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Resource
Management of
Consolidated Oracle
Databases on HP-UX

HP World 2001

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Target Problem

The proliferation of servers, each supporting a single Oracle instance has lead to:

- Many underutilized servers
- Others that are beyond capacity
- Cost of administration of all of these servers is sky-rocketing

The Solution

Instance Consolidation

- Run multiple Oracle instances and/or other applications on a single HP-UX server

The Challenge

- Competition for resources - ensuring predictable, consistent performance when multiple DB's and apps share a server

Resource Management Solutions for Oracle on HP-UX

The Problem : Competition
for resources

The Solution :

- Resource Partitioning with HP PRM
- Fine-grained instance management with Oracle Database Resource Manager
- Automatic resource balancing with HP WLM
- Oracle Database performance data collection using the HP ODBTK

Process Resource Manager (PRM)

PRM is a partitioning tool

- Administrator defines:
 - Resource groups
 - Policies for putting processes into groups
 - Resource allocations for each group
- PRM controls:
 - CPU
 - Realm memory
 - Disk bandwidth

HP-UX PRM

Key Features and Benefits of PRM

- Controls allocation of CPU, real memory and disk I/O bandwidth based on user-specified policies.
- Applications do not require modification to work with PRM.
- PRM configuration can be changed at any time - even under load.
- Supports resource policies based on users and applications.

***Enables running multiple, mission critical applications
on a single system.***

Case Study: TPC C and CPU controls

Hypothesis: PRM CPU controls can allocate critical CPU resources to match business goals

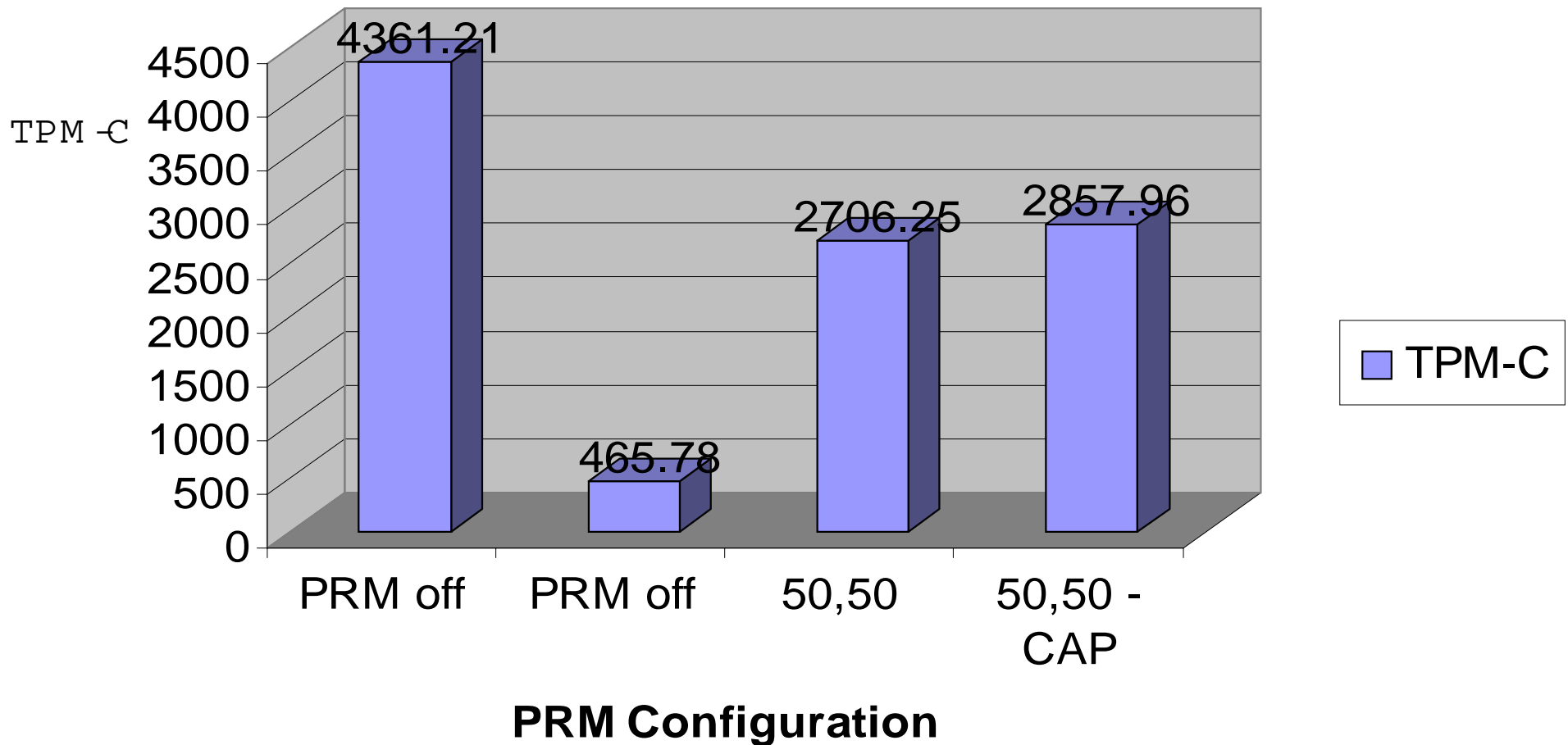
Case Study: TPCC and CPU controls

Procedure:

- Using industry standard TPCC benchmark – measure TPM on lab system
- Introduce additional CPU consumer load and repeat step 1
- Configure PRM CPU controls and resulting TPM
- Repeat step 3 with CPU capping enabled
- Repeat steps 1-4 with two database instances of TPCC

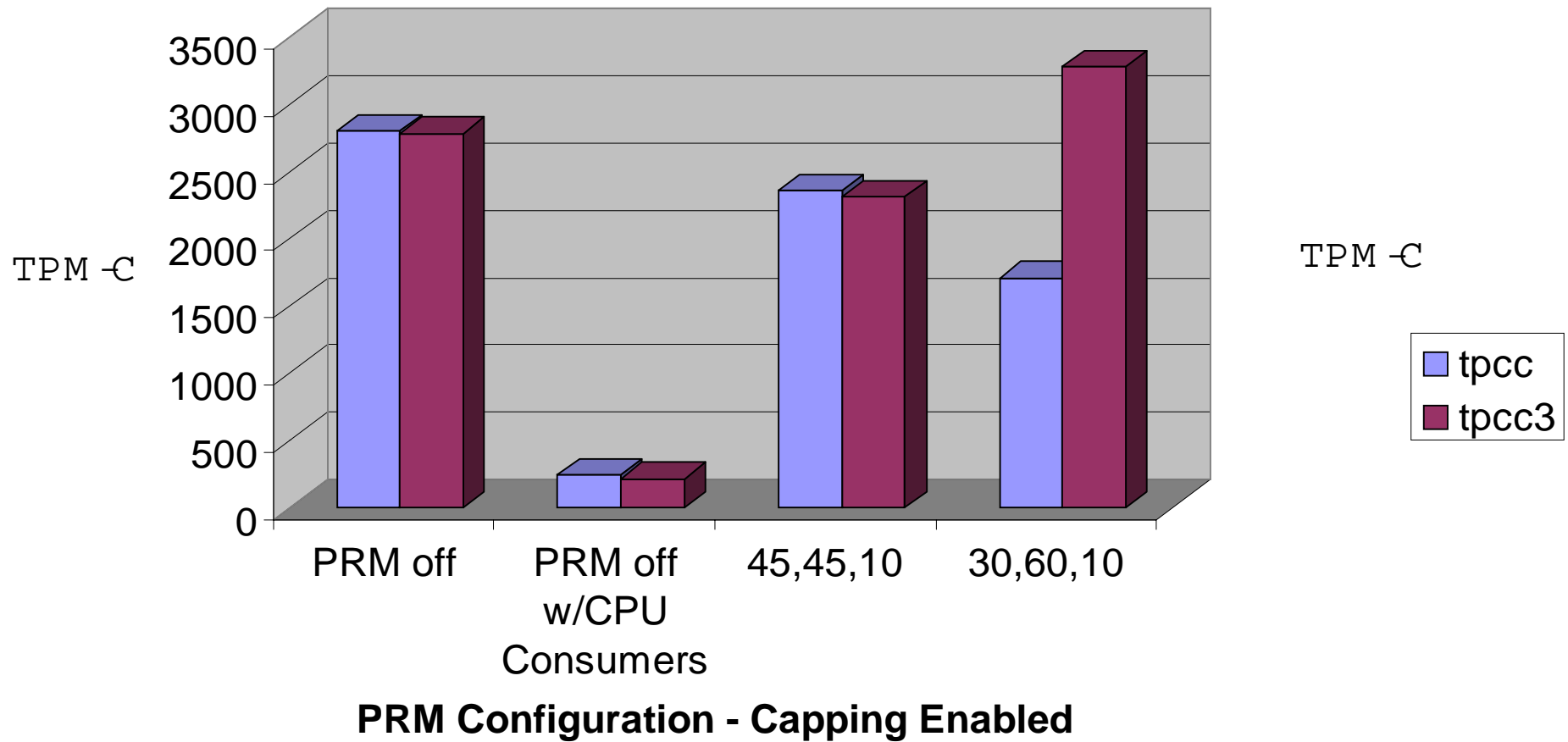
PRM ensures database performs consistently even when other CPU-intensive apps are running on the system

TPCC Single Database



PRM ensures database performs consistently even when other CPU-intensive apps are running on the system

TPCC Multiple Databases



New PRM Features Specifically Designed for Oracle

PRM now uses Memory Resource Groups

- HP-UX 11kernelbased memory management is now supported by Oracle

PRM now supports Processor Sets

- Allows allocation of whole CPU's rather than shares of each CPU
- Provides coordinated management of resources with the Oracle Database Resource Manager

Case Study: Data Mining and CPU versus Memory controls

Hypothesis: CPU controls are not always sufficient to assure application performance is meeting business goals, memory controls are needed

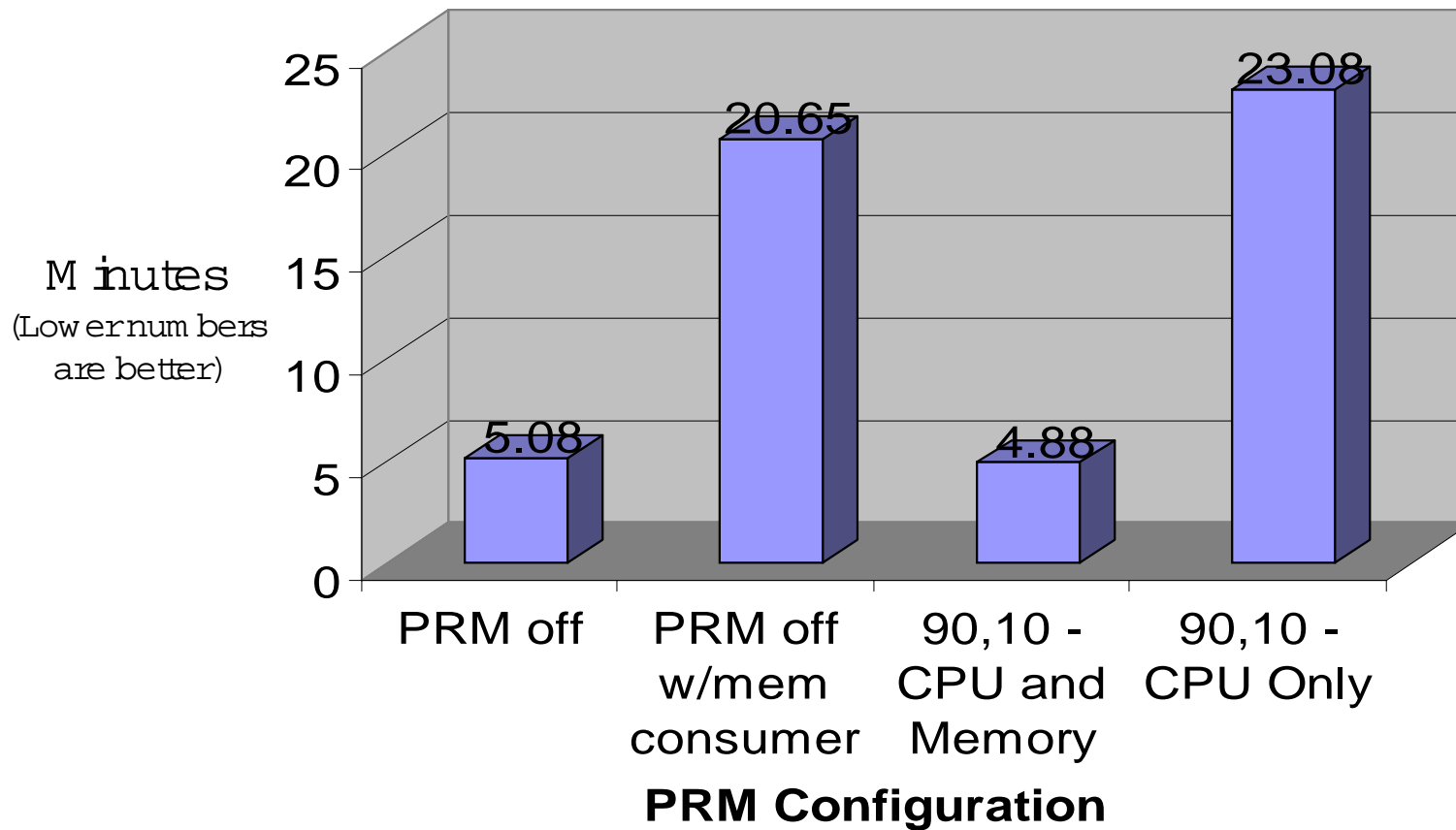
Case Study: Data Mining and CPU versus Memory controls

Procedure:

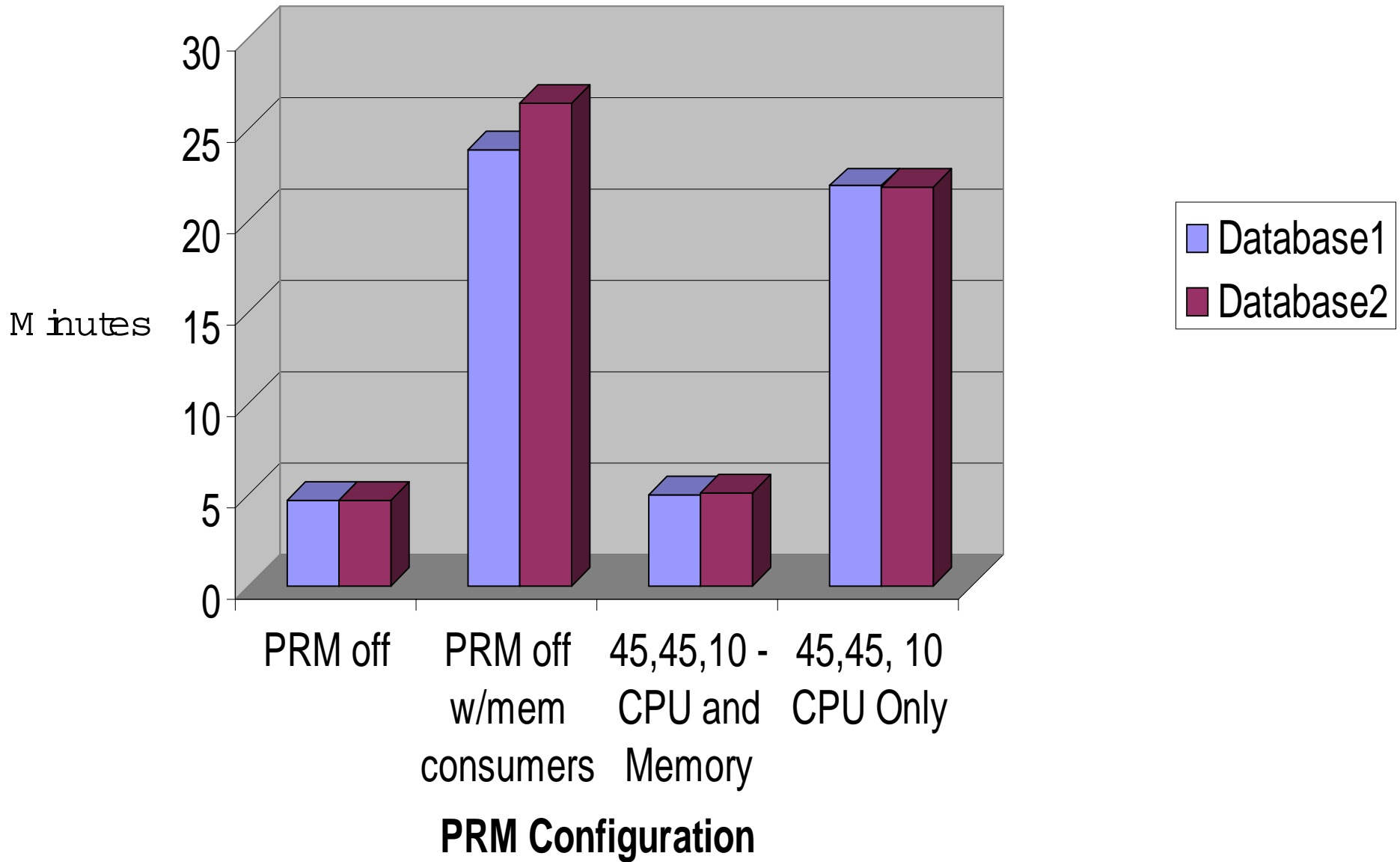
- A benchmark of large database sorts and selects was created to simulate a data mining application
- Repeated TPCC experiment with the exception of introducing memory consumers as well as CPU consumers

For this type of application memory controls are more important than CPU controls

Data Mining Simulation BM



Data Mining Simulation BM Multiple Databases



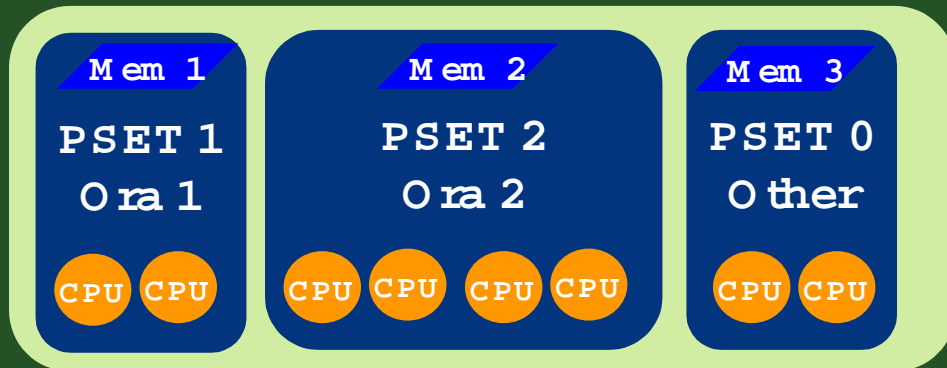
Oracle's Database Resource Manager

Provides fine-grained control of CPU resources within an instance of Oracle

- Users and Apps are assigned to resource groups
- Groups are allocated CPU shares at multiple priority levels
- Can have hierarchical groupings
- Can limit number of active operations
- Can limit execution time of operations

Integrated hierarchical management of Oracle on HP-UX

WLM adjusts pset sizes automatically
PRM slices box



ODBRM
manages
instance

ODBRM
manages
instance

WLM
Manages
pset



HP 9000 Server



Processor set defined by PRM



Memory allocated by PRM

PRM or WLM cooperate with
Oracle 9iDB Resource
Manager to manage system
resources

WLM provides sophisticated
resizing of psets to meet
database service objectives

Result: HP 9000 is the ideal
Oracle consolidation platform

HP-UX Workload Manager (WLM)

HP-UX WLM is a state
of the art dynamic
workload manager for
HP-UX Servers

- It automatically adapts the PRM configuration based on what's happening on the server
- Will offer automatic vPar resizing
- Will offer automatic PSET resizing

*WLM helps you fully achieve
the benefits of consolidation*

WLM Benefits

Maximized utilization of system resources while maintaining performance goals of highest priority applications

Cost Containment Through:

- Prioritized sharing of system resources among various applications
- Reduction in the requirement for separate servers for every application
- Reduction in the requirement for dedicated spare systems

Response-time goals

A Service Level Objective can contain a response-time goal

Example: A query to retrieve a customer record must complete in less than 5 seconds

Several interfaces are available to collect the response time data, including the Oracle Database Toolkit

WLM Database Toolkit for Oracle

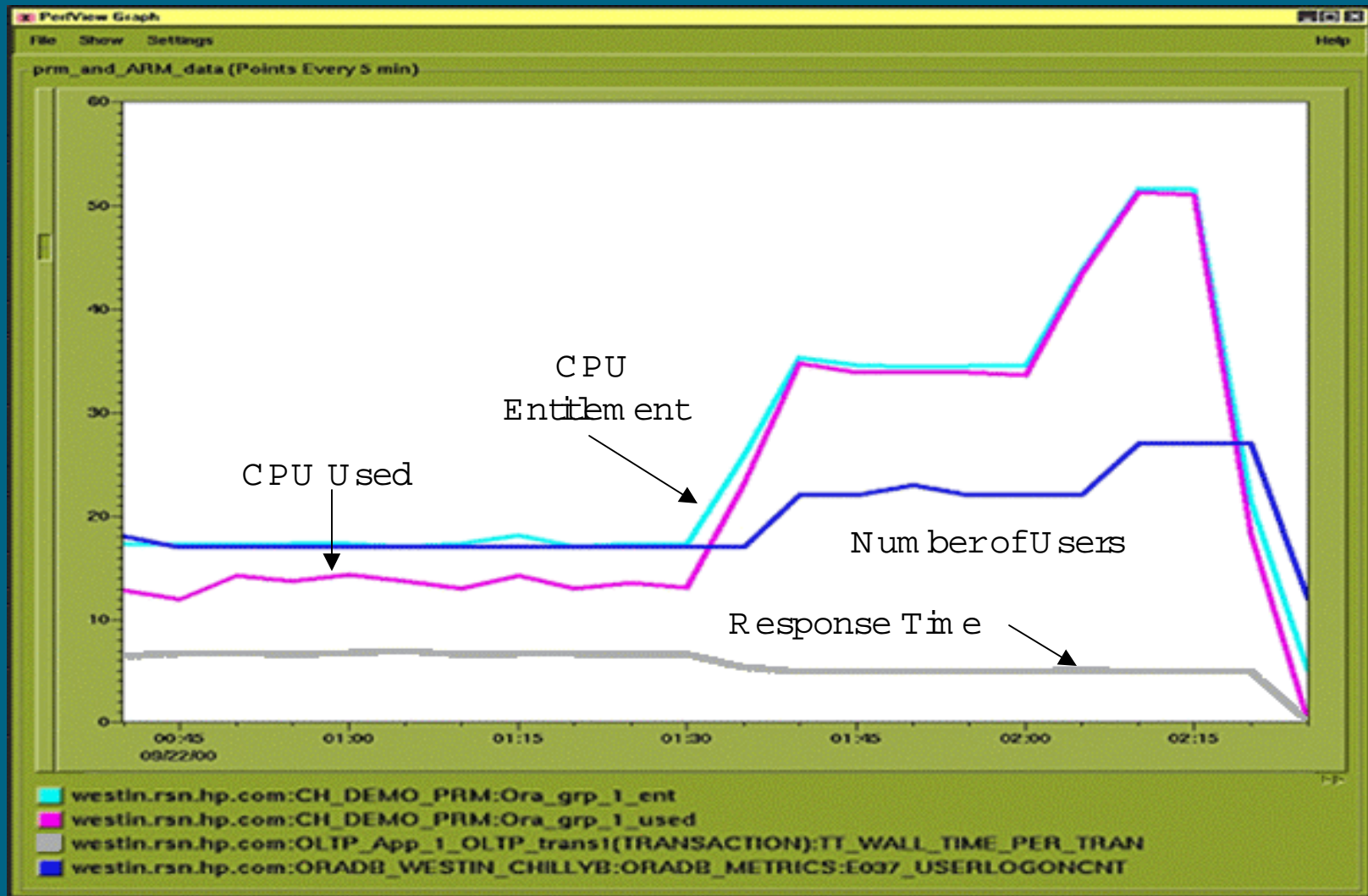
Objectives:

- Leverage capabilities of WLM :
 - Goal based resource management
 - Dynamic allocation of system resources
- Out-of-the-box integration of WLM with Oracle DB
 - Create a toolkit to make it easier to deploy WLM
 - Enable customers to extract performance & other pertinent information from the database
 - Eliminate end user development
- Enhance the Total Customer Experience

Database Toolkit Features

- Tim ed SQL - Run a set of SQL statem ents and pass the execution tim e into W LM .
- Value SQL - Run a set of SQL statem ents to extract perform ance inform ation and pass the resultant value into W LM
- Exam ples - SQL and W LM config files

Dynamic Resource Policies using HP-UX WLM



Example: RealData - allocating CPU based on number of users

Customer Scenario:
foo.com

There are multiple Oracle instances and you have high and low priority users of a particular database instance

- Use PRM to allocate CPU resources to each instance using PSETs
- Use the Oracle Database Resource Manager to control the users access to each instance

Customer Scenario:
bar.com

You have multiple Oracle instances that have varying loads

- Use WLM with the ODBTK to adjust the resources available to each instance based on the current load

Customer Scenario: YourSP, Inc.

You are consolidating Oracle instances and you have Service Level Agreements with your customers

- Use WLM to isolate each instance
- Use the ODBTK to collect performance data for each instance
- WLM will ensure that resources are applied to meet the most high priority SLO's

Customer Scenario: MegaCorp

Two groups/apps
accessing the same DB
instance on a shared
server

- Put DB Server in a PRM PSET group and use Oracle Database Resource Manager to control app access to the DB resources
- Place the two clients in separate PRM groups (PSET or FSS groups)

Summary

HP-UX provides the best consolidation platform for Oracle databases – no other Unix vendor comes close

- PRM for Resource Partitioning
- Oracle Database Resource Manager for instance control
- HP WLM for dynamic resource control
- WLM ODBTK for resource data collection

More information

On the web:

- www.hp.com/go/wln

or email:

- wlnfeedback@rsn.hp.com



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