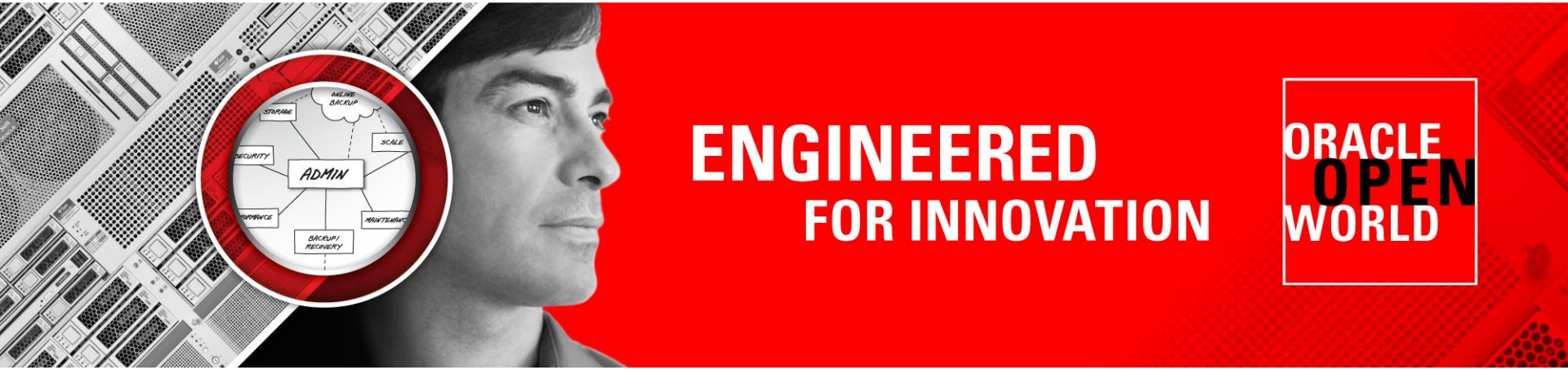
ORACLE ENTERPRISE MANAGER 12c

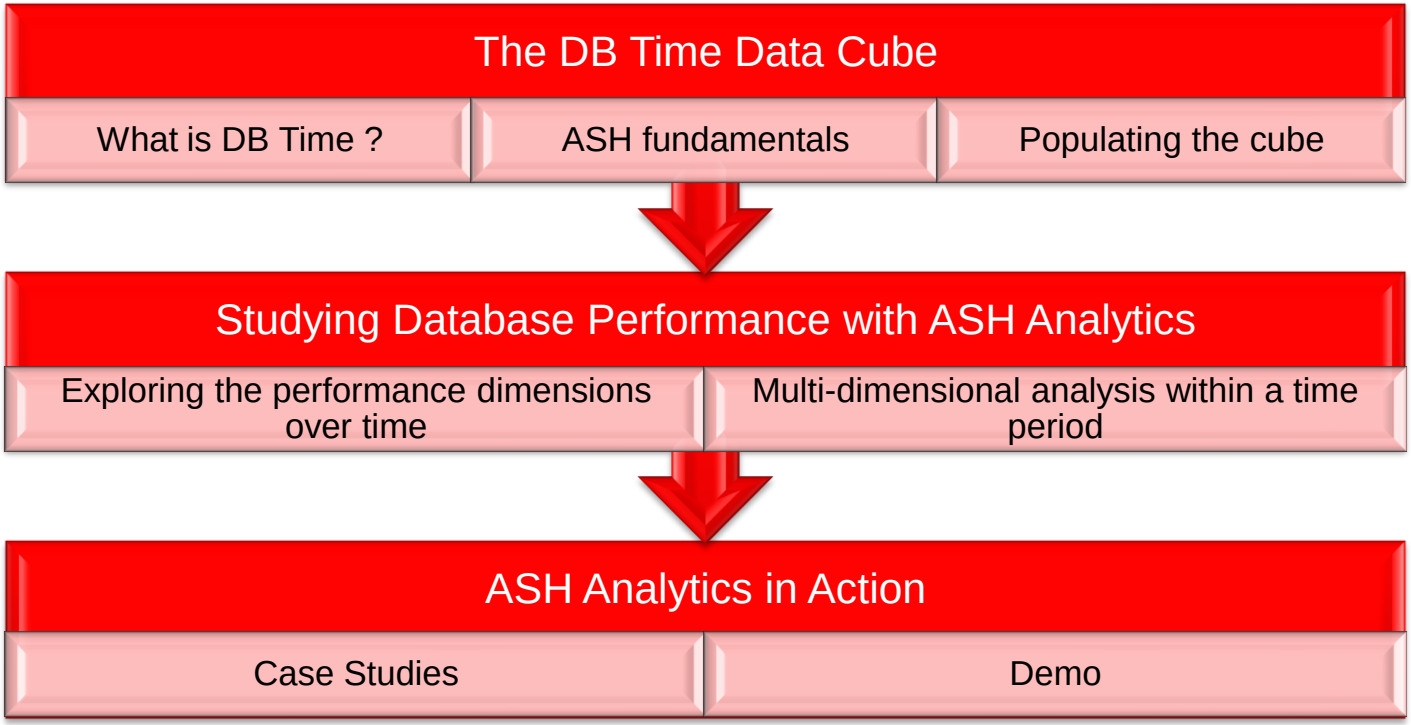


ORACLE

Oracle Enterprise Manager 12c: ASH in 3D

Deba Chatterjee and John Beresniewicz, Oracle
Anton Topurov, CERN

Agenda



- ***What is DB Time?***
- ***What is ASH?***
- ***How are ASH and DB Time related?***

DB Time Overview

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 ÷ Elapsed Time
Average Active Sessions	• Total of average activity across all sessions • Total DB Time ÷ Elapsed Time

Average Active Sessions

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

Fundamental database performance metric

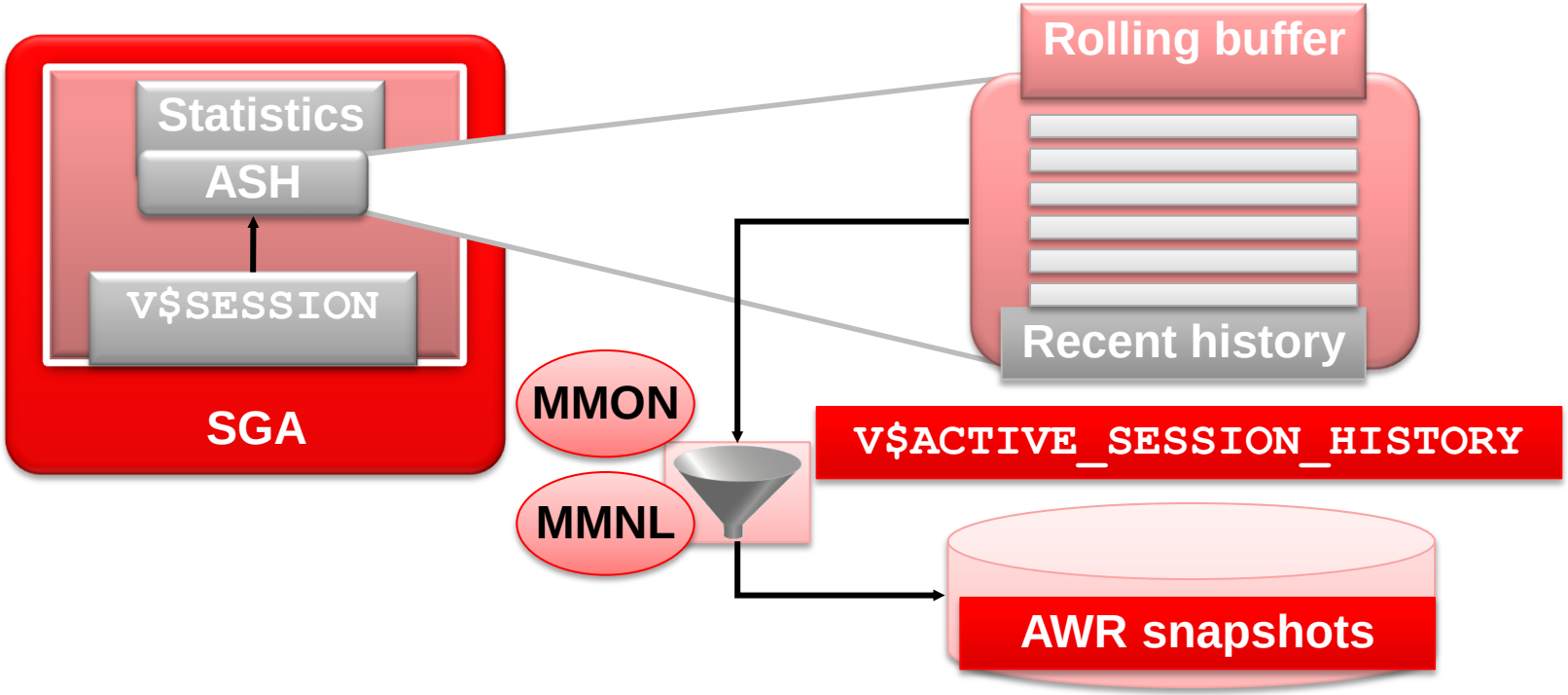
- Proportional to load on the database
- Responds directly to performance problems

Time-normalized DB Time and thus comparable

- Across systems
- Across time periods

ASH: The DB Time Data Cube

Active Session History

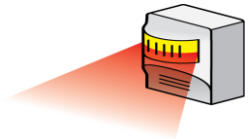


ASH captures ACTIVE SESSION information every second

Active Session History (ASH)

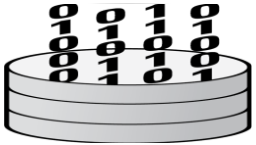
All ‘Active’ sessions captured every second

- Foregrounds and backgrounds are sampled
- Active foregrounds contribute to DB Time



In-memory: *V$ACTIVE_SESSION_HISTORY*

- Sampling interval = 1 second



On-disk: *DBA_HIST_ACTIVE_SESS_HISTORY*

- Sampling interval = 10 seconds

ASH is a system-wide record of database activity

- A **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

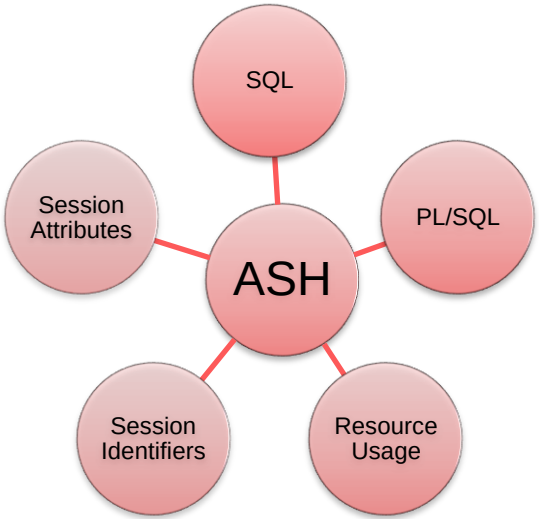
COUNT of ASH Samples = Total DB Time in seconds for that time interval

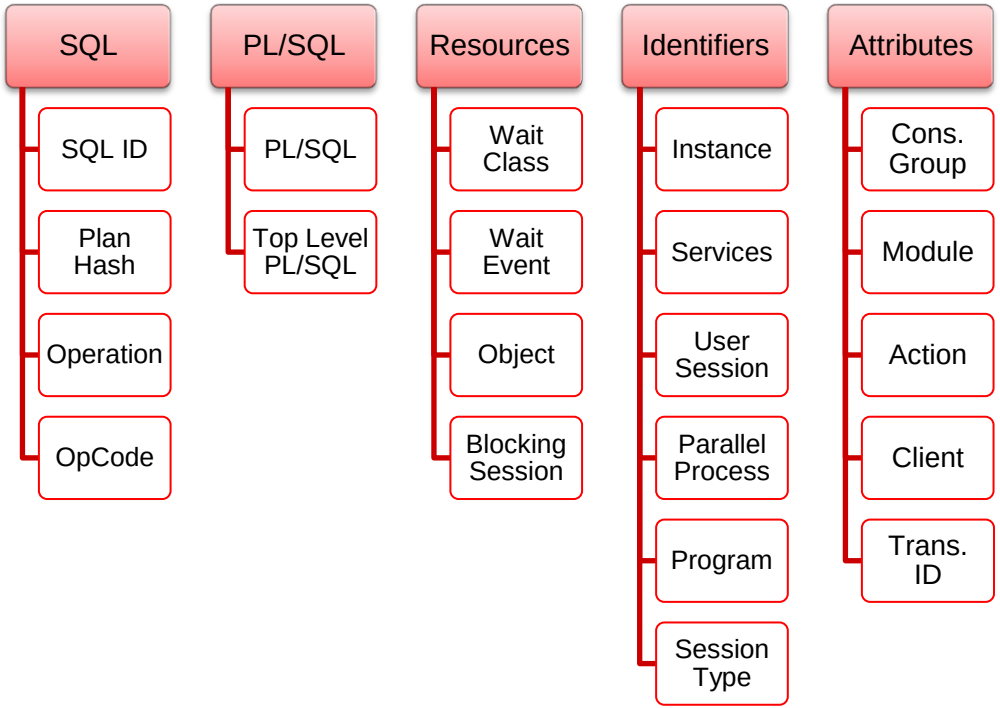
Group by over 70+ performance dimensions

Dimensions in ASH

- Logically groups them under 5 categories
- Enables DB Time analysis over many dimensions

Drilling into Logical Dimensions

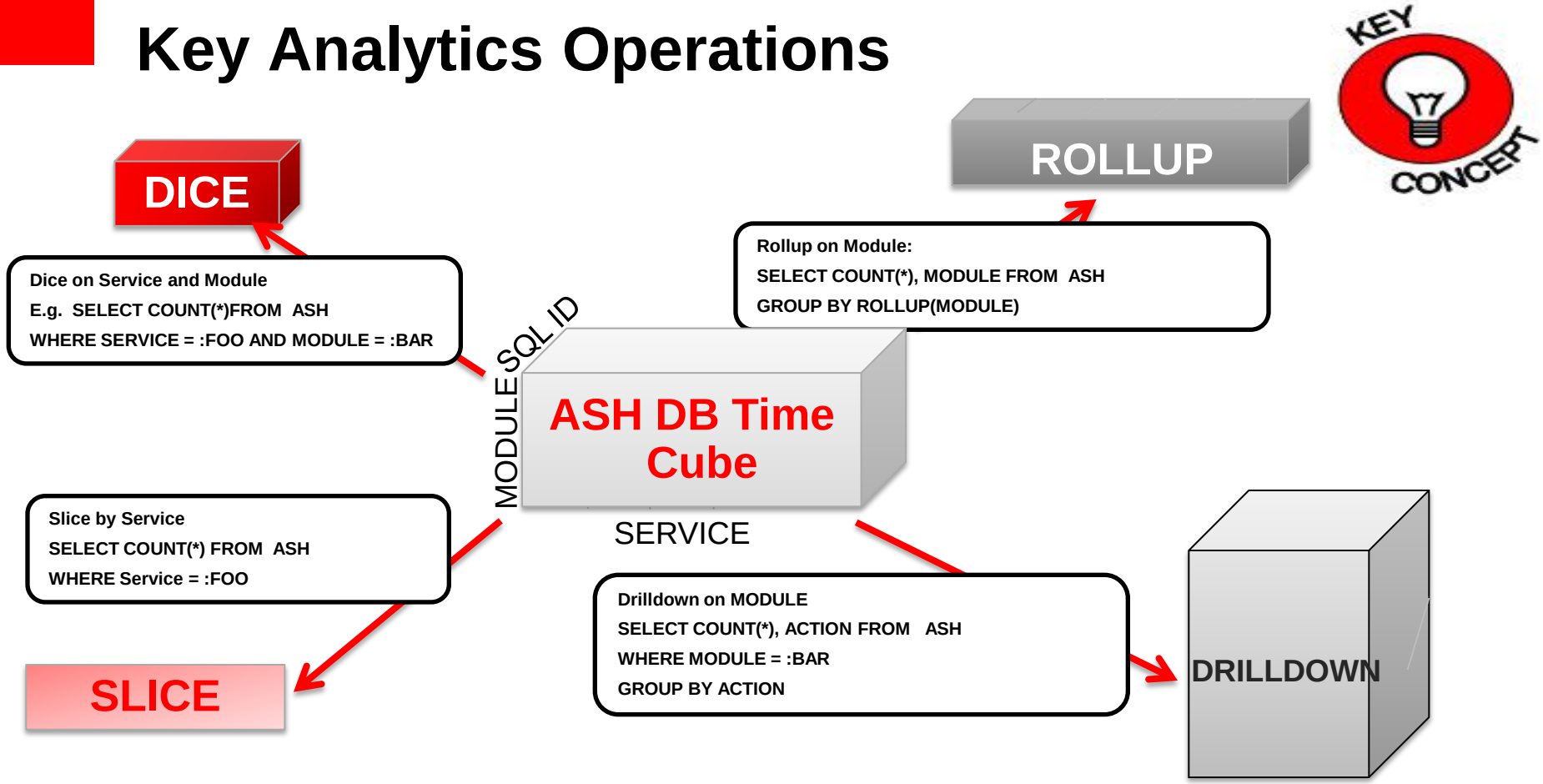


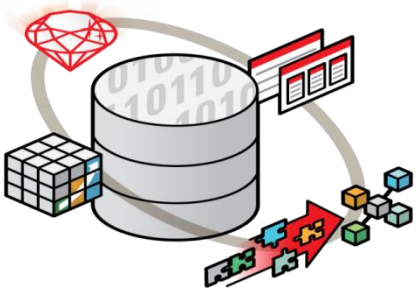


Analytic Operations Performed on Data Cubes

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

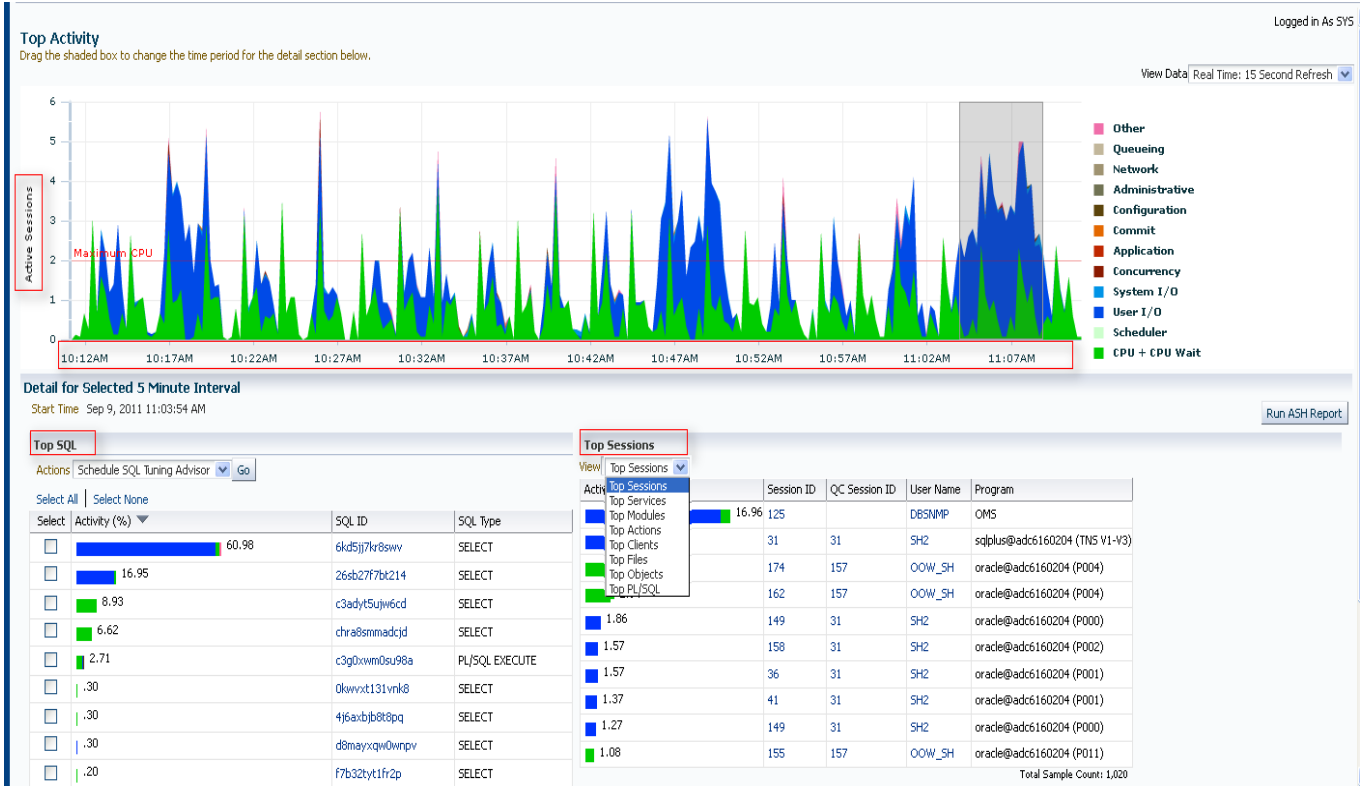
Key Analytics Operations





ASH Analytics

Top Activity Page…Predecessor to ASH Analytics



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

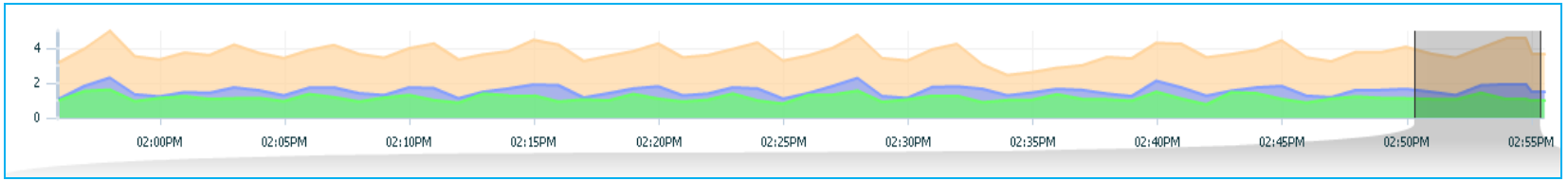
Utilizing the full value

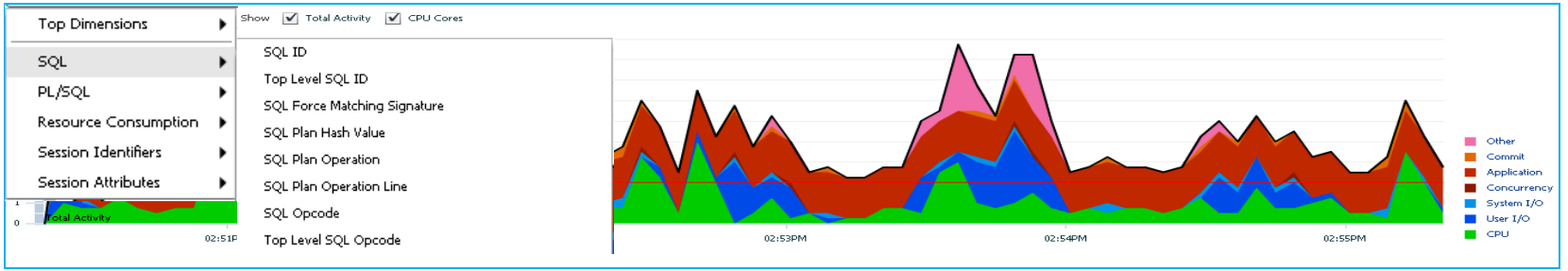
- Some key dimensions omitted
- Fixed width slider – 5 min real-time, 30 min historical

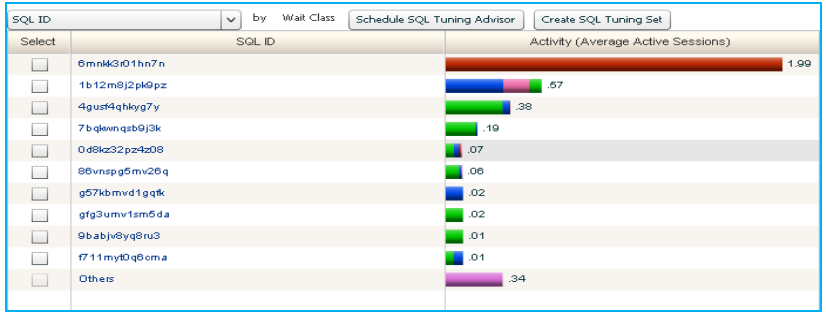
Visualization

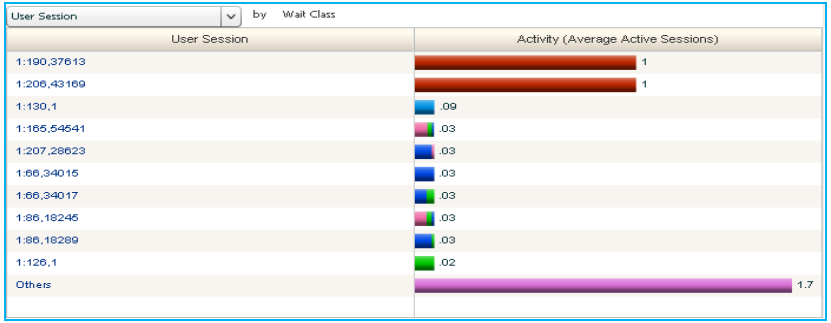
- Visualization limited to time and one other dimension
- Drilldown always sends you to a new page

ASH Analytics

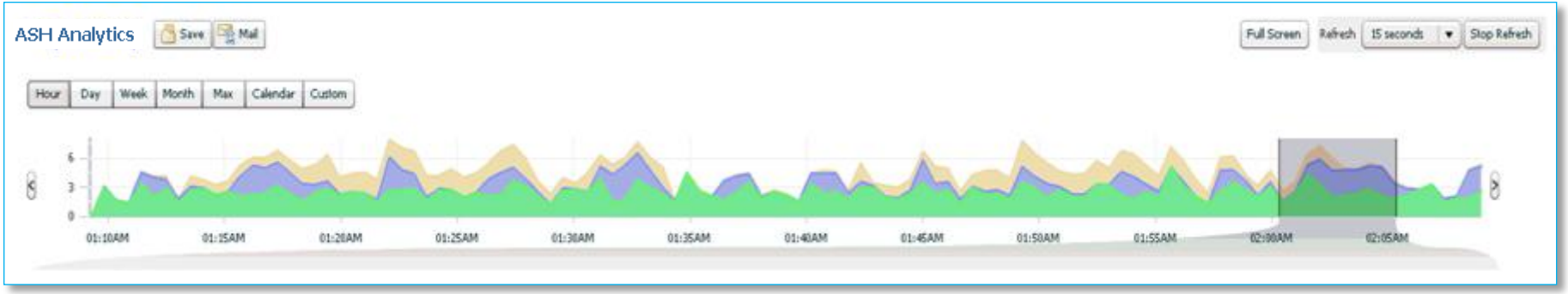






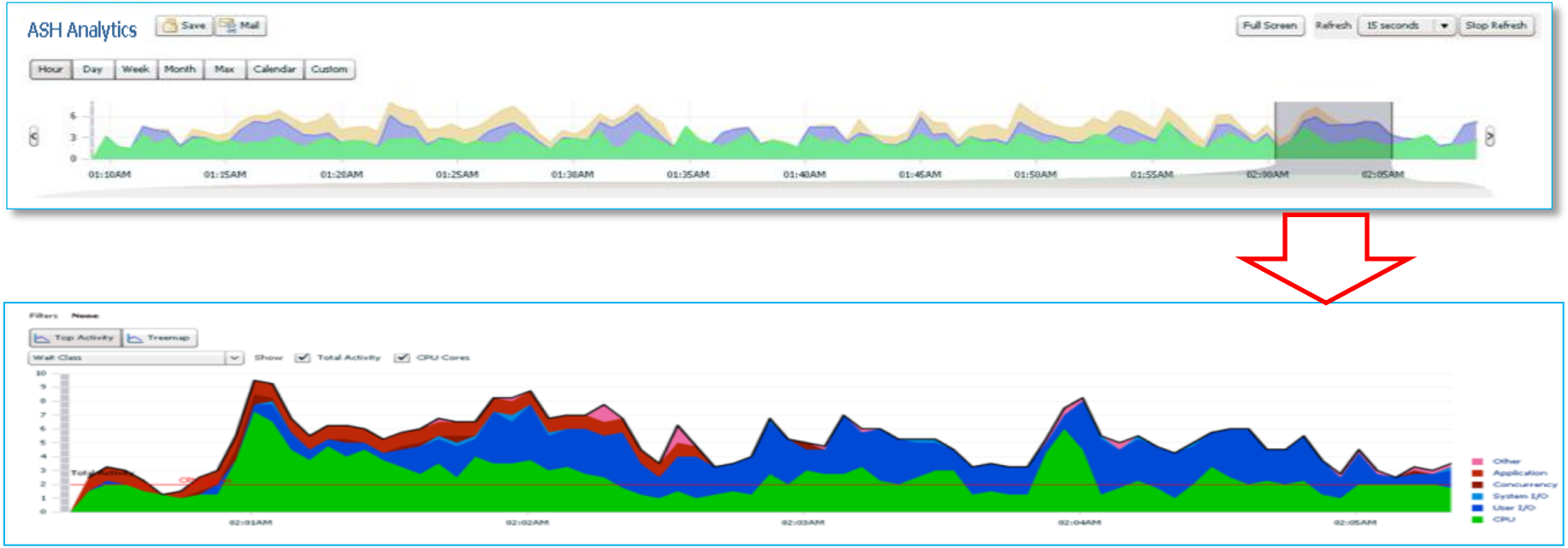


Rollup the ASH Cube



- Rolled up ASH data in 3 broad wait class categories
  - Green for CPU
  - Blue for I/O
  - Orange for ‘OTHER’ Waits
- The default view shows 1 hour of ASH data
- 5 minute default slider width.

Drilldown



- Drilldown on the wait class dimension for the selected time period
- All consumed Wait classes displayed.
- Analysis pane that allows to slice and dice the ASH data

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

Wait Class

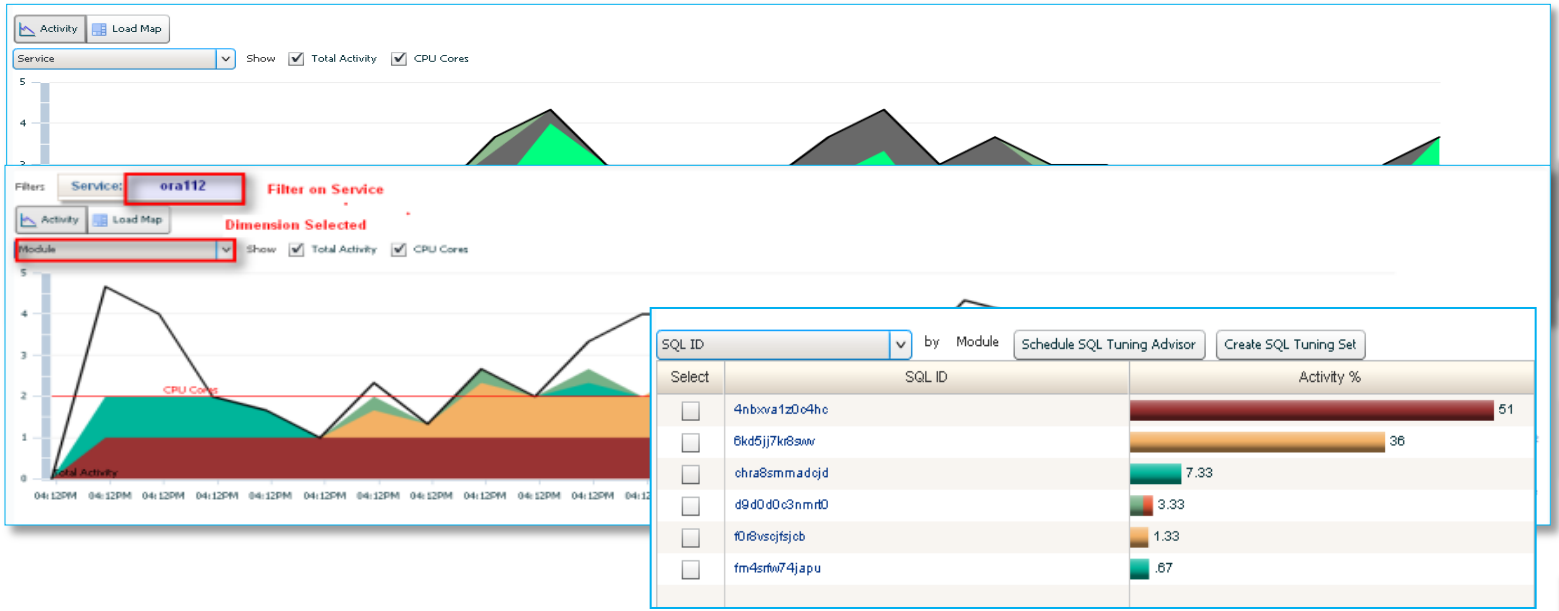
Add Filter

Wait Event

Top SQL

Case Study # 2:

What is eating my DB Time ?



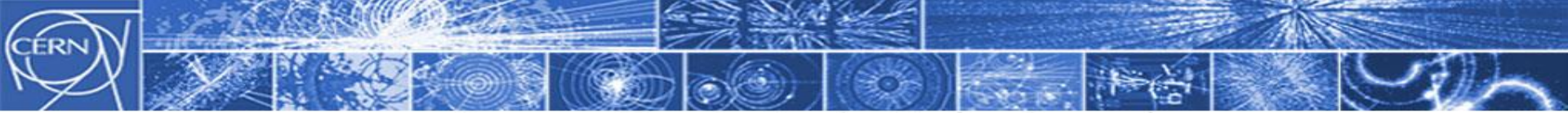
Service

Add Filter

Module

Top SQL

- Slicing the data on services
- Drilldown using the dimension hierarchy module and Top SQL



CERN

European Organization for Nuclear Research
Organisation Européenne pour la Recherche Nucléaire

Enterprise Manager at CERN

Anton Topurov
IT Department

The largest particle physics lab in the world

Annual budget

in 2011
1200 M CHF (1300 M USD)

External funding for experiments

People

2415	Staff
730	Fellows and associates
200	Students
9133	Users
2000	External Firm

Twenty Member States

Austria, Belgium, Bulgaria, Czech Republic, Denmark, Finland, France, Germany, Greece, Italy, Hungary, Netherlands, Norway, Poland,Portugal, Slovakia, Spain, Sweden, Switzerland, United Kingdom

Eight Observer States

European Commission, USA, Russian Federation, India, Israel, Japan, Turkey, UNESCO

The largest particle accelerators

17 miles (27km) long tunnel

Thousands of superconducting magnets

Ultra vacuum:
10x emptier than on the Moon

Coldest place in the Universe:
-271° C

Oracle Enterprise Manager Usage

- Monitoring 1500 targets
  - 190 Oracle Database Instances
  - 69 RAC databases
  - Oracle iAS and Weblogic application Servers
  - Services, etc
- Main Purpose
  - Proactive monitoring
  - Performance tuning

Enterprise Manager Cloud Control at CERN

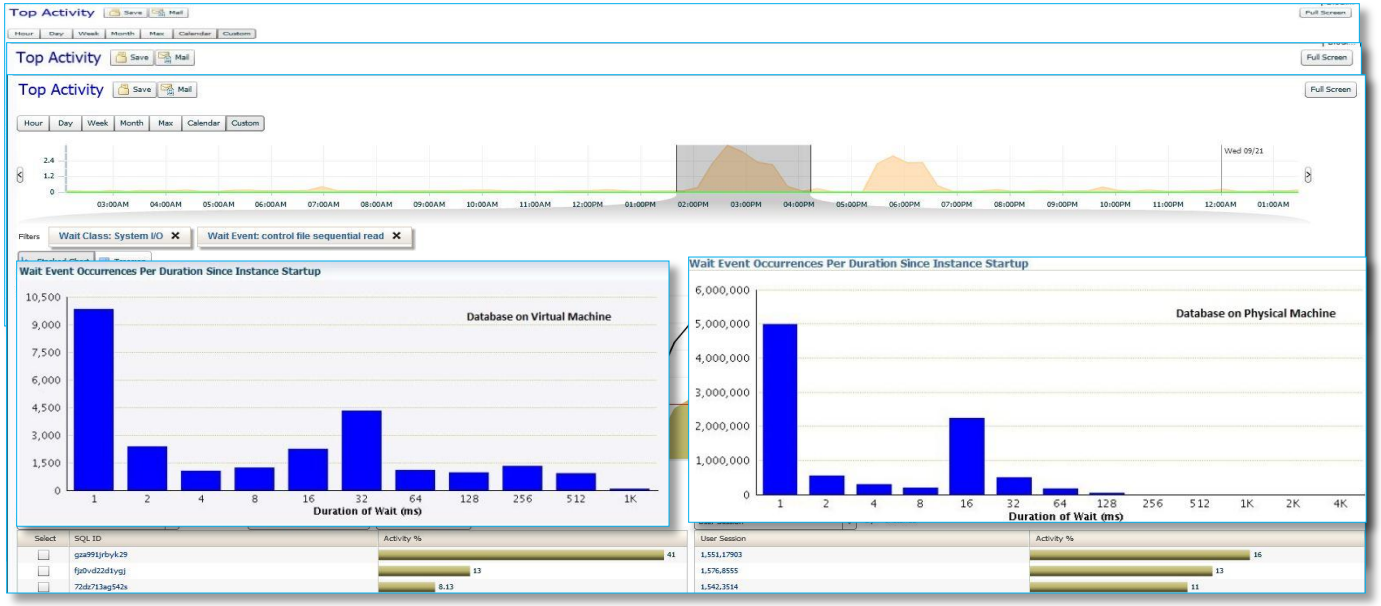
Beta testing at Oracle HQ and at CERN

Several tracks and functionalities

Performance tuning of specific importance

- for our DBAs
- for the developers

Case Study: Slow backup times on VMs



- Sliced the data on RMAN I/O
- Drilling down to corresponding wait event and histograms
- Slow network speed due to MTU 1500 on OVM

Wait Class

↓

Add Filter

↓

Wait Event

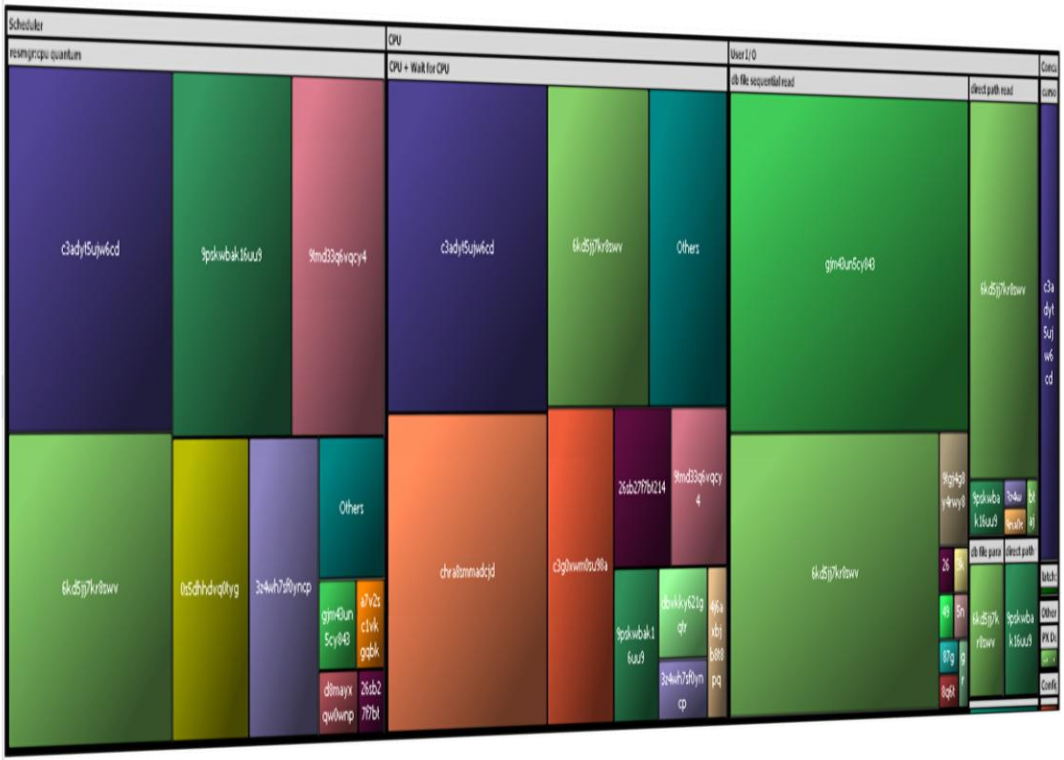
↓

Histogram

Advantages of EM CC 12 for performance tuning

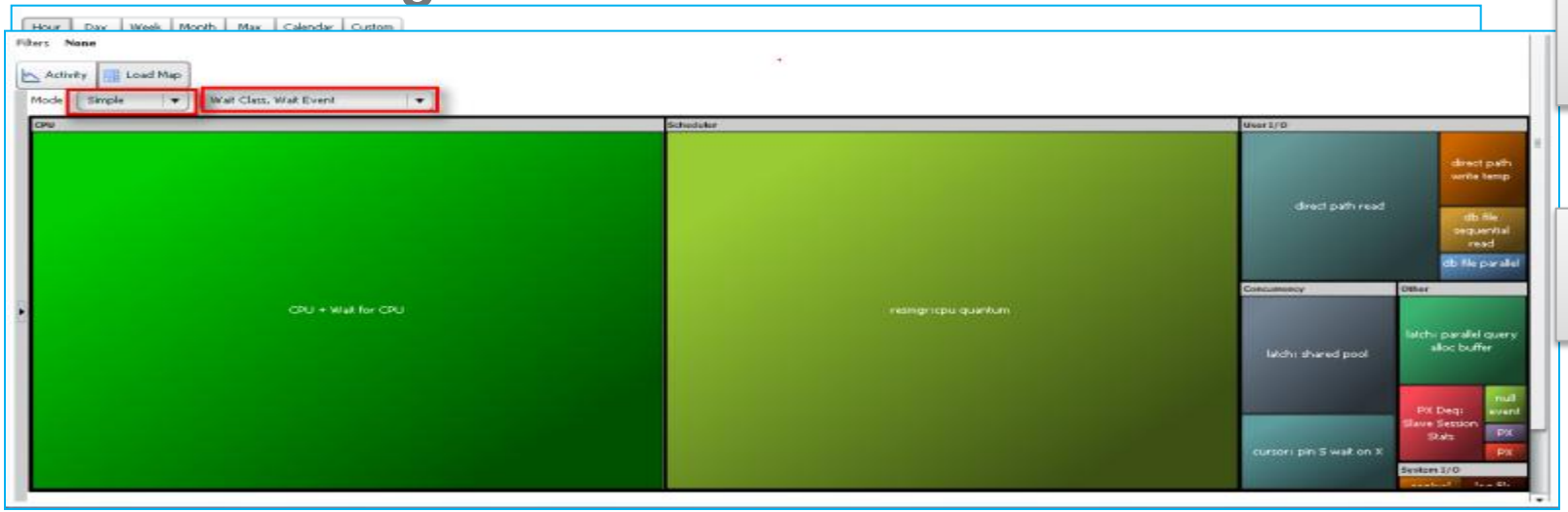
- Interactiveness
  - Lots of dimensions to choose from
- Flexibility
  - Fine-grained sliders
- Active Reports
  - Can involve developers without access to EM system

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

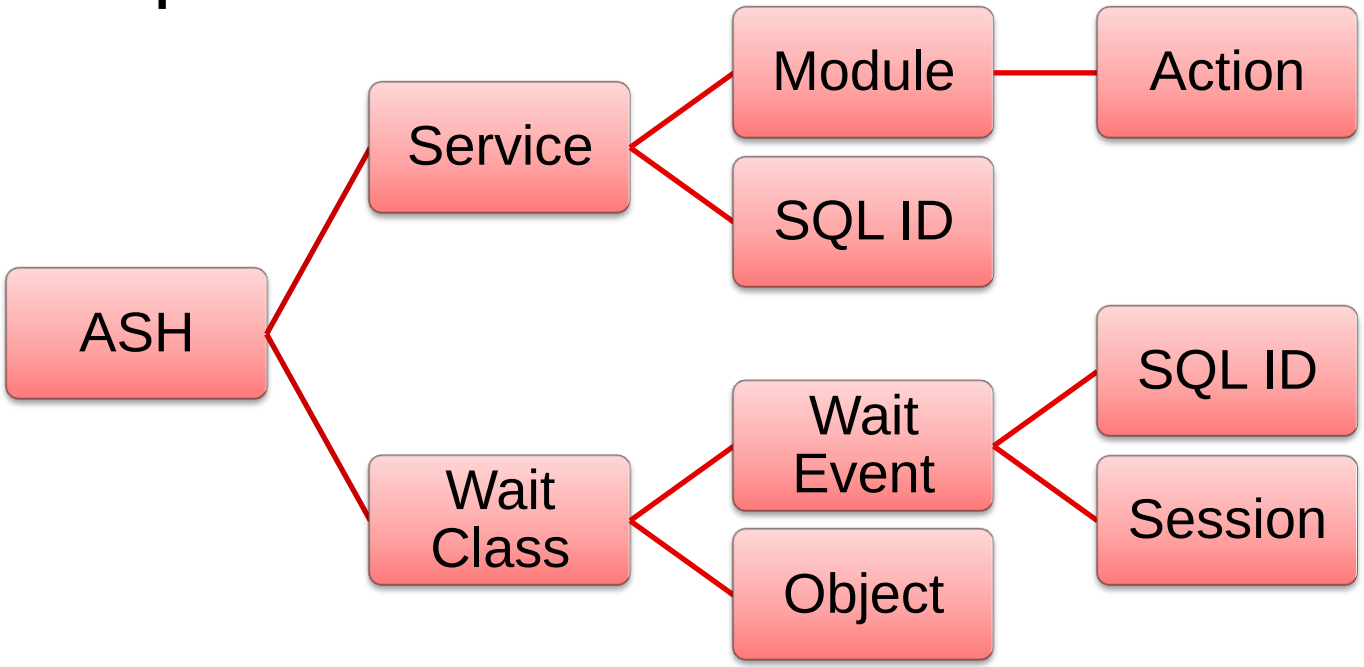


Wait Class

Wait Event

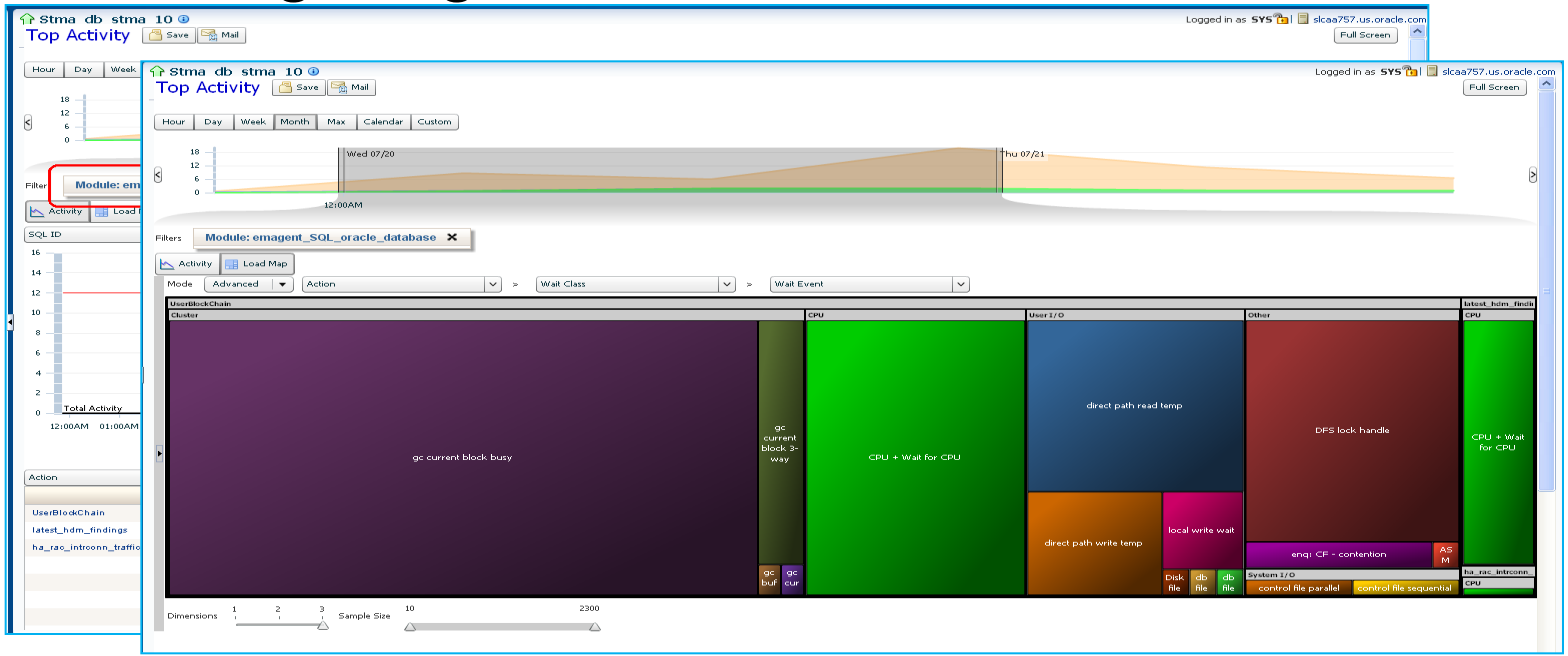
- Default Treemap View displays the Wait class → Wait Event hierarchy for the selected time period
- Size of each rectangle corresponds to the number of samples collected for each wait event

Treemap: Multi-Dimensional View



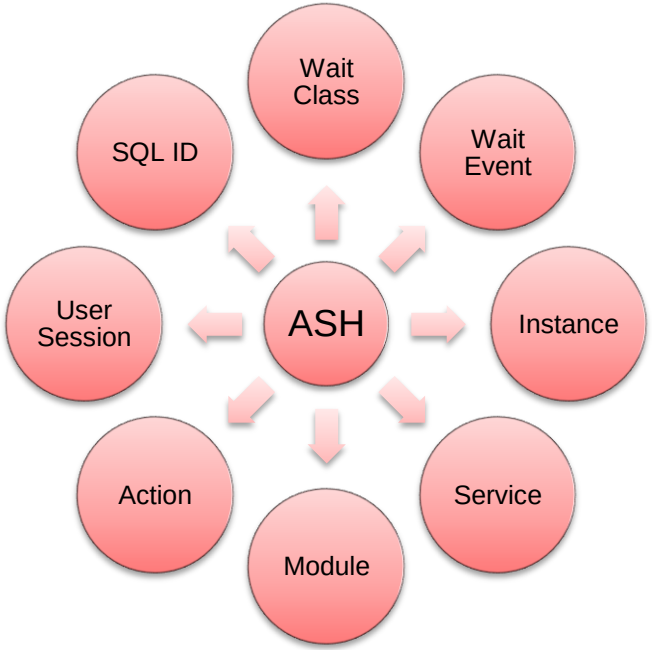
- Several pre-defined 2D & 3D hierarchies to view the data cube
- Ability to create custom hierarchy in advanced mode

Case Study # 4: Analyzing the impact of the Enterprise Manager Agent



- Informative picture of where the measured time is being spent by metric SQL collection on this instance

Advantages of ASH Analytics



- Changeable dimensions everywhere
- Many new dimensions added (e.g. SQL type, client machine, etc)
- Filters – Stay on same page while adding context
- Treemap view – Effective top-list visualization
- Better time picker – Fully changeable slider can select any time period
- Active Report – Will replace ASH Report eventually

Questions