Resource Partitioning Using HP PRM

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HP-UX Process Resource Manager (PRM)

The Problem: Competition for Resources

The Solution: PRM

What is PRM?

PRM is a partitioning tool

- PRM controls:
  - CPU
  - Real memory
  - Disk bandwidth

How PRM Works

- Lets *YOU* control how system resources are allocated to users and applications
- System Administrator defines:
  - Resource groups
  - Policies for putting processes into groups
  - Resource allocations for each group
- Every process on the system belongs to one of the defined resource groups
- Each resource group is assigned an entitlement for the resources managed by PRM
- Processes in a resource group share the group's entitlements
- Supports resource policies based on users and applications
- Applications do not require modification to work with PRM
- PRM configuration can be changed at any time - even under load

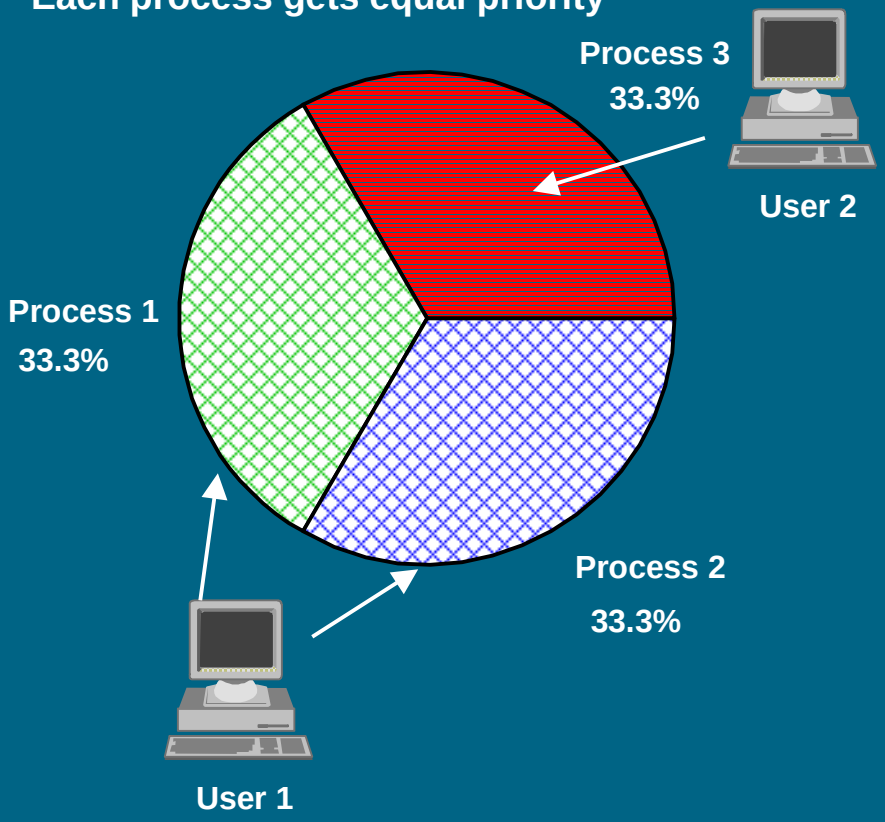
PRM Features

- Resource shares
- Hierarchical Groups
- Memory resource groups
- Processor sets
- Supports capping of CPU and Memory
- Manages multiple instances of databases (Oracle, Sybase, Informix)
- Integrated with HP ServiceGuard and GlancePlus
- Reporting of PRM data to other enterprise apps via SNMP
- GUI for managing PRM configuration
  - Java-based – can run on HP-UX or Windows
  - Can manage multiple PRM installations with single GUI instance
- PRM CPU controls are also available on Linux – see InterWorks presentation 018 "Plug-in Scheduler Policies for Linux" for details

The PRM CPU Advantage

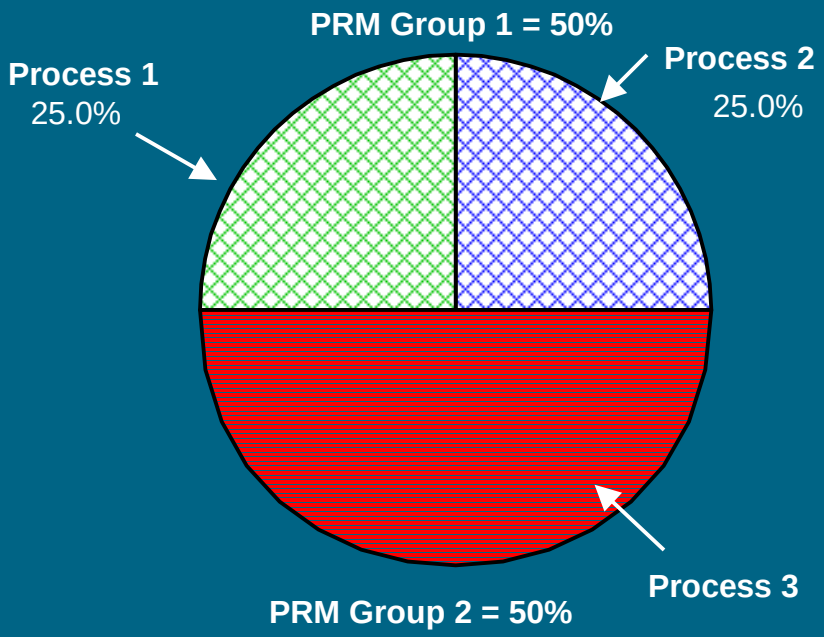
Standard UNIX Scheduler

Priority is lowered as processes consume more and more CPU
Each process gets equal priority



PRM Scheduler with HP/UX

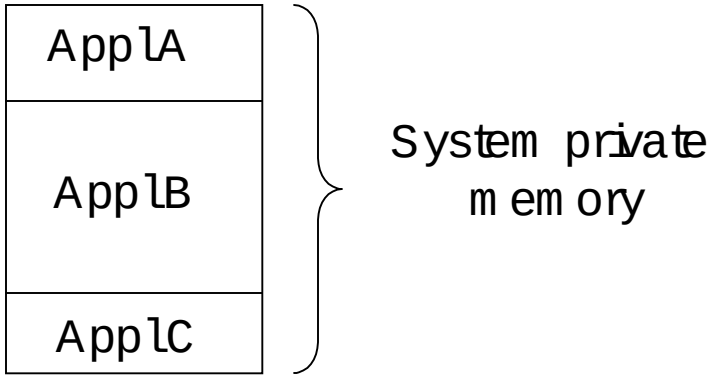
Predictably allocates and controls CPU usage



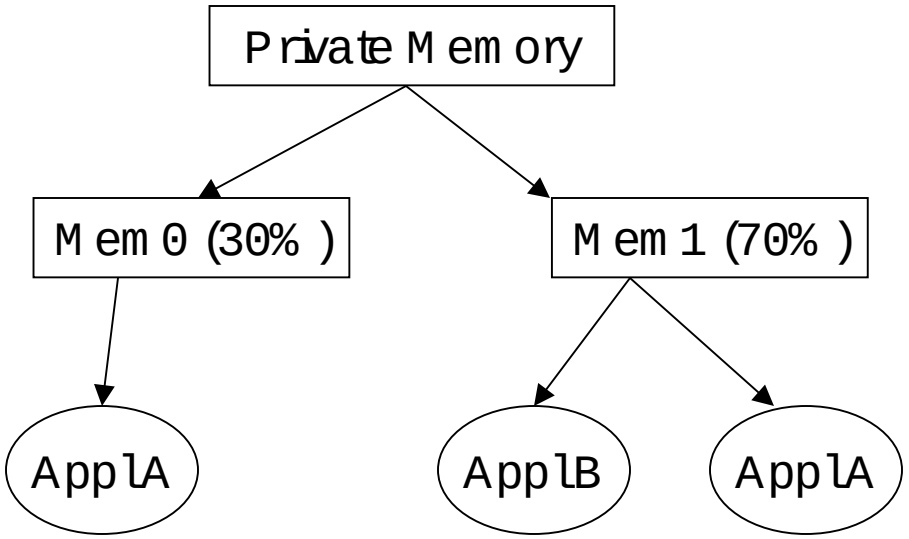
PRM Memory Management

Standard HP-UX VM vs. PRM Memory Management

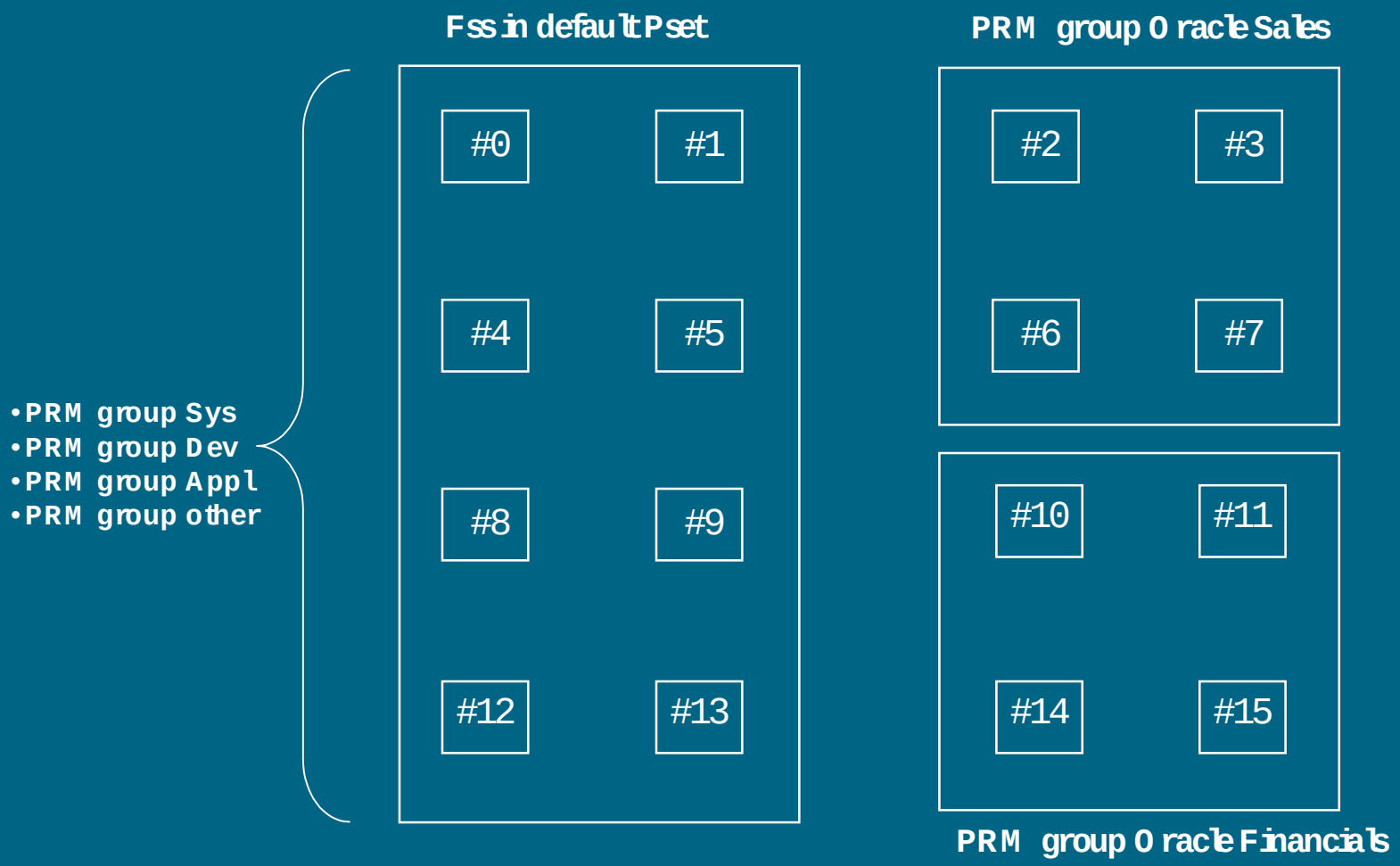
Standard HP-UX VM



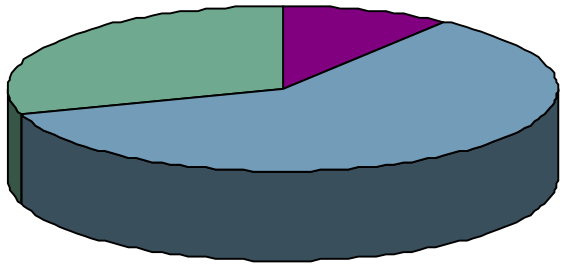
PRM Memory Management



Psets Example Configuration



Example consolidation with PRM



Three applications sharing server:

- App. owners contribute 60%, 30%, and 10% to funding of server
- PRM resource entitlements tied to funding

How it works:

- When system is fully loaded, groups get 60%, 30%, and 10% of CPU and Memory resources
- Option 1: Unlimited sharing of unused resources - Entitlement
- Option 2: No sharing of unused resources - capping

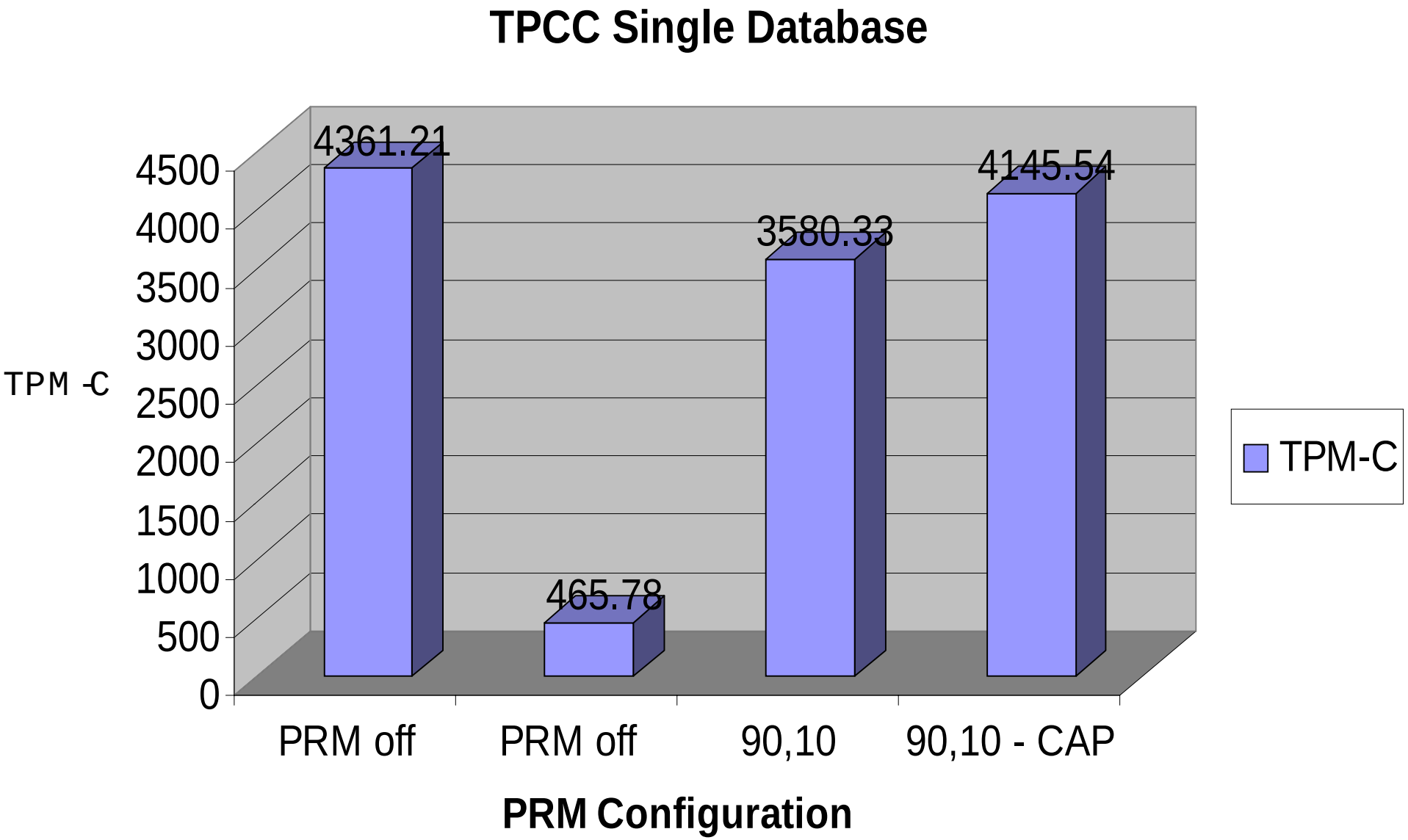
Case Study: TPCC and CPU controls

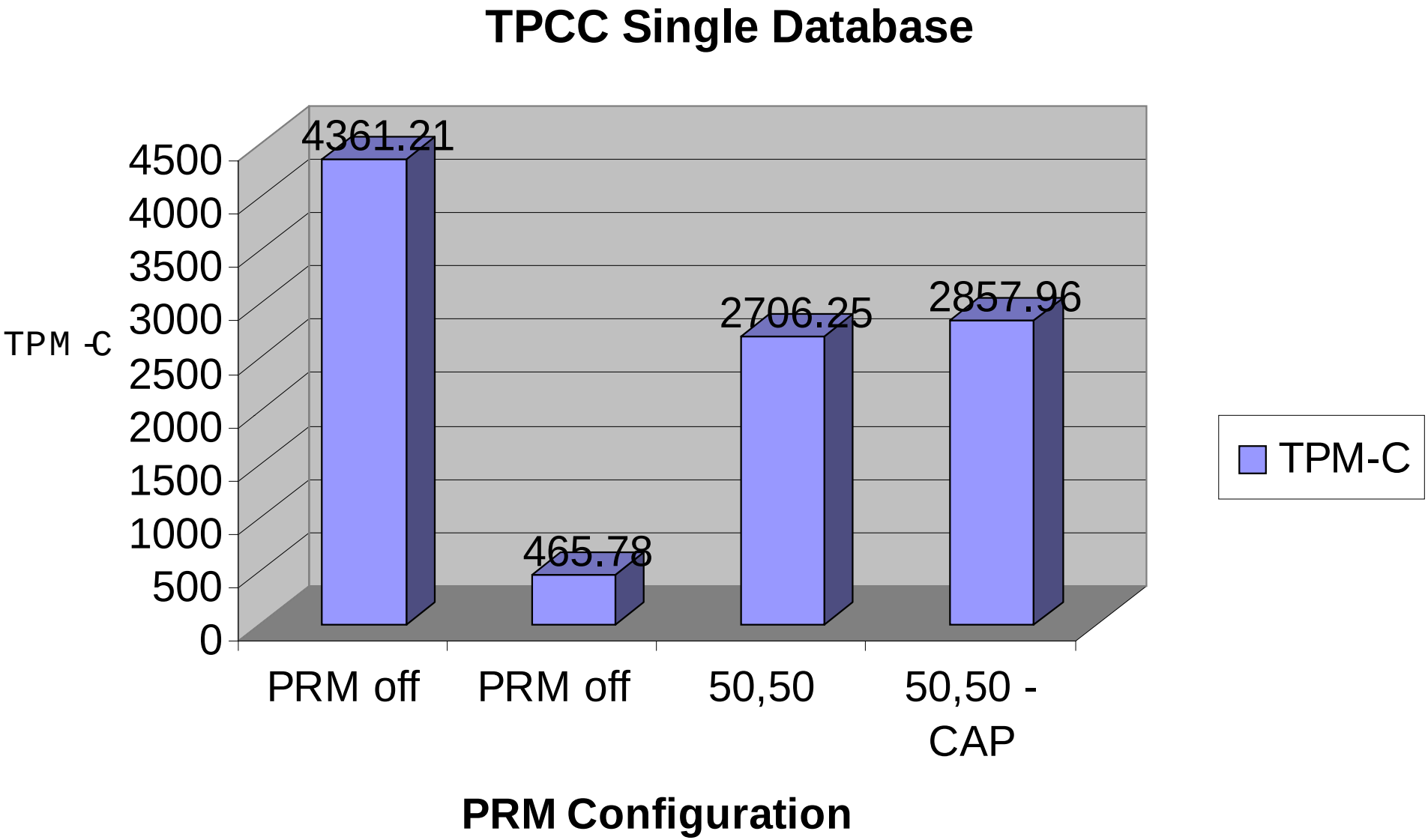
Hypothesis: PRM CPU controls can allocate critical CPU resources to match business goals

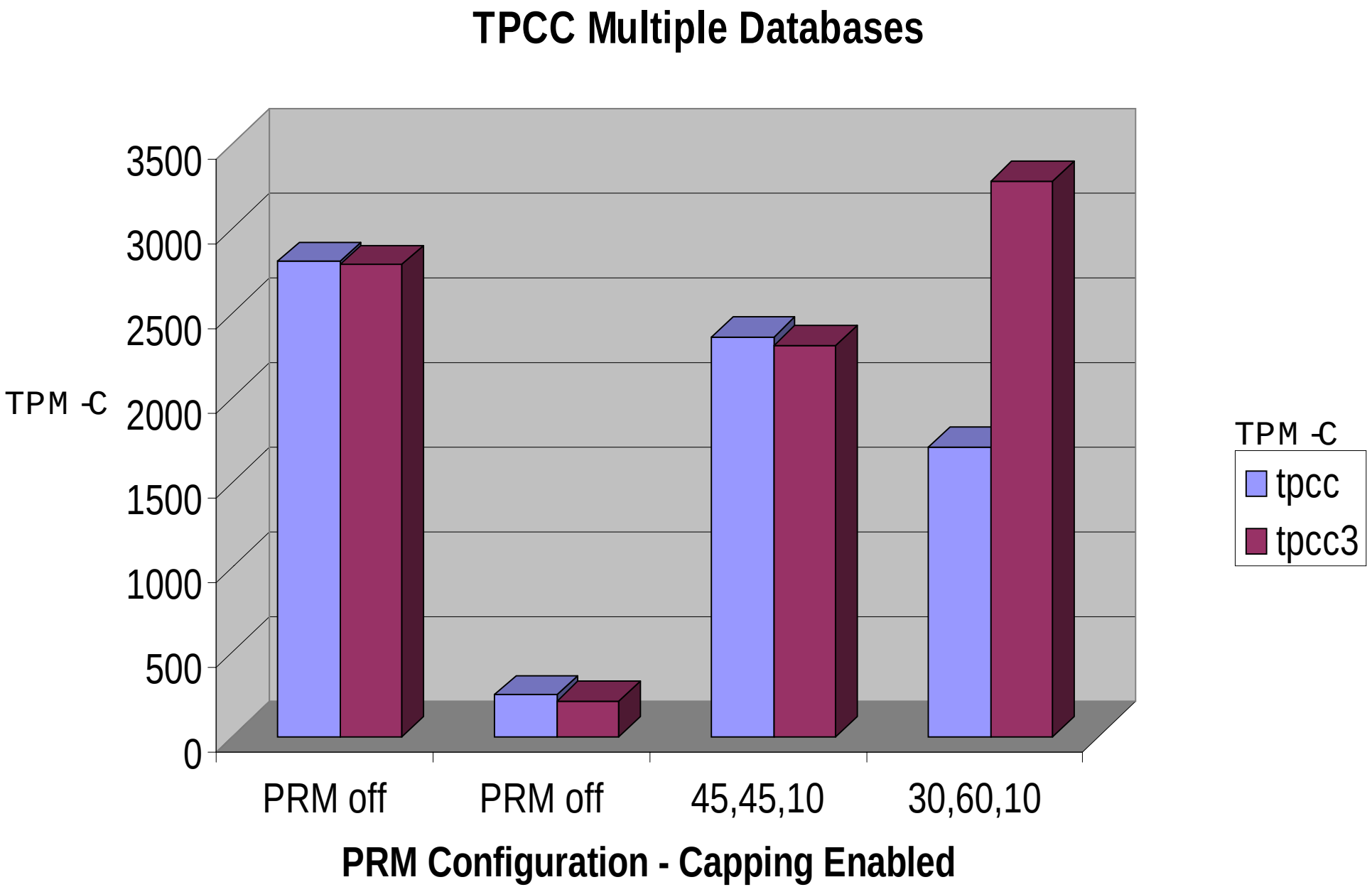
Case Study: TPCC and CPU controls

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


TPCC Single Database
TPM-C
4500
4000
3500
3000
2500
2000
1500
1000
500
0
4361.21
465.78
3580.33
4145.54
PRM off
PRM off
90,10
90,10 - CAP
PRM Configuration
TPM-C


TPCC Single Database
TPM -C
4500
4000
3500
3000
2500
2000
1500
1000
500
0
4361.21
465.78
2706.25
2857.96
PRM off
PRM off
50,50
50,50 - CAP
TPM-C
PRM Configuration


TPCC Multiple Databases
TPM -C
3500
3000
2500
2000
1500
1000
500
0
PRM off
PRM off
45,45,10
30,60,10
PRM Configuration - Capping Enabled
TPM -C
tpcc
tpcc3

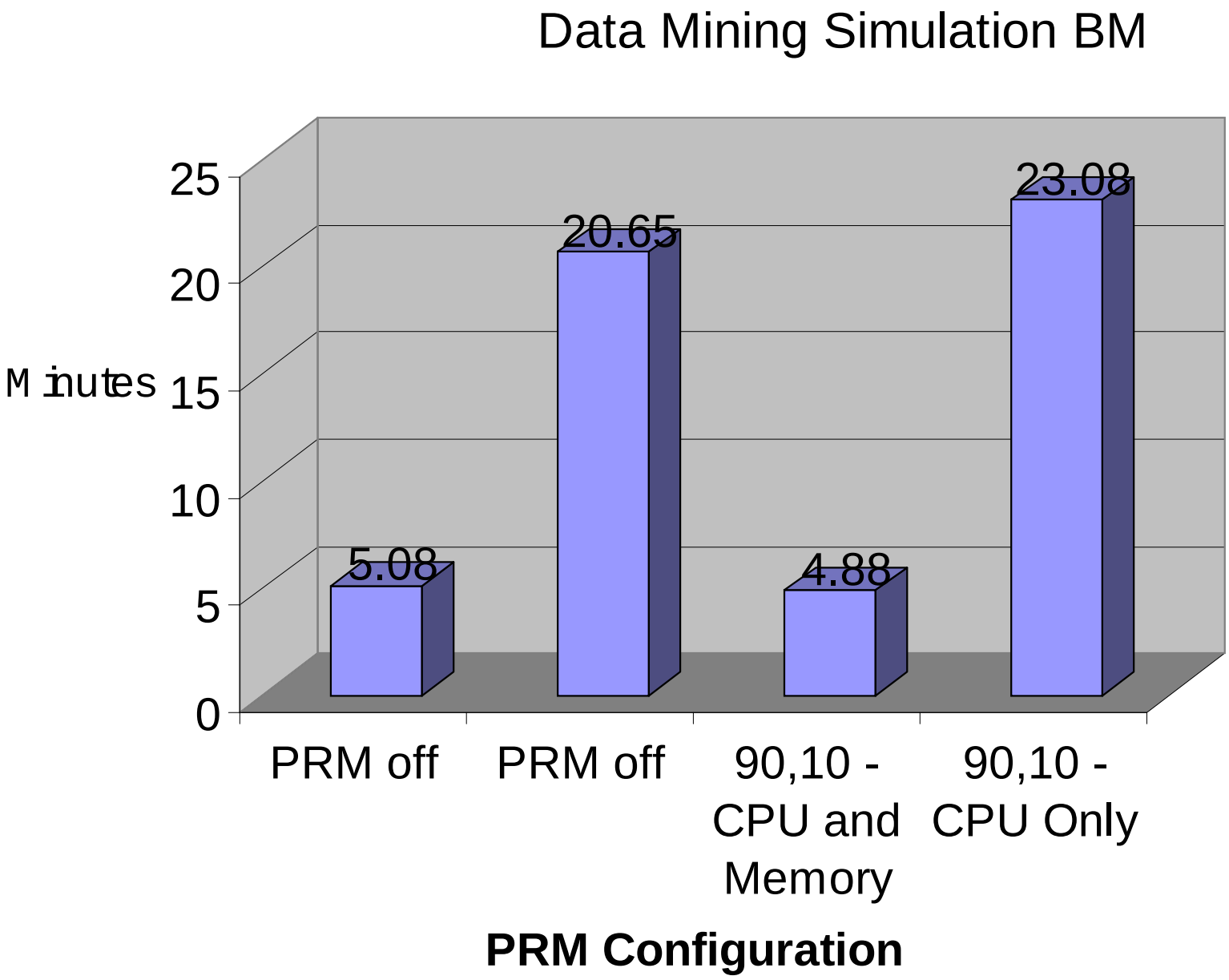
Case Study: Data Mining and CPU versus Memory controls

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

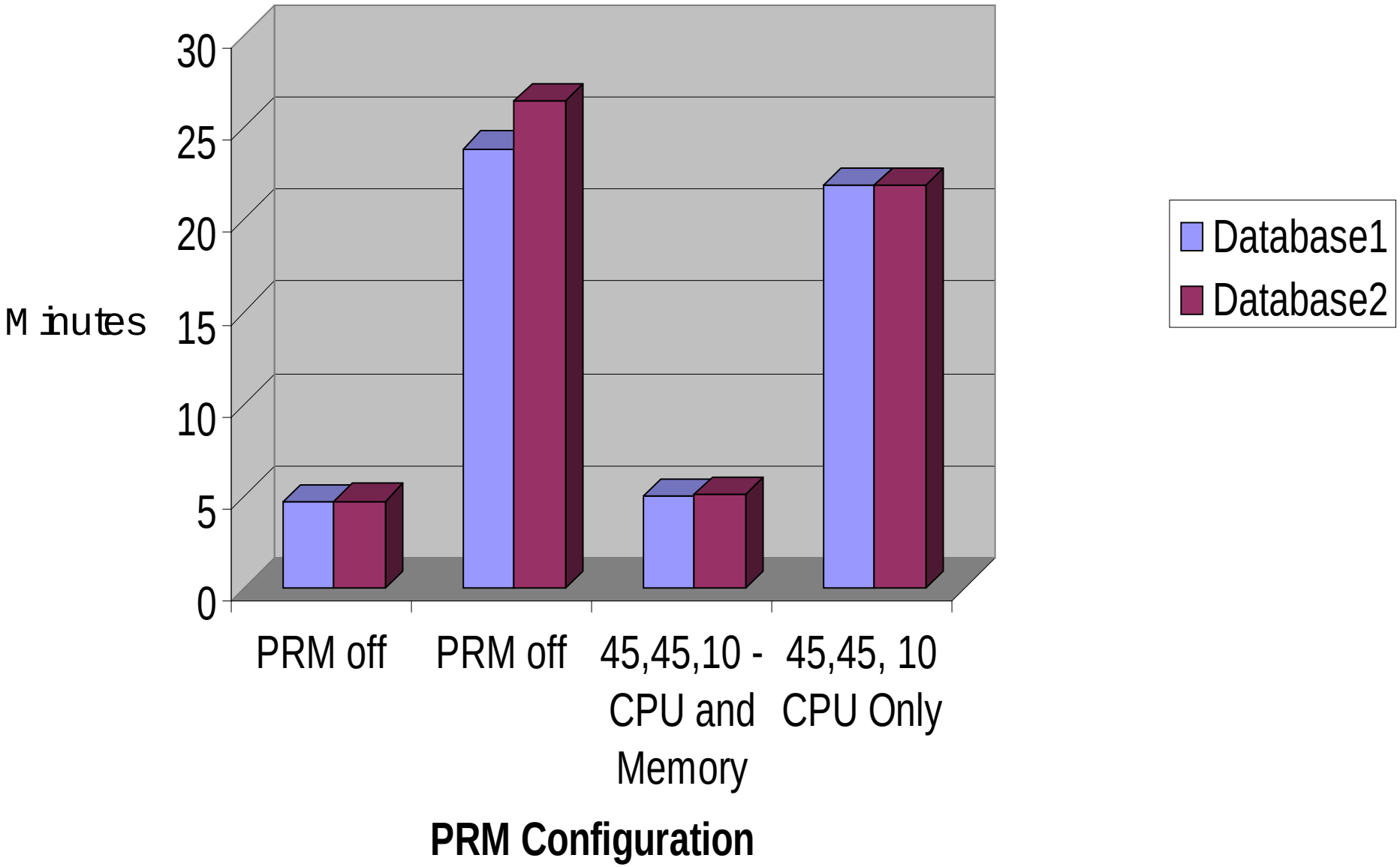
Case Study: Data Mining and CPU versus Memory controls

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


Data Mining Simulation BM
Minutes
25
20
15
10
5
0
5.08
20.65
4.88
23.08
PRM off
PRM off
90,10 - CPU and Memory
90,10 - CPU Only
PRM Configuration

Data Mining Simulation BM Multiple Databases



Summary

PRM enables running multiple, mission critical applications on a single system

http://www.hp.com/go/prm

QUESTIONS?

Backup slides