Business-Driven IT Management

Oracle Enterprise Manager: Empowering IT to Drive Business Value

Oracle Enterprise Manager 12.1: Database Manageability

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Database Homepage
Complete and customizable overview of the entire database

- Ability to personalize the view by rearranging the portlets
- View of Monitored sql
- View of performance by wait class and services
Database Home Page

Complete snapshot of system resources
- CPU including usage by other instance
- Memory with breakdown by components
- Active Sessions by wait class
- Space summary

List of open issues via the Incident Summary

ADDM findings and Compliance summary as in previous release
Topic# 2 ASH Analytics
Database Time (DB Time)

Total time spent inside database calls by active foreground sessions

Includes CPU time, IO time and non-idle wait time

Fundamental measure of Oracle performance throughput

*Database Time is total time spent by user processes either actively working or actively waiting in a database call.*
### Active Sessions

- **Active**
  - In a database call
  - Contributing to DB Time

- **Average Activity of a Session**
  - Active Time $\div$ Elapsed Time

- **Average Active Sessions**
  - Total of average activity across all sessions
  - Total DB Time $\div$ Elapsed Time
Average Active Sessions

How many fully active sessions required to generate observed DB Time?

Fundamental database performance metric

• Proportional to load on the database
• Responds directly to performance problems

Time-normalized DB Time and thus comparable

• Across systems
• Across time periods
ASH captures ACTIVE SESSION information every second
Active Session History (ASH)

All ‘Active’ sessions captured every second
- Foregrounds and backgrounds are sampled
- Active foregrounds contribute to DB Time

In-memory: \textit{V\$ACTIVE\_SESSION\_HISTORY}
- Sampling interval = 1 second

On-disk: \textit{DBA\_HIST\_ACTIVE\_SESS\_HISTORY}
- Sampling interval = 10 seconds

ASH is a system-wide record of database activity
- A \textbf{FACT} table with multiple dimensions that help diagnose performance issues
ASH and DB Time

Active sessions contribute to DB Time

ASH samples active sessions

ASH Math = estimate DB Time by counting ASH samples

COUNT of ASH Samples = Total DB Time in seconds for that time interval

Group by over 70+ performance dimensions
Drilling into Logical Dimensions

- SQL
- PL/SQL
- Session Attributes
- Session Identifiers
- Resource Usage

SQL:
- SQL ID
- Plan Hash
- Operation
- OpCode

PL/SQL:
- PL/SQL
- Top Level PL/SQL

Resources:
- Wait Class
- Wait Event
- Object
- Blocking Session

Identifiers:
- Instance
- Services
- User Session
- Parallel Process
- Program
- Session Type

Attributes:
- Cons. Group
- Module
- Action
- Client
- Trans. ID
## Analytic Operations Performed on Data Cubes

<table>
<thead>
<tr>
<th>Operation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rollup</td>
<td>Performs aggregation on a data cube mainly by dimension reduction</td>
</tr>
<tr>
<td>Drilldown</td>
<td>Is the reverse of rollup. Navigates from less detailed data to more detailed data on a dimension hierarchy</td>
</tr>
<tr>
<td>Slice</td>
<td>Performs a selection on one dimension of the data cube resulting in a sub cube</td>
</tr>
<tr>
<td>Dice</td>
<td>Defines a sub-cube by performing a selection of two or more dimension</td>
</tr>
<tr>
<td>Pivot</td>
<td>Visualization operation that rotates the data axes to provide alternate presentation</td>
</tr>
</tbody>
</table>
Key Facts

- Entirely sourced from ASH
- Multi-dimensional
- Use case: problem detection, isolation, triage
- Method: skew analysis

Dimensions visible

- Time
- Wait Class
- SQL
- Sessions
- Services
- Modules
Top Activity Page ...Where could we improve?

**Flexibility**
- Can’t switch dimensions on area chart
- Top left list is fixed to Top SQL; right table only has few dimensions
- No offline analysis

**Utilizing the full value**
- Some key dimensions omitted
- Fixed width slider – 5 min real-time, 30 min historical

**Visualization**
- Visualization limited to time and one other dimension
- Drilldown always sends you to a new page
ASH Analytics

Top Dimensions
- SQL
- PL/SQL
- Resource Consumption
- Session Identifiers
- Session Attributes

SQL ID
- Top Level SQL ID
- SQL Parse Hash Value
- SQL Plan Hash Value
- SQL Plan Operation
- SQL Plan Operation Line
- SQL Opcode
- Top Level SQL Opcode

User Session
- Activity (Average Active Sessions)
- User ID
- User Group

Oracle
Case Study # 1:
Slow response time due to high I/O

- Sliced the data on User I/O
- Drilling down to Top SQL using the Wait Event dimension
Multidimensional Visual Analytics: Treemaps

- Space-efficient visualization of hierarchical (tree) structure
- Branches are rectangles, sub-branches are nested rectangles
- Scales well to hundreds or even thousands of elements
- ASH dimensions provide many possible hierarchies
ASH Analytics: Removing the time dimension

- Default Treemap View displays the Wait class → Wait Event hierarchy for the selected time period
- Size of each rectangle corresponds to the number of samples collected for each wait event
Compare Period
1. Production System: Regression
   • This morning my performance was terrible, yesterday it was excellent… Why? What Changed?

2. DB Replay: I upgraded to 11g and my DB performance regressed.. Why?
   • Compelling, intelligent reporting is a critical component of RAT
   • Compare Capture to Replay or Replay to Replay
Compare Period ADDM

- Full ADDM analysis across two AWR snapshot periods
- Detects causes, measure effects, then correlates them
  - Causes: workload changes, configuration changes
  - Effects: regressed SQL, reach resource limits (CPU, I/O, memory, interconnect)
- Makes actionable recommendations along with quantified impact
**Key Concepts**

- **Base Period**
  - Basis (normally good) period to compare against (think “Baseline”)
  - For RAT, this is the capture period, or (preferably) the replay before modifications when comparing two replays

- **Compare Period**
  - The time period we “test” against the base period
  - For production, the “bad” period we hope to explain

- **Workload Compatibility**
  - Is it even running the same application? Does it make sense to compare?
  - An index to gauge the workloads’ similarity taking into account SQL statements and their load
  - Ideally **100%** for capture/replay
STEP 1:
- Identify what changed
- DB configurations, workload changes

STEP 2:
- Did the Buffer cache get smaller?
- Why is there 10% new SQL?
- Uses DB Time as basis for measuring performance

STEP 3:
How come Top SQL impact increased by 45%?
Read I/O are up by 55%, why?
- Correlate performance differences with changes

Did a buffer cache reduction cause a read I/O increase?
Compare Period – 3 Modes

One snapshot offset

System moving window

Customized period
Compare Period: Report
Real-Time ADDM
Emergency Monitoring
Unresponsive Database Problem

- **How do I diagnose a slow or hung database?**
  - If the database is unresponsive, I can’t even connect!
  - Even if I can connect, I need a diagnosis quickly!

- **Should I just bounce the database?**
  - All in-flight operations will be aborted, mid-tier connections/states will be lost
  - All diagnostic information will be lost
  - “If I could only know which blocking session to kill!”
Real-Time ADDM

- Real-time analysis of hung or slow database systems
- Holistically identify global resource contentions and deadlocks
- Quantified performance impact
- Precise, actionable recommendations
- Provide cluster-wide analysis for RAC
Real-Time ADDM—Architecture

- Makes a lightweight connection without acquiring additional locks and resources, bypassing the SQL layer through the agent
- Also attempts to initiate standard JDBC connection
- Data returned by either connection is analyzed by Real-Time ADDM
Questions