

# Resources Allocation



## Objectives

After completing this lesson, you should be able to:

- Manage resource allocation between PDBs and within a PDB
- Control PDB IO rate limit
- Enable parallel statement queuing at PDB level
- Avoid excessive session PGA
- Manage PDB performance profiles



# Allocating Resources in the CDB

Choose a strategy:

- Allow all PDBs to use all the resources.
  - Gives maximum flexibility for each PDB
  - Allows any PDB to consume all available resources
- Assign a minimum allocation to each PDB.
  - Ensures all PDBs get a specific share of the resources
  - Allows any PDB to consume any unused resources
- Assign a maximum allocation to each PDB.
  - Prevents a PDB from taking more than the maximum value assigned
  - May result in unused capacity

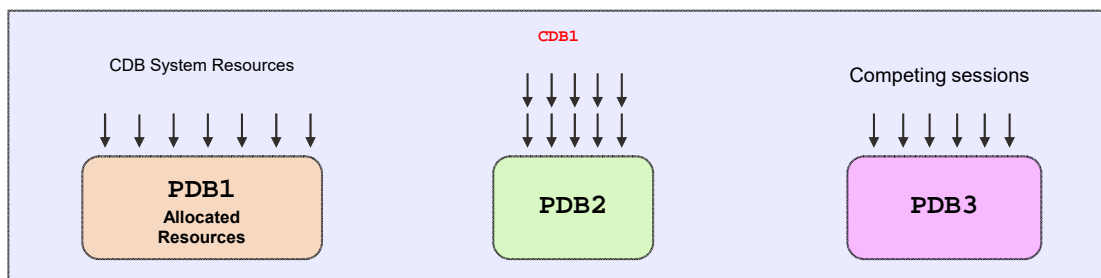
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# Resource Manager and Pluggable Databases

In a CDB, the Resource Manager manages resources:

- Between PDBs
- Within each PDB

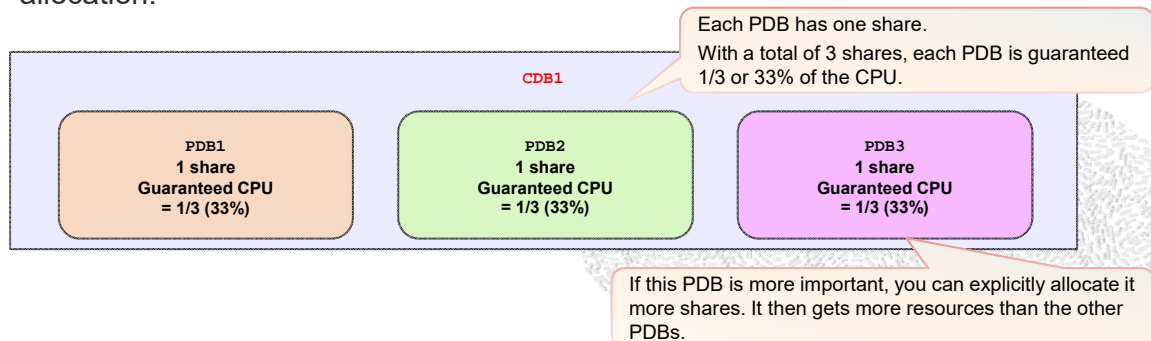


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# Managing Resources Between PDBs

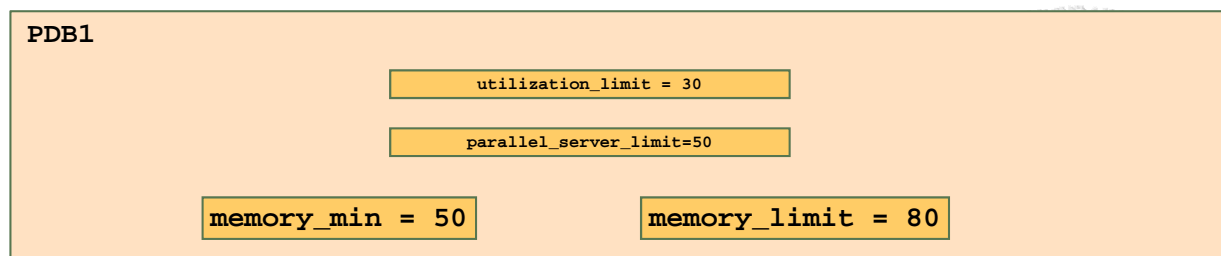
- PDBs compete for resources: CPU, Exadata I/O, and parallel servers
  - System shares are used to allocate resources for each PDB.
  - Limits are used to cap resource utilization of each PDB.
- When a new PDB is plugged in, the CDB DBA can specify a default or an explicit allocation.



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## CDB Resource Plan Basics: Limits

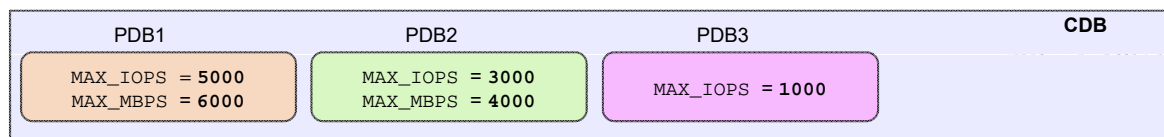
- Four limits can be defined for each PDB:
  - Utilization limit for CPU, Exadata I/Os, and parallel servers
  - Parallel server limit to override the utilization limit
  - Memory\_min
  - Memory\_limit
- You can change default values.



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# PDB IO Rate Limit

- MAX\_IOPS: Number of IOs issued per second
- MAX\_MBPS: MB of IO issued per second
- Set to 0 by default (*no value at the CDB root level*) → no limit
- Stored in the PDB dictionary
- Migrated with the PDB on an unplug or a plug into a new CDB



```
SQL> ALTER SESSION SET CONTAINER = PDB1;
SQL> ALTER SYSTEM SET MAX_IOPS = 5000 SCOPE=SPFILE;
SQL> ALTER SYSTEM SET MAX_MBPS = 6000 SCOPE=SPFILE;
```

```
DBA_HIST_RSRC_PDB_METRIC
IO_REQUESTS, IO_MEGABYTES,
IOPS, IOMBPS,
AVG_IO_THROTTLE
```

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# CDB Resource Plan: Full Example

		Specifies allocation of CPU, Exadata I/O, parallel servers	Limits usage of CPU, Exadata I/O	Limits usage of parallel servers	
PDB/Directive Name	Shares	Utilization Limit	Parallel Server Limit	Memory Limit	Memory Minimum
(Default Allocation)	(1)	(100%)	(100%)	(100%)	
(Autotask Allocation)	(-1)	(90%)	(100%)	(100%)	
PDB1	1	30%	50%	50%	30%
PDB2	1	30%	80%	40%	10%
PDB3	1	30%	30%	30%	10%
PDB4	2	100%	100%	100%	50%

PDB1 is:

- Guaranteed 1/5 (20 percent) of CPU and Exadata disk bandwidth
- Limited to 30 percent of CPU and Exadata disk bandwidth
- Limited to 50 percent of the parallel servers

Sets minimum of memory

Limits usage of memory

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## Managing Resources Within a PDB

- In a non-CDB database, workloads within a database are managed with resource plans.
- In a PDB, workloads are also managed with resource plans, also called PDB resource plans.
- The functionality is similar.

V\$RSRC\_PLAN

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## Putting It Together

- How do CDB and PDB resource plans work together?
  - Resources allocated to a PDB, based on CDB resource plan
  - Resource allocated to a consumer group based on the PDB resource plan

CDB Plan

PDB	Shares	Utilization Limit
PDB1	1	50%
PDB2	1	50%
PDB3	2	100%

PDB3 Plan

Consumer Group	Shares	Utilization Limit
OLTP	3	100%
REPORTS	1	50%
OTHER	1	50%

- What does this mean for PDB3 Reports?
  - Guaranteed 50%  $(2/4) \times 20\% (1/5) = 10\%$  of the resources
  - Limited to  $100\% \times 50\% = 50\%$  of the resources

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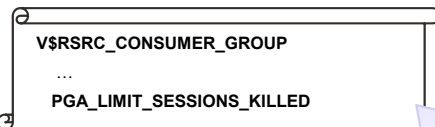
# Session PGA Limit

For security purposes:

- Avoid excessive usage of PGA memory
- Set the PGA limit that a session can use before it hits an error

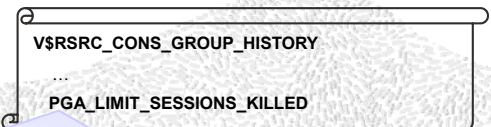
DAY plan

Consumer Group	Session_PGA_limit
OLTP	350
REPORTS	100
OTHER	50



NIGHT plan

Consumer Group	Session_PGA_limit
OLTP	50
REPORTS	400
OTHER	50



The number of times that sessions in a consumer group hit the session PGA limit

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# Performance Profiles

DBA\_CDB\_RSRC\_PLAN\_DIRECTIVES

PLUGGABLE\_DATABASE = PDB1  
PROFILE = LOW

CDB1

DBMS\_RESOURCE\_MANAGER.CREATE\_CDB\_PROFILE\_DIRECTIVE

PROFILE LOW for DAY plan:  
Shares=2

PROFILE HIGH for DAY plan:  
Shares=3

SQL> ALTER SYSTEM SET  
db\_performance\_profile= LOW;

PDB1

PDB2

db\_performance\_profile=HIGH

PDB3

PDB4

PDB5

Application Container  
APP2

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# Summary

In this lesson, you should have learned how to:

- Manage resource allocation between PDBs and within a PDB
- Control PDB IO rate limit
- Enable parallel statement queuing at PDB level
- Avoid excessive session PGA
- Manage PDB performance profiles



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## Practice 11: Overview

- 11-1: Managing PDB performance profiles
- 11-2: Managing resource allocation between PDBs
- 11-3: Avoiding excessive session PGA memory usage in PDBs

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