

Oracle Cloud Computing

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## Mixed Workload Management for Oracle Exadata

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Principal Sales Consultant



# Oracle Exadata Database Machine

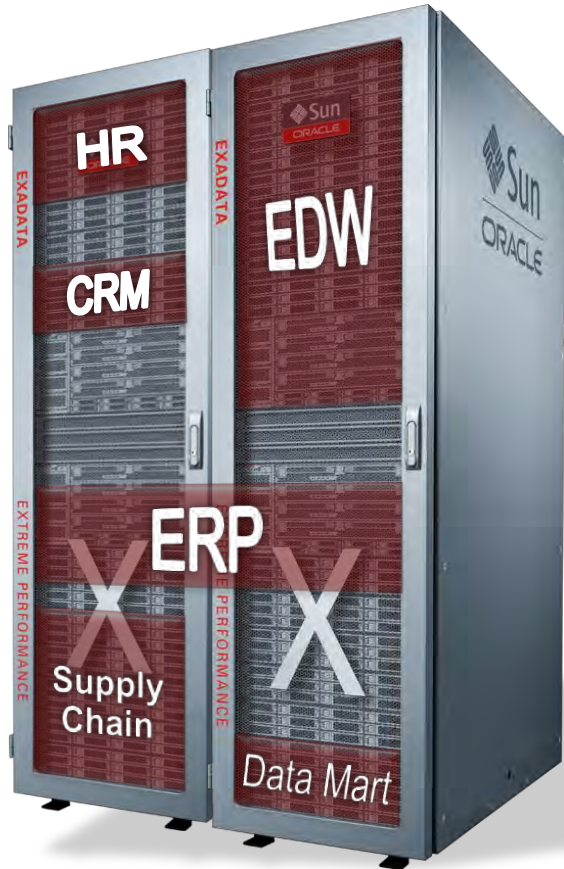
Single shared platform for...



- Data Warehousing
- OLTP
- Database Consolidation

# Enabling Consolidation with Exadata

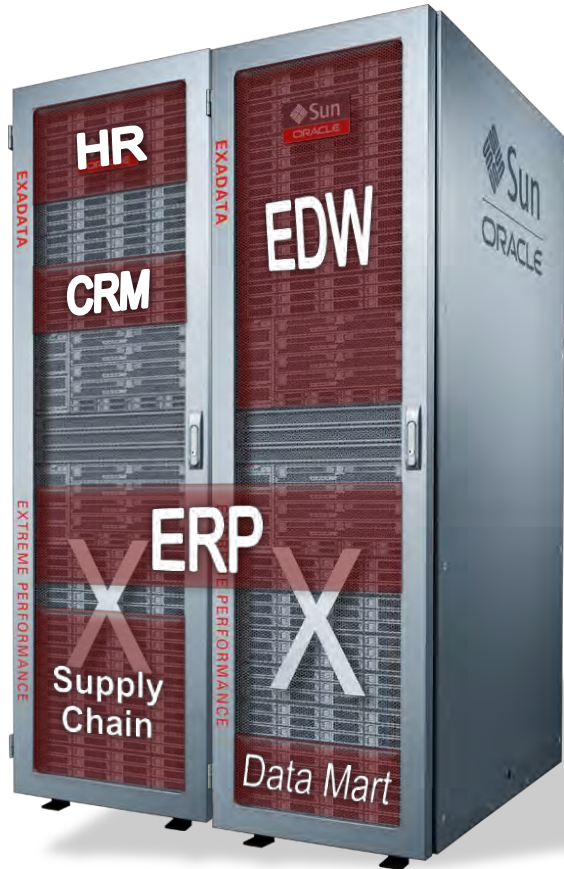
Reduced costs, tighter integration



- Extreme Performance
- Large Memory
- Workload Management

# Workload Management on Exadata

A key requirement for database consolidation



- Instance caging
- Database Resource Manager
- I/O Resource Manager
- Quality of Service

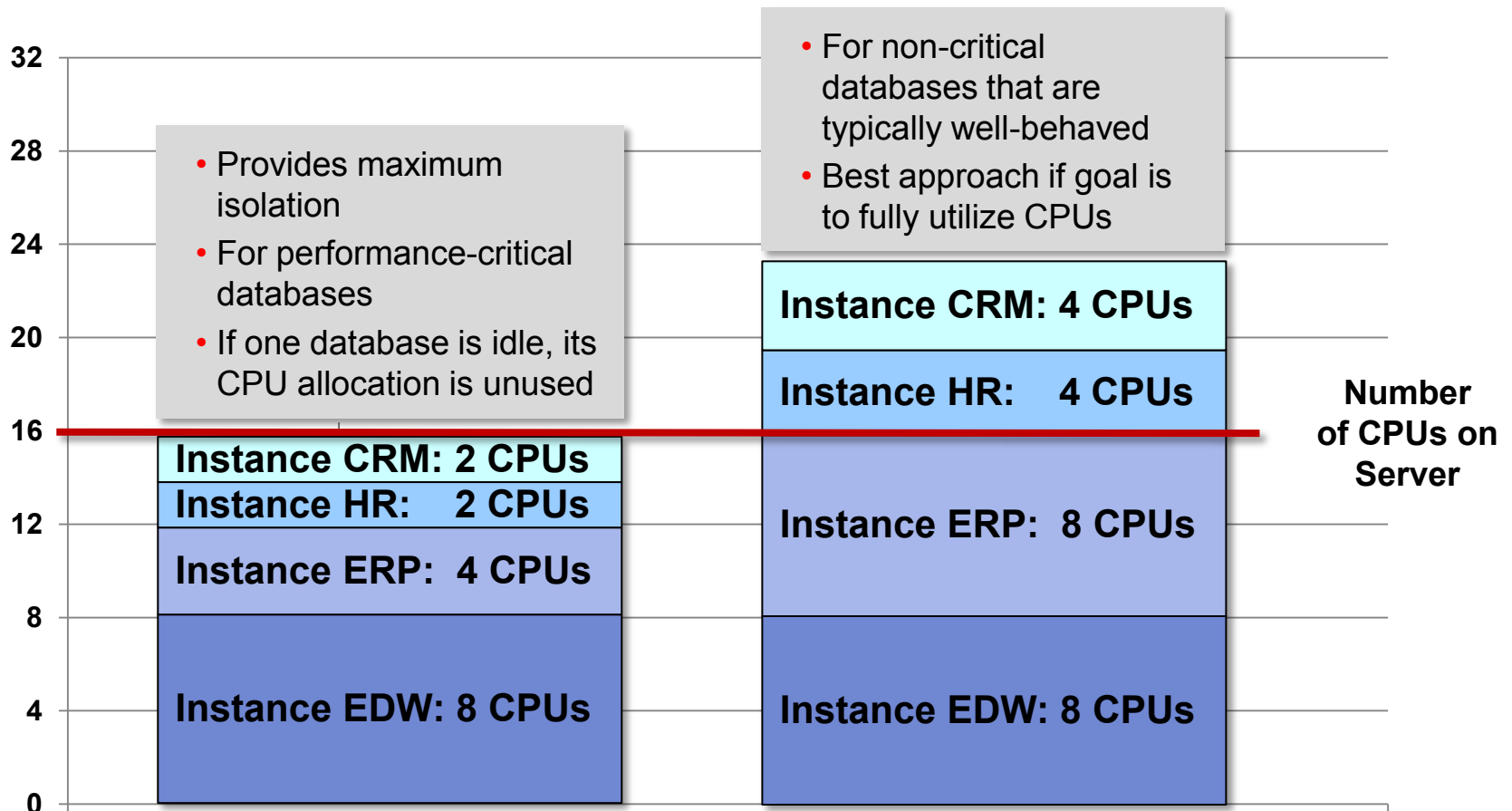
The background is a solid red color. In the upper half, there are several clusters of 3D cubes of various sizes, some of which are semi-transparent, creating a sense of depth and layering. In the lower half, there is a stylized cityscape composed of 3D rectangular blocks of different heights and widths. Some of these blocks have a small orange 'X' mark on their side. The overall aesthetic is modern and geometric.

# Instance Caging

# Instance Caging

## Partitioning Approach

## Over-Provisioning Approach



The top half of the slide features a cluster of semi-transparent, light-colored 3D cubes of various sizes, arranged in a somewhat chaotic but structured pattern against a dark red background. The cubes have a slight glow and are rendered with perspective, giving them a three-dimensional appearance.

# Database Resource Management (DBRM)

# Enabling Resource Management Using Oracle Enterprise Manager

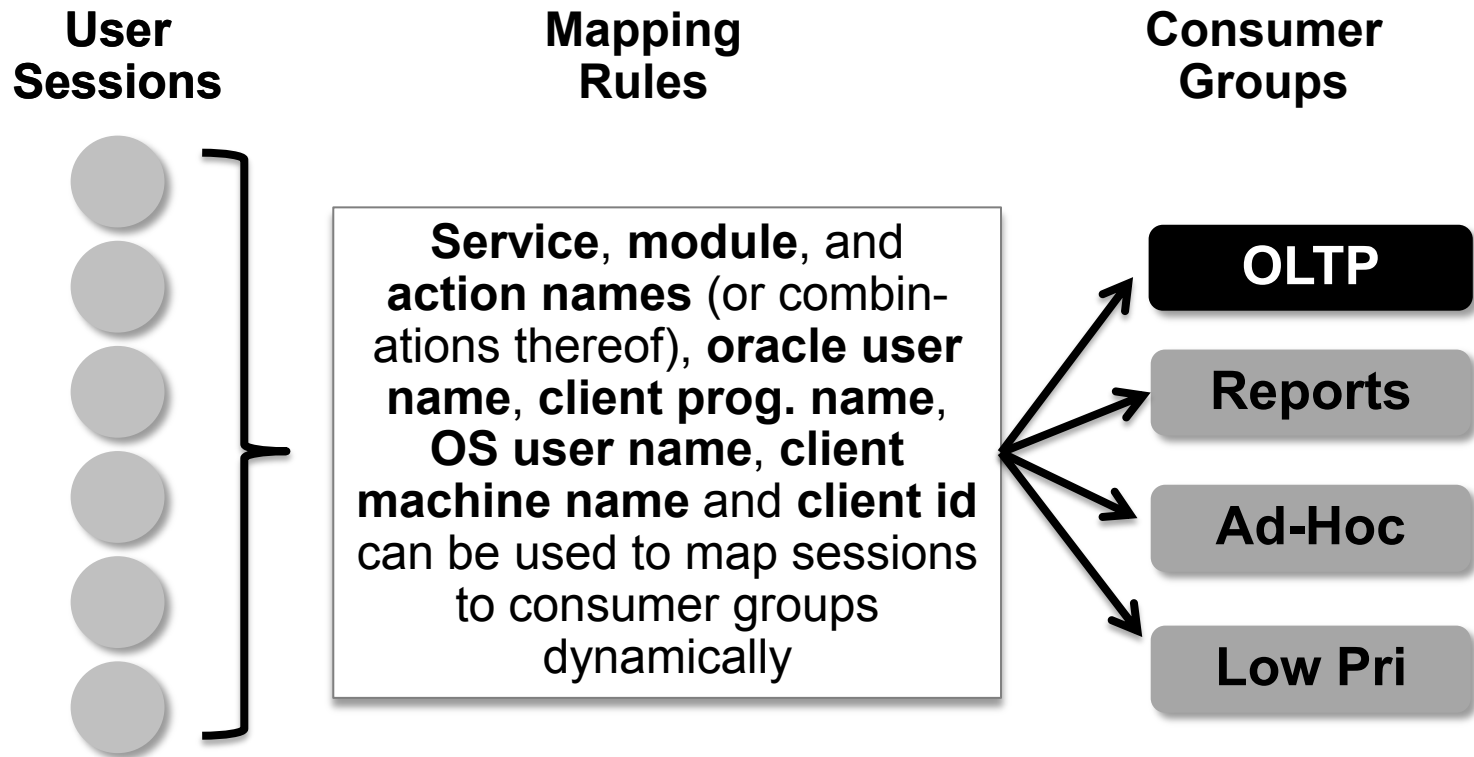
The screenshot displays the Oracle Enterprise Manager 11g Database Control interface. The top navigation bar includes 'Setup', 'Preferences', 'Help', and 'Logout'. The main content area is divided into several sections:

- Storage:** Control Files, Tablespaces, Temporary Tablespace Groups, Datafiles, Rollback Segments, Redo Log Groups, Archive Logs, Migrate to ASM, Make Tablespace Locally Managed.
- Database Configuration:** Memory Advisors, Automatic Undo Management, Initialization Parameters, View Database Feature Usage.
- Oracle Scheduler:** Jobs, Chains, Schedules, Programs, Job Classes, Windows, Window Groups, Global Attributes, Automated Maintenance Tasks.
- Statistics Management:** Automatic Workload Repository, AWR Baselines.
- Resource Manager:** Getting Started, Consumer Groups, Consumer Group Mappings, Plans, Settings, Statistics, Parallel Statement Queue. This section is highlighted with a red circle and a red arrow pointing to a larger, semi-transparent view of the same section.
- Security:** Users, Roles, Profiles, Audit Settings, Transparent Data Encryption, Oracle Label Security, Virtual Private Database, Application Contexts, Resource Manager Security.
- Query Optimizer:** Manage Optimizer Statistics, SQL Plan Control, SQL Tuning Sets.
- Enterprise Manager Administration:** Enterprise Manager Users.
- Related Links:** Access, Alert History, Baseline Metric Thresholds, Jobs, Monitoring Configuration, Scheduler Central, User-Defined Metrics.

The bottom of the interface shows the 'Database' tab selected, with 'Setup' and 'Preferences' also visible. The Oracle logo is present in the bottom left corner.

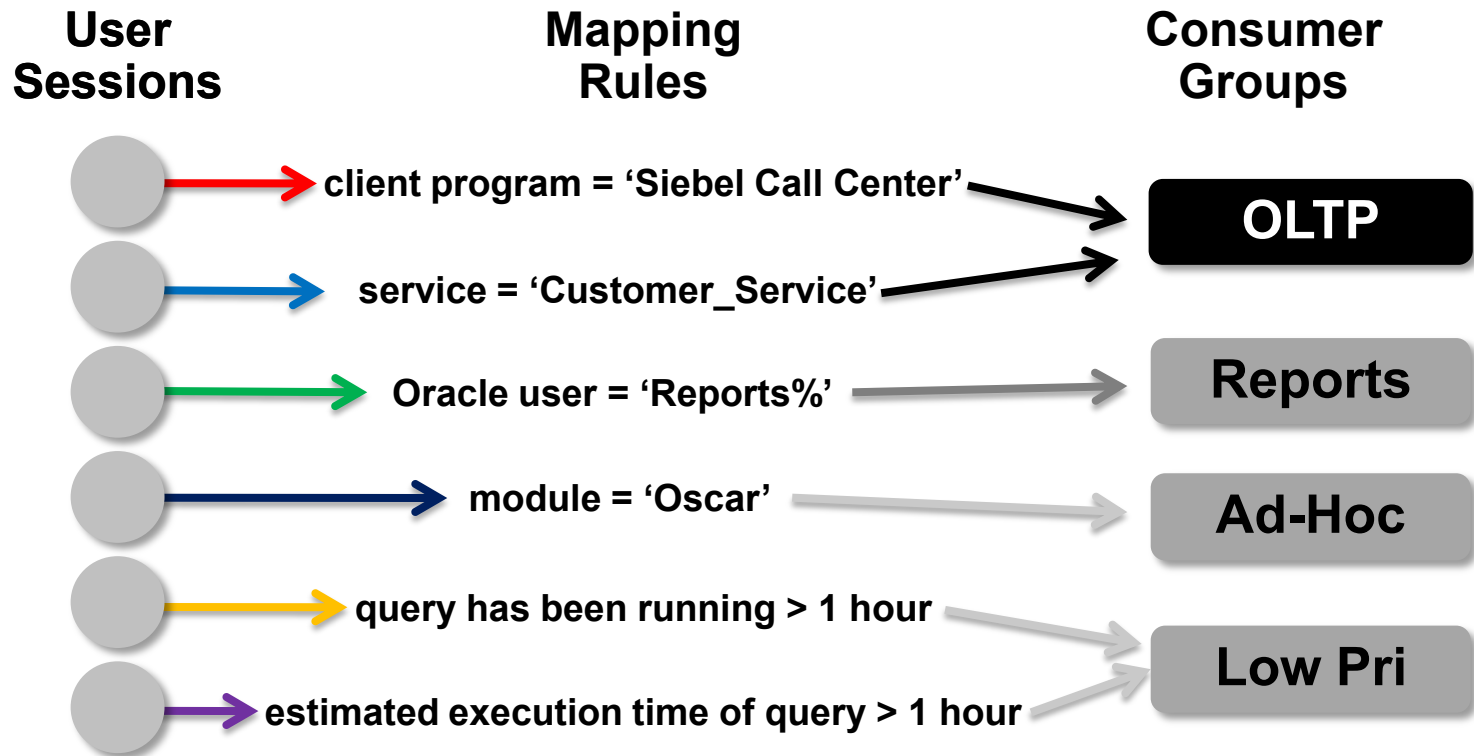
# Resource Management

## Step 1: Create consumer groups and map sessions



# Resource Management

## Step 1: Create consumer groups and map sessions



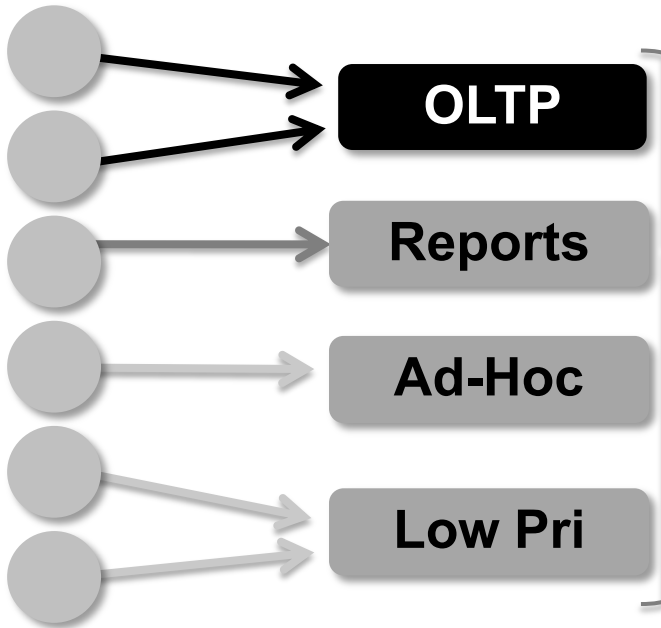
# Resource Management

## Step 2: Create resource plans

User Sessions

Consumer Groups

Resource Plan(s)

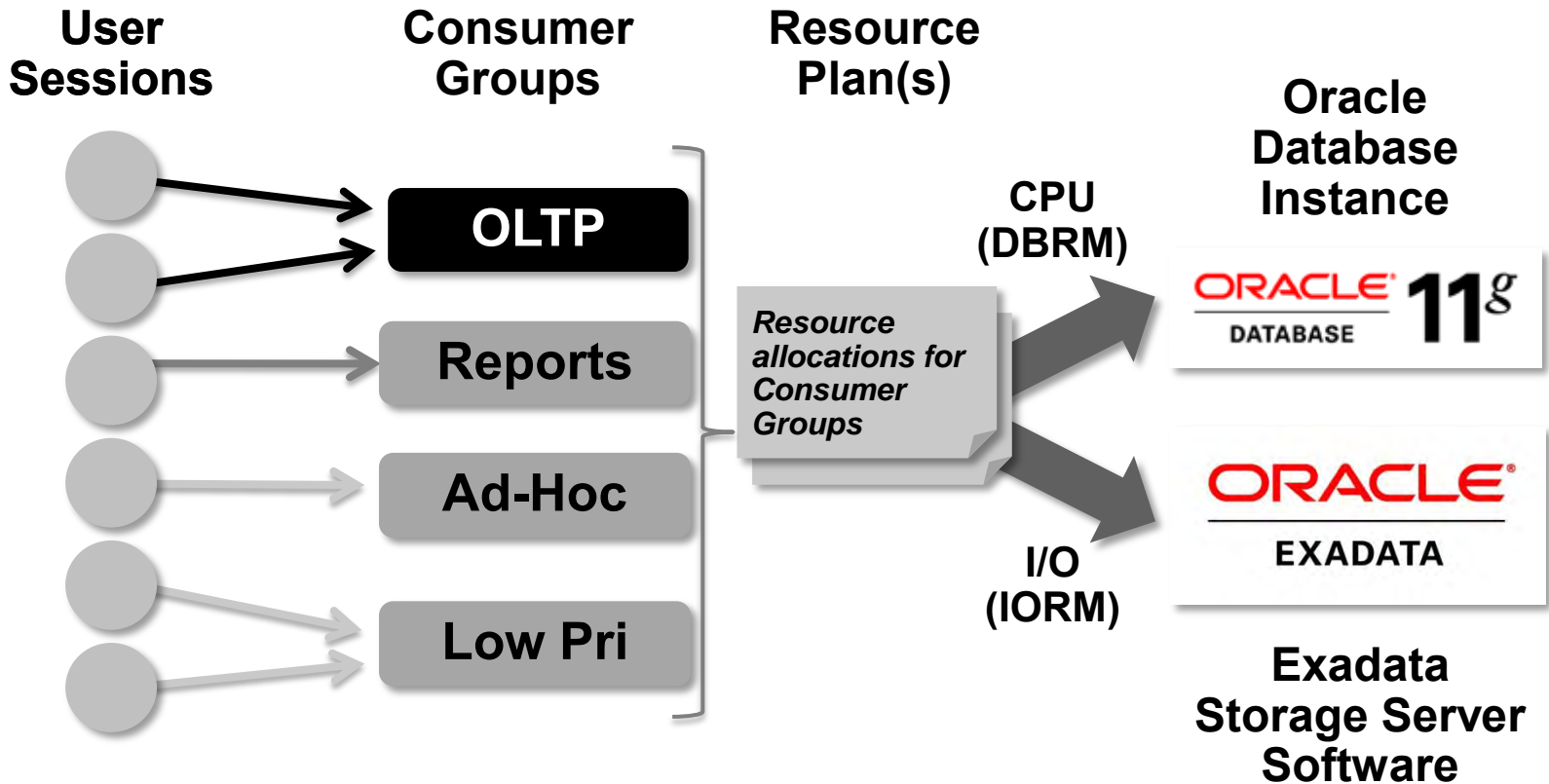


*Resource allocations for Consumer Groups*

Consumer Group	Level 1 Allocation	Level 2 Allocation	Maximum Utilization
OLTP	90%		
Reports		60%	80%
Ad-Hoc	10%	30%	50%
Low Pri		10%	50%

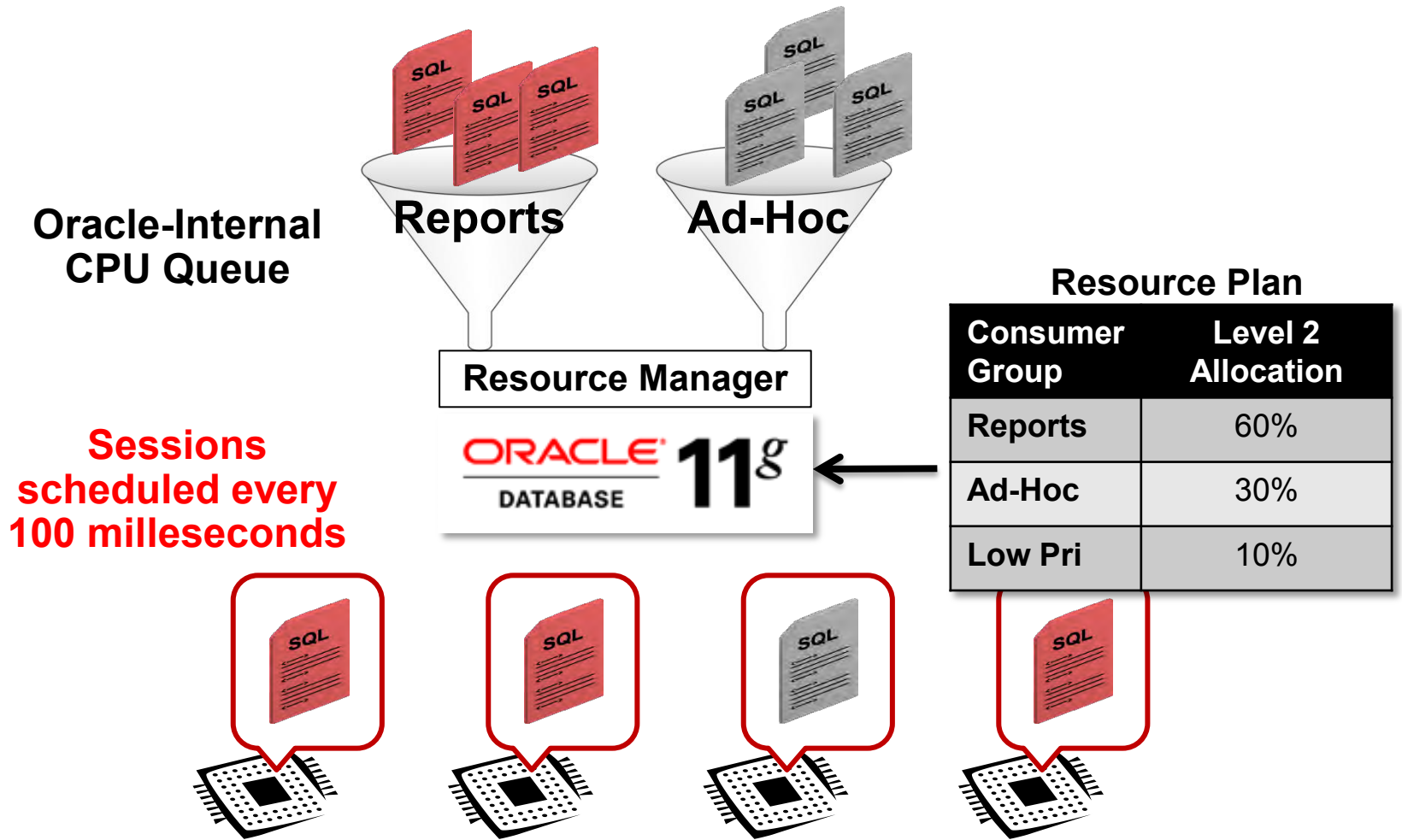
# Resource Management

## Step 3: Enable plans



# Resource Manager Example

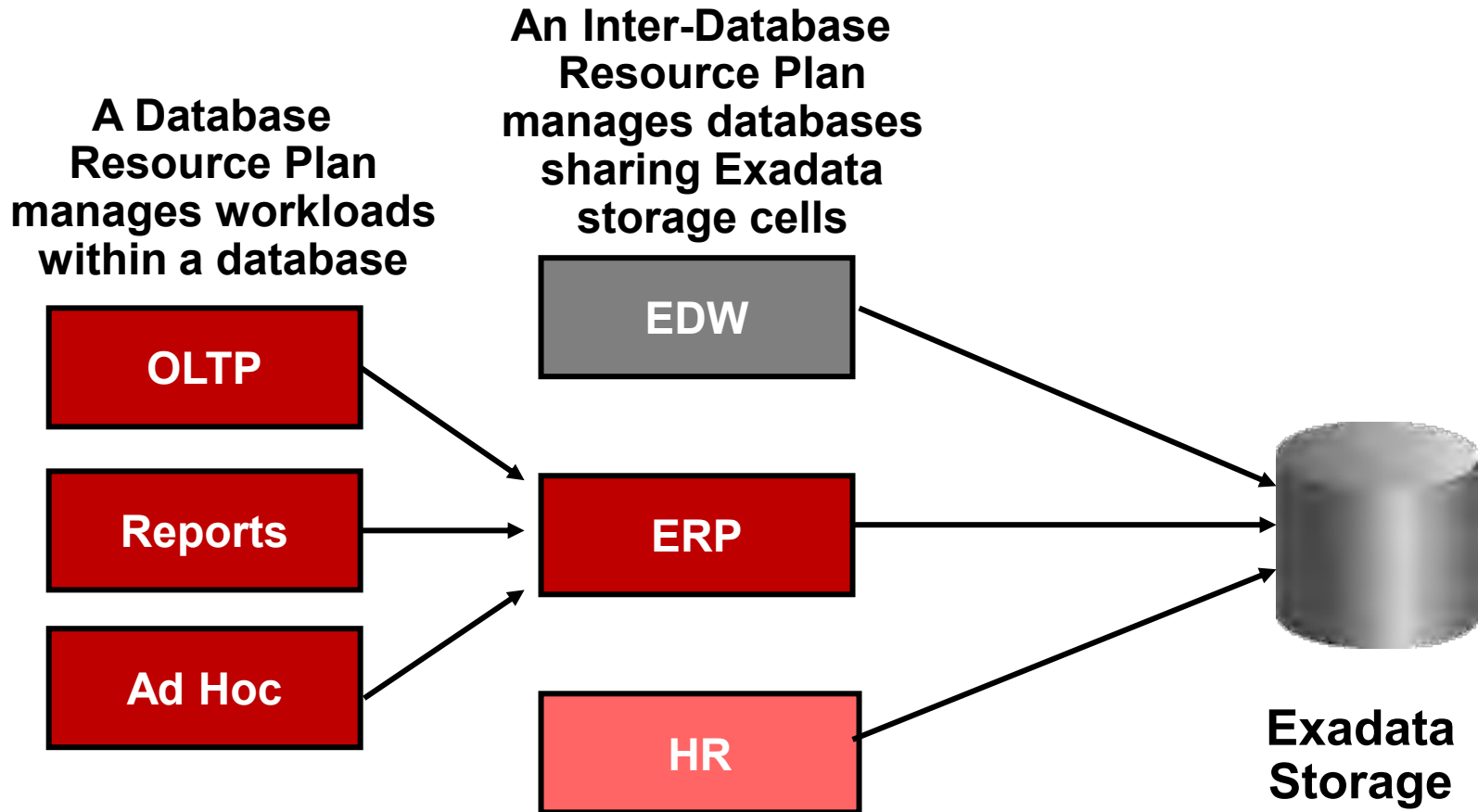
## Prioritizing Level 2 Allocation



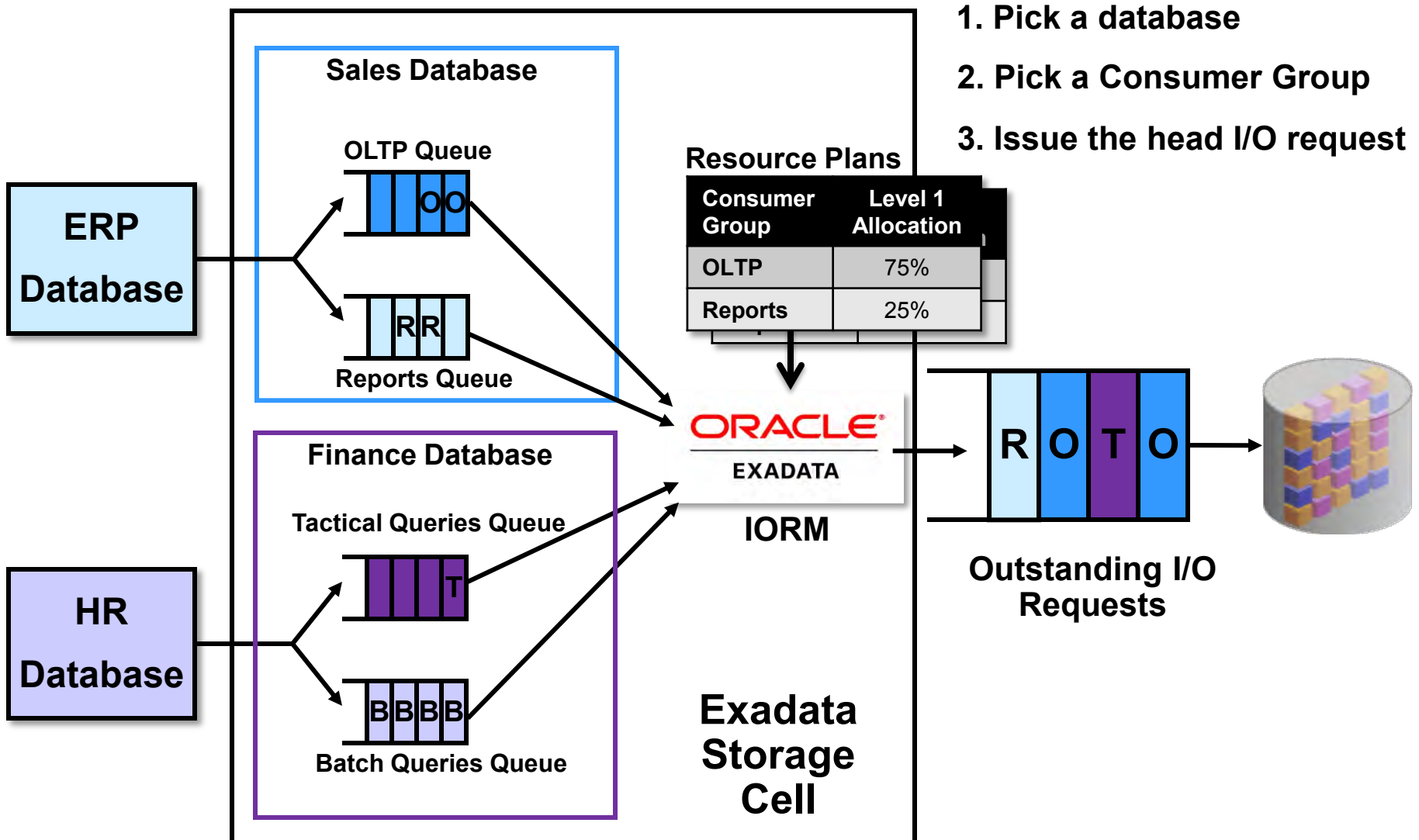
The top half of the slide features a collection of semi-transparent, 3D rectangular blocks of various sizes and orientations, arranged in a somewhat chaotic but structured pattern. The blocks are rendered in shades of light red and white, creating a sense of depth and volume against the dark red background.

# I/O Resource Manager (IORM)

# Exadata I/O Resource Manager



# Exadata I/O Resource Manager



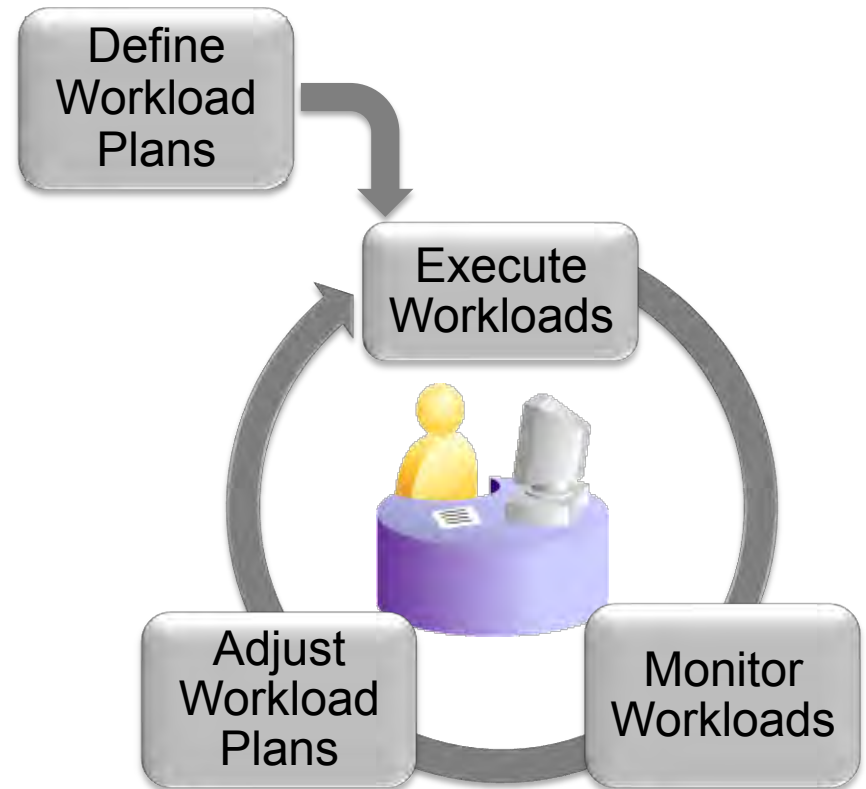


# Quality of Service (QoS)

# Mixed Workload Management

Define, monitor, adjust resource sharing plans

- Define mixed workload plans
  - Set priorities
  - Allocate resources
  - Set thresholds and throttles
- Monitor the workload
- Adjust policies over time
- If using Quality of Service
  - May make recommendations



# QoS Management – Access Page

Cluster: staiv-cluster1

Latest Data Collected From Target Oct 11, 2009 4:46:54 PM PDT Refresh

Home Performance Targets Administration Interconnects Topology

## Server Pools

Manage Server Pools  
Add Server Pool

## Quality of Service Management

Dashboard  
View Performance Class Quality of Service  
Create Policy Set  
Edit Policy Set

## Quality of Service Management

Dashboard  
View Performance Class Quality of Service  
Create Policy Set  
Edit Policy Set

## Resource Types

Manage Resource Types  
Add Resource Type

Home Performance Targets Administration

## Hosts

Name	Status	Clusterware Status	Alerts	Policy Violations	Compliance Score (%)	ASM Instance	CPU Util %	Mem Util %	Total IO/sec
staiv01.us.oracle.com			0 3	5 2 0	76	+ASM1_staiv01.us.oracle.com  0 0	27.23 ✓	64.31 ✓	321.44 ✓
staiv02.us.oracle.com			1 4	5 2 0	76	+ASM2_staiv02.us.oracle.com  0 0	24.85 ✓	56.8 ✓	312.63 ✓
staiv03.us.oracle.com			0 5	5 2 0	76	+ASM3_staiv03.us.oracle.com  0 0	43.24 ✓	70.91 ✓	416.72 ✓
staiv04.us.oracle.com			0 2	5 2 0	76	+ASM4_staiv04.us.oracle.com  0 0	42.53 ✓	64.36 ✓	408.55 ✓

## Related Links

Access  
Blackouts  
Metric Collection Errors

Alert History  
Deployments  
Monitoring Configuration

All Metrics  
Metric and Policy Settings  
Target Properties

Cluster | Database | Setup | Preferences | Help | Logout

# Dashboard

ORACLE Enterprise Manager 11g Setup Preferences Help Logout

Database: Cluster: staiv-cluster

### Performance Overview

This table provides an overview of Performance Class Metrics. Based on the collected metrics, QoS Management identifies a Target Performance Class and provides recommendations to help meet its Performance Objective.

Performance Classes	Server Pools	Rank
<a href="#">salescart_pc</a>	online	Highest
<a href="#">erp_pc</a>	backoffice	High
<a href="#">sales_pc</a>	online	High
<a href="#">hr_pc</a>	backoffice	Medium
<a href="#">Default_pc</a>	backoffice,online	Low

### Performance Satisfaction Metric (Last 5 min)

### Performance Overview

This table provides an overview of Performance Class Metrics. Based on the collected metrics, QoS Management identifies a Target Performance Class and provides recommendations to help meet its Performance Objective.

Performance Classes	Server Pools	Rank	Objective Type	Measure Only	Resource Use vs Wait Time (Last 5 sec)	Performance Satisfaction Metric (Last 5 min)
<a href="#">salescart_pc</a>	online	Highest	Average Response Time			
<a href="#">erp_pc</a>	backoffice	High	Average Response Time			
<a href="#">sales_pc</a>	online	High	Average Response Time			
<a href="#">hr_pc</a>	backoffice	Medium	Average Response Time			
<a href="#">Default_pc</a>	backoffice,online	Low	Average Response Time	✓		n/a

✓ TIP \*\*\* next to Performance Class indicates that QoS Management is making recommendations for that Performance Class at this time

### Recommendations ( less than a minute ago )

Quality of Service Management periodically provides recommendations to help meet its Performance Objective. No action required: all Performance Objectives are being met.

### Recommendations ( less than a minute ago )

Application Quality of Service periodically provides recommendations to help meet its Performance Objective. No action required: all Performance Objectives are being met.

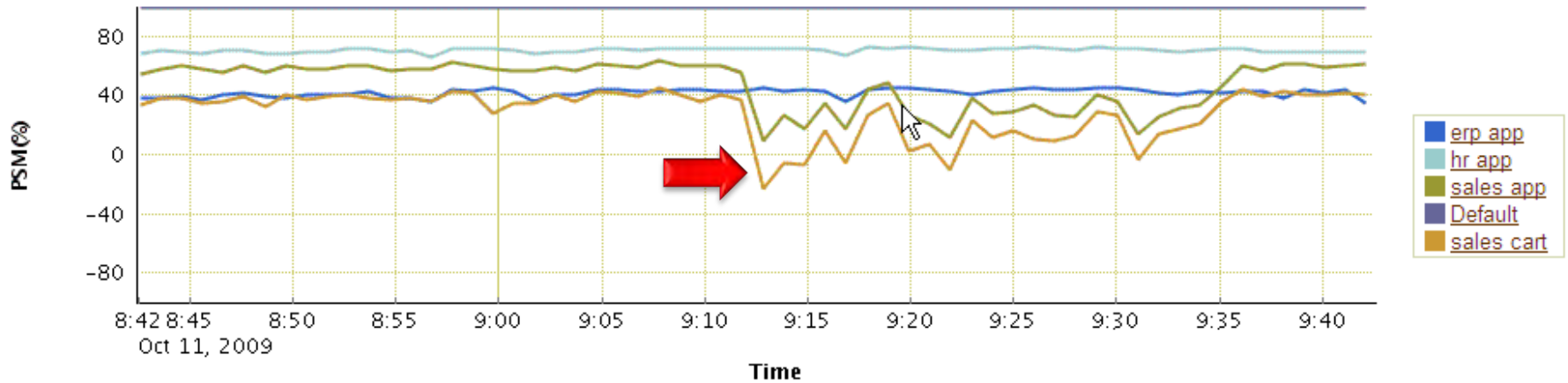
### Resource Wait Times Breakdown

This table provides breakdown of resource wait times by Performance Class. The data can also be used to make manual adjustments to the system.

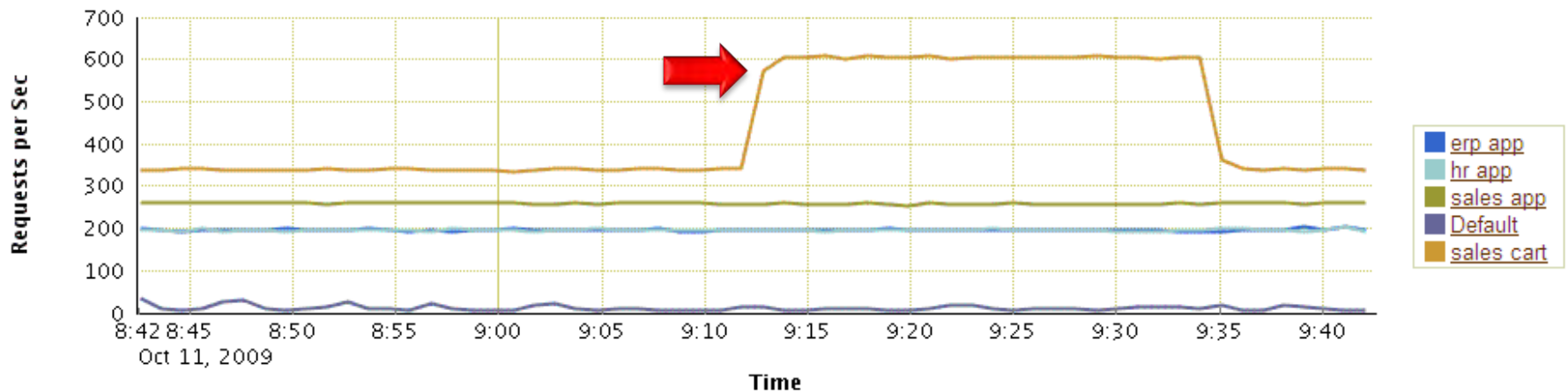
Performance Class/Server Pool	CPU (sec)	Global Cache (sec)	IO (sec)	Other (sec)
staiv-cluster				
▶ salescart_pc	0.007302	0.000000	0.000000	0.001016
▶ erp_pc	0.001466	0.000000	0.000000	0.000238
▶ sales_pc	0.003236	0.000000	0.000000	0.001677
▶ hr_pc	0.001685	0.000000	0.000000	0.000418
▶ Default_pc	0.000557	0.000000	0.000000	0.000149

# Metrics – Sales Cart Demand Surge

## Performance Satisfaction Metric



## Demand



# Dashboard – Sales Cart Demand Surge

Cluster: stajv-cluster >

## Quality of Service Management Dashboard

Latest Data Collected From Target January 8, 2011 11:10:27 PM PST [Refresh](#) View Data Real Time: 15 Second Refresh

This is an overall view of the quality of service being delivered by workloads (performance classes) hosted in this cluster. The status of how these performance classes are doing against their objectives for a particular policy is available at a glance as well as any recommendations to re-allocate resources to address bottlenecks and restore performance. [d](#)

### General

QoS Status [Enabled](#)  
 Current Active Policy [Business Hours](#) [Change Active Policy](#)  
 Performance Class QoS [Details](#)  
 Recommendations [salescart\\_pc](#)

### Performance Overview

This table provides an overview of Performance Class Metrics. Based on the collected metrics, QoS Management identifies a Target Performance Class and provides recommendations to help meet its Performance Objective.

Performance Classes	Server Pools	Rank	Objective Type	Measure Only	Resource Use vs Wait Time (Last 5 sec)	Performance Satisfaction Metric (Last 5 min)
*salescart_pc	online	Highest	Average Response Time			
erp_pc	backoffice	High	Average Response Time			
sales_pc	online	High	Average Response Time			
hr_pc	backoffice	Medium	Average Response Time			
Default_pc	backoffice,online	Low	Average Response Time	✓		n/a

TIP \*\* next to Performance Class indicates that QoS Management is making recommendations for that Performance Class at this time

### Recommendations ( less than a minute ago )

Quality of Service Management periodically provides recommendations to help a Performance Class meet its Performance Objective.

Performance Class to help **salescart\_pc** ( approximately 1 minutes ago )  
 Resource Type to help **online.cpu** ( approximately 1 minutes ago )  
 Recommended Action **Promote salescart\_pc from Consumer Group 2 to Consumer Group 0.**  
[Recommendation Details](#) [Implement](#)



### Recommendations ( less than a minute ago )

Quality of Service Management periodically provides recommendations to help a Performance Class meet its Performance Objective.

Performance Class to help **salescart\_pc** ( approximately 1 minutes ago )

Resource Type to help **online.cpu** ( approximately 1 minutes ago )

Recommended Action **Promote salescart\_pc from Consumer Group 2 to Consumer Group 0.**

[Recommendation Details](#) [Implement](#)

mmendations. The data

# Implement Promote Recommendation

## Recommended Actions

Action Rank 1: Promote salescart\_pc from Consumer Group 2 to Consumer Group 0.

Action Promote salescart\_pc from Consumer Group 2 to Consumer Group 0.

Estimated Time 2 minutes

Rationale All potential single mapping changes have been analyzed. Changes evaluated and rejected are listed below.

Evaluation The beneficiary's PSM value is expected to change by 15.981 percentage points. The sum of all PSM values is expected to change by -6.911 percentage points. This action is a candidate for recommendation.

Performance Class	Performance Satisfaction Metric (Last 5 min)		Average Response Time		
	Projected (%)	Projected Change (%)	Objective Value (sec)	Current Value (sec)	Projected Value (sec)
Default_pc	100	0.0	0.00000	0.00214	0.00255
hr_pc	40	0.0	0.03000	0.01799	0.01799
sales_pc	11	-22.9	0.05000	0.03292	0.04436
erp_pc	53	0.0	0.04000	0.01868	0.01868
salescart_pc	-10	16.0	0.03200	0.04348	0.03572

Implement

## Situation Analysis

# Dashboard – All Is Well Again

ORACLE Enterprise Manager 11g Database Control

Cluster: staitv-cluster >

Cluster Database

## Quality of Service Management Dashboard

Latest Data Collected From Target

This is an overall view of the quality of service being delivered by workloads (performance classes) hosted in this cluster. The status of how these performance classes are meeting their performance objectives and any recommendations to re-allocate resources to address bottlenecks and restore performance. [D](#)

**General**

QoS Status [Enabled](#)  
 Current Active Policy [Business Hours](#) [Change Active Policy](#)  
 Performance Class QoS [Details](#)  
 Recommendations **None**

### Performance Overview

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<a href="#">sales_pc</a>	online	High	Average Response Time			
<a href="#">hr_pc</a>	backoffice	Medium	Average Response Time			
<a href="#">Default_pc</a>	backoffice,online	Low	Average Response Time	✓		n/a

✓ **TIP**™ next to Performance Class indicates that QoS Management is making recommendations for that Performance Class at this time

### Recommendations ( less than a minute ago )

Quality of Service Management periodically provides recommendations to help a Performance Class meet its Performance Objective.  
**No action required: all Performance Objectives are being met.**

### Resource Wait Times Breakdown

This table provides breakdown of resource wait times by Performance Class. For each performance class, the bottlenecked resource is the one that has the most wait time. This data is used by QoS Management to produce Recommendations. The data can also be used to make manual adjustments to the system.

Performance Class/Server Pool	CPU (sec)	Global Cache (sec)	IO (sec)	Other (sec)
▼ staitv-cluster				
▶ salescart_pc	0.005178	0.000000	0.000000	0.000820
▶ erp_pc	0.006163	0.000000	0.000000	0.001291
▶ sales_pc	0.003137	0.000000	0.000000	0.001479
▶ hr_pc	0.005085	0.000000	0.000000	0.001019
▶ Default_pc	0.001295	0.000000	0.000000	0.000520

# Metrics Select

Cluster: staiv-cluster >

## Quality of Service Management Dashboard

Latest Data Collected From Target January 8, 2011 11:25:58 PM PST  View Data Real Time: 15 Second Refresh

This is an overall view of the quality of service being delivered by workloads (performance classes) hosted in this cluster. The status of how these performance classes are doing against their objectives for a particular policy is available at a glance as well as any recommendations to re-allocate resources to address bottlenecks and restore performance.

### General

QoS Status [Enabled](#)  
 Current Active Policy [Business Hours](#)   
 Performance Class QoS [Details](#)  
 Recommendations [More](#)



### Performance Overview

This table provides an overview of Performance Class Metrics. Based on the collected metrics, QoS Management identifies a Target Performance Class and provides recommendations to help meet its Performance Objective.

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<a href="#">erp_pc</a>	backoffice	High	Average Response Time			
<a href="#">sales_pc</a>	online	High	Average Response Time			
<a href="#">hr_pc</a>	backoffice	Medium	Average Response Time			
<a href="#">Default_pc</a>	backoffice,online	Low	Average Response Time	✓		n/a

TIP \*\* next to Performance Class indicates that QoS Management is making recommendations for that Performance Class at this time

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### Resource Wait Times Breakdown

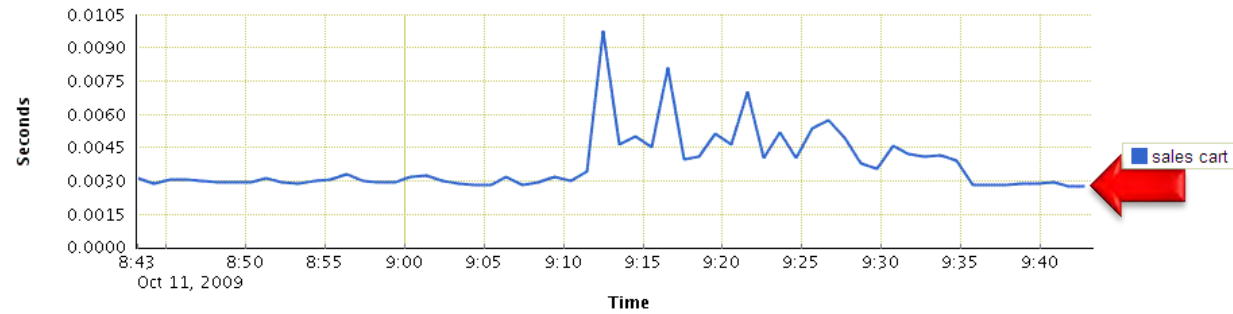
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[Expand All](#) | [Collapse All](#)

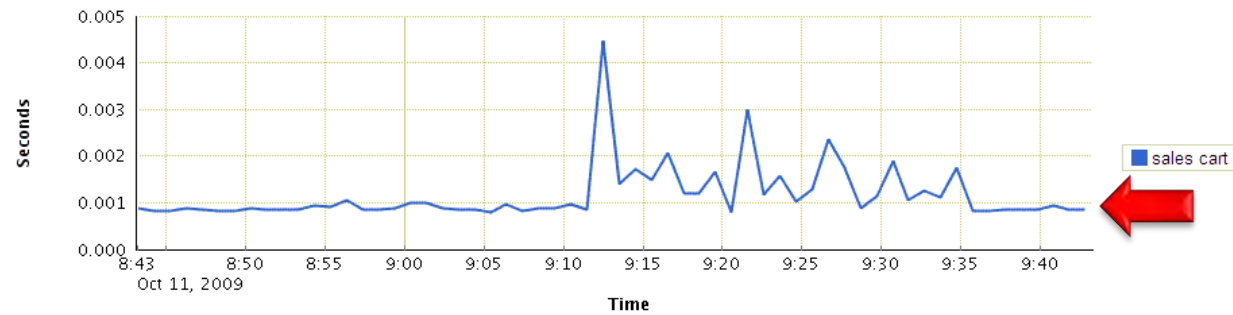
Performance Class/Server Pool	CPU (sec)	Global Cache (sec)	IO (sec)	Other (sec)
▼ staiv-cluster				
▶ salescart_pc	0.005178	0.000000	0.000000	0.000820
▶ erp_pc	0.006163	0.000000	0.000000	0.001291
▶ sales_pc	0.003137	0.000000	0.000000	0.001479
▶ hr_pc	0.005085	0.000000	0.000000	0.001019
▶ Default_pc	0.001295	0.000000	0.000000	0.000520

# Metrics – Sales Cart Performance Class

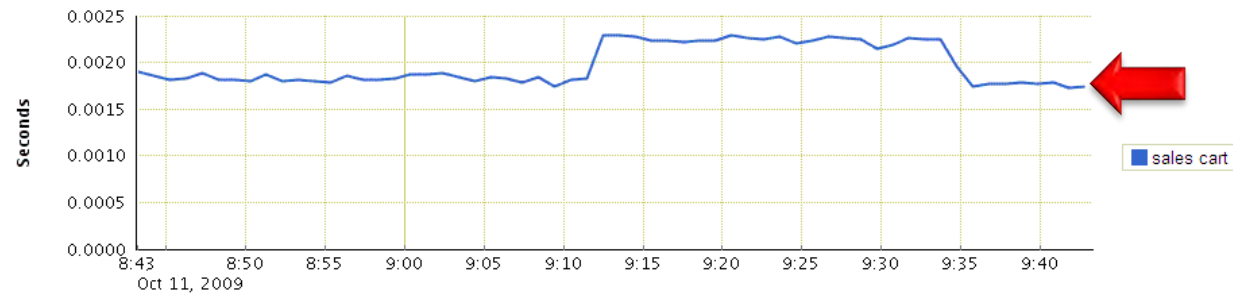
Average Response Time



Resource Wait Time



Resource Usage Time



# Take-Aways

- Workload management essential for consolidation
- For server consolidation
  - Use Instance Caging to distribute CPU among the databases
- For mixed workloads ensure resources are available
  - Database Resource Manager
  - I/O Resource Manager
  - Parallel Statement Queuing
- For storage consolidation
  - Use IORM to distribute disk bandwidth among the databases

# For More Information

<http://search.oracle.com>

or

[www.oracle.com/exadata](http://www.oracle.com/exadata)

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