legend for 'Average Active Sessions' includes categories like Other, Network, Administrative, Configuration, Commit, Application, Concurrency, System I/O, User I/O, Scheduler, and CPU Used. The legend for 'Instance Disk I/O' includes Other Writes (KB), Physical Writes (KB), Other Reads (KB), and Physical Reads (KB). The legend for 'Instance Throughput' includes Logons, Transactions, Physical Reads (KB), and Redo Size (KB). A red circle with the number '1' is placed over the first graph's legend area.

Runnable Processes

Active Sessions

Instance Disk I/O

Instance Throughput

Logons

Transactions

Physical Reads (KB)

Redo Size (KB)

Other Writes (KB)

Physical Writes (KB)

Other Reads (KB)

Physical Reads (KB)

Other

Network

Administrative

Configuration

Commit

Application

Concurrency

System I/O

User I/O

Scheduler

CPU Used

Top Activity

Logons

Transactions

Physical Reads (KB)

Redo Size (KB)

Other Writes (KB)

Physical Writes (KB)

Other Reads (KB)

Physical Reads (KB)

Reactive Diagnosis: Active Session History (ASH) Report

MYTH: With Statspack or SQL_TRACE who needs ASH data?

Reality: Instance Level Stats – Too little detail, Trace Level stats – Too much, intrusive, need to replay workload

- ASH Report
 - Uses “ASH” data within AWR retention period
 - Helps analyze transient performance problems (few minutes)
 - Ability to perform targeted analysis by various dimensions
 - By Time, Session ID, Action, Module, etc. or their combination
 - Provides “foot print” or execution profile
 - Facilitates “blocker” analysis
 - Enqueues, buffer busy waits, latch holders, Transaction-IDs
 - Obviates need for workload replay and SQL trace in most cases
 - Accessible through EM and command line interface

Reactive Diagnosis: ASH Report

Real World Case Study

Top Service/Module

Service	Module	% Activity
SYSDATABASES	01@ D:\bug_scr2_month_latest.sql	99.68

ASH Report for a Long Running Session

Top User Events

Event	Event Class	% Activity
db file sequential read	User I/O	89.59
CPU + Wait for CPU	CPU	7.10
latch: shared pool	Configuration	2.27

Activity Over Time

- analysis period is divided into smaller time slots
- top 3 events are reported in each of those slots

Slot Time (Duration)	Event	Sample Cnt	% Activity
03:00:00 (90.0 min)	db file sequential read	258	5.17
	CPU + Wait for CPU	18	0.36
	latch: shared pool	5	0.10
04:30:00 (90.0 min)	db file sequential read	468	9.38
	CPU + Wait for CPU	39	0.78
	latch: shared pool	10	0.20
06:00:00 (90.0 min)	db file sequential read	467	9.36
	CPU + Wait for CPU	37	0.74
	latch: shared pool	13	0.26
07:30:00 (90.0 min)	db file sequential read	474	9.50
	CPU + Wait for CPU	34	0.68

Reactive Diagnosis: ASH Report

Real World Case Study

Top Service/Module

Service	Module	% Activity
SYSDATABASES	01@ D:\bug_scr2_month_latest.sql	99.68

ASH Report for a Long Running Session

Top User Events

Event	Event Class	% Activity
db file sequential read	User I/O	89.59
CPU + Wait for CPU	CPU	7.10
latch: shared pool	Configuration	2.27

Skew

Activity Over Time

- analysis period is divided into smaller time slots
- top 3 events are reported in each of those slots

Slot Time (Duration)	Event	Sample Cnt	% Activity
03:00:00 (90.0 min)	db file sequential read	258	5.17
	CPU + Wait for CPU	18	0.36
	latch: shared pool	5	0.10
04:30:00 (90.0 min)	db file sequential read	468	9.38
	CPU + Wait for CPU	39	0.78
	latch: shared pool	10	0.20
06:00:00 (90.0 min)	db file sequential read	467	9.36
	CPU + Wait for CPU	37	0.74
	latch: shared pool	13	0.26
07:30:00 (90.0 min)	db file sequential read	474	9.50
	CPU + Wait for CPU	34	0.68

Reactive Perf. Diagnosis: ASH Report

Top Sessions

ASH Report Details...

- '# Samples Active' sk... with the session was found waiting for... with respect to wall clock time and not total database activity.

Sid, serial#	% Activity	Event	% Event	User	Program	# Samples Active
2035,39795	99.68	db file sequential read	89.35	SM	...	4,456/5,400 [83%]
		CPU + Wait for CPU	7.04			351/5,400 [7%]
		latch: shared pool	2.27			113/5,400 [2%]

Top SQL Statements

SQL ID	% Activity	Event	% Event	SQL Text
943s6zg4w225k	91.68	db file sequential read	86.93	SELECT COUNT(*) FROM RPTHEAD, H...
5t1fvyxq1k2kaj	3.51	CPU + Wait for CPU	4.23	SELECT H.RPTNO, H.PROGRAMMER...
		db file sequential read	1.72	
		CPU + Wait for CPU	1.04	

Complete List of SQL Text

SQL Id	SQL Text
043s6zg4w225k	SELECT COUNT(*) FROM RPTHEAD_HISTORY WHERE RPTNO = :B2 AND OLD_STATUS IN (:B6, :10) AND NEW_STATUS = 11 AND UPD_BY = :B1
5t1fvyxq1k2kaj	SELECT H.RPTNO, H.PROGRAMMER, H.STATUS, H.FIXED_DATE - H.RPTDATE AGE FROM RPTHEAD H WHERE H.FIXED_DATE >= :B2 AND H.FIXED_DATE < :B1 AND H.RPTDATE < :B1 AND CS.PRIORITY = 2 AND H.RPTDATE >= TO_DATE('01-mar-2003', 'DD-mon-yyyy') AND H.PRODUCT_ID IN (1000, 1001, 1027, 1033, 1057, 1119, 1137, 1148, 1168, 1171, 1181, 1192, 1275, 129, 1351, 166, 169, 174, 187, 2, 201, 208, 21, 214, 229, 240, 26, 29, 31, 32, 300, 325, 332, 375, 378, 385, 397, 398, 44, 485, 495, 497, 5, 500, 501, 502, 503, 505, 507, 508, 509, 510, 512, 513, 518, 532, 533, 540, 543, 569, 571, 572, 574, 61, 662, 665, 719, 723, 740, 769, 770, 776, 777, 79, 799, 83, 930, 968, 989, 99, 996, 999, 1290, 1119, 1289, 1287, 1286, 1292, 1293)

Reactive Perf. Diagnosis: AWR Compare Periods Report

- Easier and accurate diagnosis of problems due to workload or configuration variations
 - Report identifies performance attributes and database settings different
 - Compare Performance to “Baseline”
 - Create “Baseline” or Preserved Snapshot Sets
 - Compare Good Vs Bad Performance “Baselines”
 - Normalizing statistics over “dbtime” enables periods of different durations to be compared
 - Accessible through EM and command line interface

Creating Baseline and Running Compare Periods Report

Compare Periods Report Steps

Manage Snapshots and Preserved Snapshot Sets

Snapshots [1300](#)

Preserved Snapshot Sets [2](#)

Latest Snapshot Time **Aug 27, 2005 2:40:26 PM**

Earliest Snapshot Time **Aug 18, 2005 3:01:05 PM**

Select Beginning Snapshot
 Go To Time 3:00 PM
 (Example: 12/15/03)

Select ID	Capture Time	Collection Level
C 1276	Aug 27, 2005 10:41:01 AM	TYPICAL
C 1277	Aug 27, 2005 10:50:56 AM	TYPICAL
C 1278	Aug 27, 2005 11:01:02 AM	TYPICAL
C 1279	Aug 27, 2005 11:11:01 AM	TYPICAL

Actions:

Preserved Snapshot Sets

Page Refreshed Aug 27, 2005 2:59:18 PM

Select Preserved Snapshot Set ID	Name	Beginning Snapshot ID	Capture Time	Actions
C 8	BAD_PERF_BASELINE1	433	Aug 21, 2005 2:30:44 PM	<input type="button" value="Compare Periods"/> <input type="button" value="Create SQL Tuning Set"/> <input type="button" value="View Report"/> <input type="button" value="Run ADDM"/> <input type="button" value="Delete Preserved Snapshot Set"/> <input type="button" value="Compare Periods"/>
C 9	GOOD_PERF_BASELINE2	569	Aug 22, 2005 1:10:58 PM	<input type="button" value="Compare Periods"/> <input type="button" value="Create SQL Tuning Set"/> <input type="button" value="View Report"/> <input type="button" value="Run ADDM"/> <input type="button" value="Delete Preserved Snapshot Set"/> <input type="button" value="Compare Periods"/>

Creating Baseline and Running Compare Periods Report

Compare Periods Report Steps

1. Create Baseline (Good Perf.)
2. Create Another Baseline (Bad Perf.)

Manage Snapshots and Preserved Snapshot Sets

Snapshots 1300

Preserved Snapshot Sets 2

Latest Snapshot Time **Aug 27, 2005 2:40:26 PM**

Earliest Snapshot Time **Aug 18, 2005 3:01:05 PM**

Select Beginning Snapshot
Go To Time 8/27/05 3:00 PM (Example: 12/15/03) Go

Select ID	Capture Time	Collection Level
C 1276	Aug 27, 2005 10:41:01 AM	TYPICAL
C 1277	Aug 27, 2005 10:50:56 AM	TYPICAL
C 1278	Aug 27, 2005 11:01:02 AM	TYPICAL
C 1279	Aug 27, 2005 11:11:01 AM	TYPICAL

Actions: Create Preserved Snapshot Set, Create SQL Tuning Set, View Report, Run ADDM, Delete Snapshot Range, Compare Periods

Preserved Snapshot Sets

Page Refreshed Aug 27, 2005 2:59:18 PM

Select Preserved Snapshot Set ID	Name	Beginning Snapshot ID	Capture Time
C <u>8</u>	BAD_PERF_BASELINE1	433	Aug 21, 2005 2:30:44 PM
C <u>9</u>	GOOD_PERF_BASELINE2	569	Aug 22, 2005 1:10:58 PM

Actions: Compare Periods, Create SQL Tuning Set, View Report, Run ADDM, Delete Preserved Snapshot Set, Compare Periods

Creating Baseline and Running Compare Periods Report

Compare Periods Report Steps

1. Create Baseline (Good Perf.)
2. Create Another Baseline (Bad Perf.)

Manage Snapshots and Preserved Snapshot Sets

Snapshots 1300
 Preserved Snapshot Sets 2
 Latest Snapshot Time **Aug 27, 2005 2:40:26 PM**
 Earliest Snapshot Time **Aug 18, 2005 3:01:05 PM**

Select Beginning Snapshot
 Go To Time 3:00 PM
(Example: 12/15/03)

Select ID	Capture Time	Collection Level
C 1276	Aug 27, 2005 10:41:01 AM	TYPICAL
C 1277	Aug 27, 2005 10:50:56 AM	TYPICAL
C 1278	Aug 27, 2005 11:01:02 AM	TYPICAL
C 1279	Aug 27, 2005 11:11:01 AM	TYPICAL

Actions:

3. Run Compare Periods Report

Preserved Snapshot Sets

Page Refreshed Aug 27, 2005 2:59:18 PM

Select Preserved Snapshot Set ID	Name	Beginning Snapshot ID	Capture Time	Actions
C <u>8</u>	BAD_PERF_BASELINE1	433	Aug 21, 2005 2:30:44 PM	<input type="button" value="Compare Periods"/> <input type="button" value="Go"/> <input type="button" value="Create SQL Tuning Set"/> <input type="button" value="Go"/> <input type="button" value="View Report"/> <input type="button" value="Go"/> <input type="button" value="Run ADDM"/> <input type="button" value="Go"/> <input type="button" value="Delete Preserved Snapshot Set"/> <input type="button" value="Go"/> <input type="button" value="Compare Periods"/> <input type="button" value="Go"/>
C <u>9</u>	GOOD_PERF_BASELINE2	569	Aug 22, 2005 1:10:58 PM	<input type="button" value="Compare Periods"/> <input type="button" value="Go"/> <input type="button" value="Create SQL Tuning Set"/> <input type="button" value="Go"/> <input type="button" value="View Report"/> <input type="button" value="Go"/> <input type="button" value="Run ADDM"/> <input type="button" value="Go"/> <input type="button" value="Delete Preserved Snapshot Set"/> <input type="button" value="Go"/> <input type="button" value="Compare Periods"/> <input type="button" value="Go"/>

Reactive Perf. Diagnosis: AWR Compare Periods Report (10gR2)

Top 5 Timed Events

Top Wait Events Compared side-by-side

		1st					2nd				
Event	Waits	Time(s)	Percent Total DB Time	Wait Class	Event	Waits	Time(s)	Percent Total DB Time	Wait Class		
CPU time		22,191.7	32.97		enq: TX - row lock contention	1,578	3,211.1	65.73	Application		
enq: TX - row lock contention	10,634	21,127.4	31.39	Application	CPU time		1,244.4	25.47			
*latch: library cache	559,941	5,302.2	7.88	Concurrency	buffer busy waits	285	145.0	2.97	Concurrency		
*latch: shared pool	376,303	3,184.8	4.73	Concurrency	*db file sequential read	25,916	22.0	.45	User I/O		
buffer busy waits	1,647	737.3	1.10	Concurrency	*SQL*Net message to client	4,435,906	17.2	.35	Network		
-SQL*Net message to client	5,964,422	48.2	.07	Network	-latch: shared pool	33	0.7	.01	Concurrency		
-db file sequential read	2,285	0.7	.00	User I/O	-latch: library cache	182	0.4	.01	Concurrency		

Reactive Perf. Diagnosis: AWR Compare Periods Report (10gR2)

Top 5 Timed Events

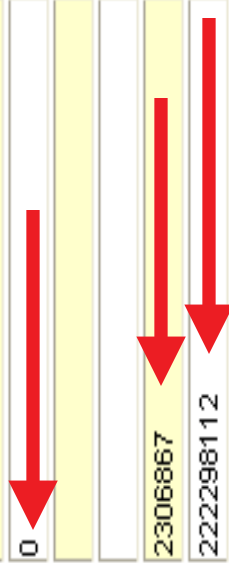
Top Wait Events Compared side-by-side

		1st					2nd				
Event	Waits	Time(s)	Percent Total DB Time	Wait Class	Event	Waits	Time(s)	Percent Total DB Time	Wait Class		
CPU time		22,191.7	32.97		enq: TX - row lock contention	1,578	3,211.1	65.73	Application		
enq: TX - row lock contention	10,634	21,127.4	31.35	Application	CPU time		1,244.4	25.47			
*latch: library cache	559,941	5,302.2	7.88	Concurrency	buffer busy waits	285	145.0	2.97	Concurrency		
*latch: shared pool	376,303	3,184.8	4.73	Concurrency	*db file sequential read	25,916	22.0	.45	User I/O		
buffer busy waits	1,647	737.3	1.10	Concurrency	*SQL*Net message to client	4,435,906	17.2	.35	Network		
-SQL*Net message to client	5,964,422	48.2	.07	Network	-latch: shared pool	33	0.7	.01	Concurrency		
-db file sequential read	2,285	0.7	.00	User I/O	-latch: library cache	182	0.4	.01	Concurrency		

Reactive Perf. Diagnosis: AWR Compare Periods Report (10gR2)

resource_manager_plan	PRI_SIM_PLAN
resumable_timeout	0
serial_reuse	disable
service_names	r2e
session_cached_cursors	20
session_max_open_files	10
sessions	280
sga_max_size	629145600
sga_target	146800640
shadow_core_dump	partial
shared_memory_address	0
shared_pool_reserved_size	4823449
shared_pool_size	12582912
shared_servers	0
skip_unusable_indexes	TRUE
sort_area_retained_size	0
sort_area_size	1048576
spfile	/scratch/pgongloo/10.2/r2e/cbs/s
sql92_security	FALSE

DB Configuration Settings Compared...



Reactive Perf. Diagnosis: EM Memory Access Mode

- **MYTH:** Since Oracle does not use Direct Memory Access, it can't be used for diagnosing hung systems
- **Reality:** Oracle DB 10g Release 2 does support Direct Memory Access with EM interface!
- Value proposition
 - For diagnosing hung or slow moving databases
 - SQL-based diagnostics are richer, preferable in most cases
 - EM Interface similar for Memory and SQL Access modes
- Dedicated SGA Collector reads metrics directly from the SGA memory – one per instance
- Integration with ORADEBUG Hang Analysis

Reactive Perf. Diagnosis: Diagnosing Slow/Hung Databases

Database Instance: database > Hang Analysis

View Data Real Time: 15 Second Refresh

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Zoom Factor 80%

EM Hang Analysis / ORADEBUG Integration

The wait graph for the instance is shown below. Sessions shown may be instantaneously blocked (green), in a prolonged wait state (yellow) or hung (red).

Total Sessions 29
Waiting Sessions 7
Blocked Sessions 6
Root Blockers 1

Session Summary

SID	148	Session	0x2fab7a3c
Blocker SID	none	Serial Number	28
SQL Address	2cb7c84	SQL Hash	1103055320
File Number	1650815232	Event Name	SQL*Net message from client
User ID	0	Program	sqlplus@stach06 (TNS V1-V3)
OS PID	5220		

```
graph TD; 148[SID 148] --> 147[SID 147]; 147 --> 135[SID 135]; 147 --> 142[SID 142]; 135 --> 137[SID 137]; 135 --> 132[SID 132]; 142 --> 132;
```

Hang Analysis can be invoked from Performance Page, Related Links

Best Practices from Real-World Deployments

ORACLE

Performance Diagnosis: Best Practices

- Proactive Diagnosis
 - ADDM
 - ADDM: Run ADDM Now
- Reactive Diagnosis
 - General Manual Analysis: EM Performance Page Drill-Downs
 - Transient or Targeted Analysis: ASH Report
 - Workload Change Comparison: AWR Compare Periods Report
 - Database Hung/Slow Moving: EM Memory Access

Best Practices: AWR Vs STATSPACK

- If licensed for database Diagnostic and Tuning Packs, disable Statspack
 - AWR is a super set of Statspack
 - Running both at same time may impact performance
 - If cannot disable Statspack, run it at different times
- Do not change STATISTICS_LEVEL from default setting of TYPICAL
 - TYPICAL: Recommended, Minimal Performance Overhead
 - BASIC: Disables Self-Management, Not Recommended
 - ALL: Advanced Diagnosis, Consult Support

Oracle Database 10g: Self- Management Infrastructure Overhead

- **MYTH: With 10g Self-Management Infrastructure and Non-Direct Memory Access method, performance overhead must be high!**
- **Reality: Oracle uses kernel structures efficiently, incurs minimal overhead: About 2% when system is fully loaded, this includes**
 - Oracle 10g DB Self-Management Functionality
 - Other features governed by STATISTICS_LEVEL = TYPICAL
- **Most customer deployments have experienced overall performance improvement !!**
 - Validated with real world customers for large deployments in production
 - Significant net performance improvement after implementing ADDM recommendations

Best Practices: Implementing Advisor Recommendations

- When to implement ADDM or other Advisor recommendations?
 - Look for persistent problems rather than one-off scenarios
 - Gauge trends by running AWR/ADDM reports for longer time periods, for e.g., daily 8-12 noon for peak OLTP load
- SQL Tuning Sets (STS) for tracking and tuning SQL statements
 - Encompasses bind variables, execution context and important statistics
 - STS can be used for capturing workload
 - Can be transported to another system for testing (10gR2)
 - **OOW 2005: Optimizing the Optimizer: Essential SQL Tuning Tips and Techniques: Will be posted on OTN shortly**

Best Practices: Implementing Advisor Recommendations (contd.)

- Use rigorous change control mechanism when implementing recommendations
- Preserve interesting Advisory Task data
 - Give meaningful Task Name and Description
 - Change Task Expiration Date appropriately
- Preserve AWR raw data beyond retention using Preserved Snapshot Sets
 - Support Purposes
 - Future Compare Periods Analysis

Best Practices: Use ASH Data

- **“Sifting through the ASHes: Performance Analysis with the Oracle 10g Active Session History”** by Graham Wood, on OTN
- **Make best use of ASH data**
 - Use ASH Report to get footprint of a target (session,SQL_ID)
 - Always on, almost no overhead !!
 - Avoids workload replay in most cases!!
 - ASH simulation is available for even pre-10g databases

Best Practices: Gotchas!

- Possible AWR Library Cache Contention in few cases
 - When already incurring significant library cache contention
 - Metalink Note: 296765.1, Bugs 3941893/4133353, back port / workaround: 10.1.0.3, fixed: 10.1.0.4
- Idle SQL Forms session incorrectly appear in ASH Data
 - Bug 4137362, back port: 10.1.0.3, fixed: 10.1.0.4
- Customize Maintenance Window Time for Your Environment if Necessary
- Use SVG Plug-in for Mozilla / IE Browsers
 - <http://www.adobe.com/svg/viewer/install/main.html>

QUESTIONS ANSWERS

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