

Multitenant Architecture and RAC

By Ahmed Baraka

Objectives

In this lecture, you will learn how to perform the following:

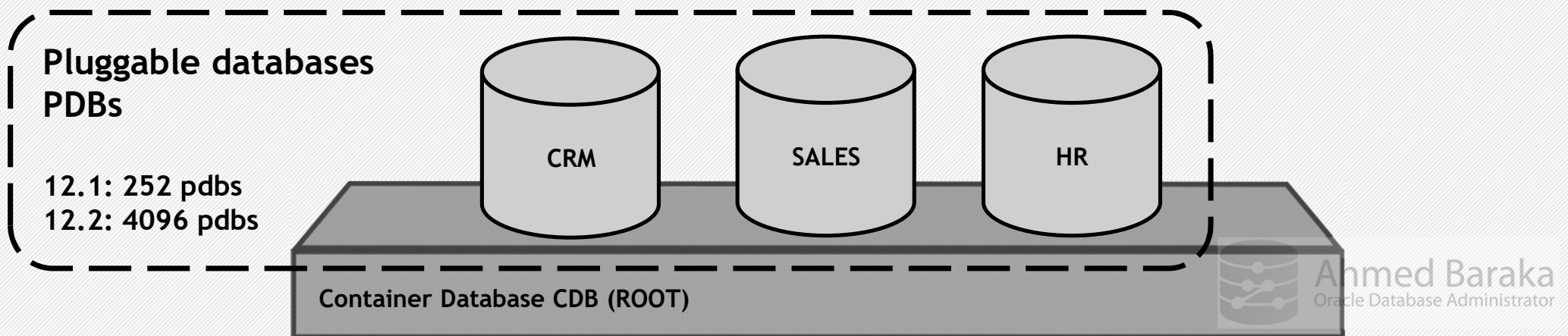
- Describe the architecture of Oracle Database Multitenant
- Create a Container Database (CDB)
- Describe the difference between common and local users
- Connect to a CDB and PDBs
- Startup and shutdown CDB and PDBs
- Understand the CDB-level performance views
- Clone a PDB online
- Drop a PDB



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What is the Oracle Database Multitenant Architecture?

- Consolidate one or more databases into a single housing container database.
- CDB database vs non-CDB database



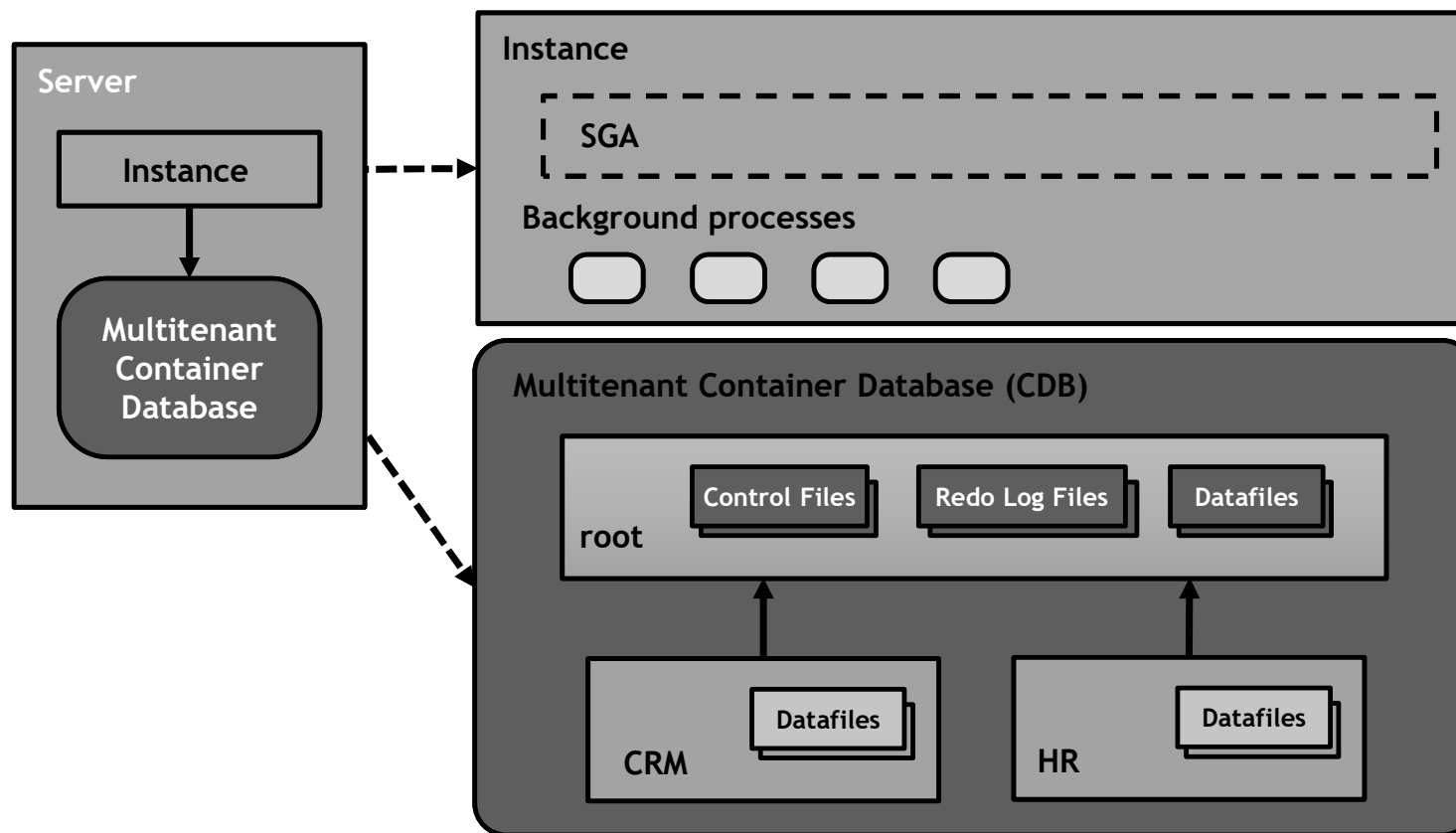
Oracle Database Multitenant Advantages

- Addresses the consolidation challenges:
 - Resources utilization
 - DBA resource costs
- Existing applications and schema do not need to change
- Tenant isolation
- Easy and efficient database cloning and moving



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Multitenant Architecture



Multitenant Architecture Terms

Term	Definition
Container Database (CDB)	A multitenant container database that houses zero or more pluggable databases.
non-CDB	A database that was created without using the multitenant architecture. All the pre-12c databases are non-CDBs.
Pluggable Database (PDB)	Portable collection of schemas, schema objects, and nonschema objects that appears to an Oracle Net client as a non-CDB.
Root container (CDB\$ROOT)	A master set of data files and metadata (data dictionary tables, Oracle-supplied packages, system users) and containing information regarding all containers within a CDB.



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Creating a CDB using DBCA

Database Configuration Assistant - Create a database - Step 4 of 14

Specify Database Identification Details

ORACLE 12c DATABASE

Database Operation
Creation Mode
Deployment Type
Database Identification
Storage Option
Fast Recovery Option
Database Options
Configuration Options
Management Options
User Credentials
Creation Option
Summary
Progress Page
Finish

Provide a unique database identifier information. An Oracle database is uniquely identified by a Global database name, typically of the form "name.domain".

Global database name: CDB1

SID: CDB1

Service name:

☒ Create as Container database

A Container database can be used for consolidating multiple databases into a single database, and it enables database virtualization. A Container database (CDB) can have zero or more pluggable databases (PDB).

☒ Use Local Undo tablespace for PDBs

☐ Create an empty Container database

☒ Create a Container database with one or more PDBs

Number of PDBs: 1

PDB name: CDB1pdb



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Creating a CDB using DBCA including PDBs

Database Identification

Database Identification

Global Database Name:

SID:

☒ Create As Container Database

Creates a database container for consolidating multiple databases into a single database virtualization. A container database (CDB) can have zero or more pluggable databases (PDBs).

☐ Create an Empty Container Database

☒ Create a Container Database with one or more PDBs

Number of PDBs:

PDB Name:

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Common and Local Users

- **Common user:**

- Created in the root
- Can login to other PDBs in the CDB
- Usually used for CDB-level administrators
- SYS and SYSTEM are default common users

- **Local user:**

- Defined in the container level
- Can login only to its container
- Usually used for data-owners and PDB-level administrators



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Connecting to a CDB and PDBs

```
SQL> CONNECT / as sysdba
SQL> CONNECT sys@//hostname:1525/CDB1 as sysdba
SQL> CONNECT sys@//hostname:1525/PDBHR as sysdba
SQL> CONNECT scott@//hostname/PDBHR
SQL> SHOW CON_NAME
```



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Startup and Shutdown a PDB

- Affecting the current container:

```
ALTER PLUGGABLE DATABASE OPEN [READ ONLY];  
ALTER PLUGGABLE DATABASE CLOSE [IMMEDIATE];
```

- Affecting a named container (from root):

```
ALTER PLUGGABLE DATABASE pdb1 OPEN;  
ALTER PLUGGABLE DATABASE ALL OPEN;  
ALTER PLUGGABLE DATABASE ALL EXCEPT pdb1 OPEN;
```



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Startup and Shutdown a PDB (cont)

- Using the **STARTUP** command (from root):

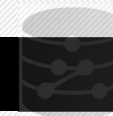
```
STARTUP PLUGGABLE DATABASE pdb1 [OPEN] [READ ONLY]  
[RESTRICT] [FORCE]
```

- After connecting as PDB admin:

```
STARTUP  
SHUTDOWN
```

- To view the state of the PDBs (from root):

```
SELECT NAME, OPEN_MODE, RESTRICTED FROM V$PDBS
```



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Startup and Shutdown a PDB in RAC

- To start a PDB in specific instances:

```
ALTER PLUGGABLE DATABASE pdb1 OPEN INSTANCES=('rac1','rac2');  
ALTER PLUGGABLE DATABASE pdb1 OPEN INSTANCES=ALL;  
ALTER PLUGGABLE DATABASE pdb1 OPEN INSTANCES=ALL EXCEPT ('rac1');
```

- To view the state of the PDBs (from root):

```
SELECT INST_ID, NAME, OPEN_MODE, RESTRICTED FROM GV$PDBS
```

- The same applies in shutting down the PDBs

```
ALTER PLUGGABLE DATABASE pdb1 CLOSE INSTANCES=('rac1','rac2');
```



Startup and Shutdown a CDB

- Traditional command supported:

```
sqlplus / as sysdba  
STARTUP  
SHUTDOWN
```

- If registered in clusterware or Oracle Restart:

```
srvctl start database -d cdb  
srvctl stop database -d cdb
```



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Data Dictionary Views in CDB level

View Category within a PDB	Description
USER_***	Objects owned by the current user
ALL_***	Objects accessible by the current user
DBA_***	All the objects in within the current container (root or pdb)
CDB_***	All objects in the CDB (container identified by CON_ID) Examples: CDB_PDBS, CDB_TABLESPACES, CDB_USERS
V\$***	SGA accessed by all the containers (container identified by CON_ID)



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Cloning a PDB Online

- You can clone a PDB within a CDB online:

```
CREATE PLUGGABLE DATABASE pdb2 FROM pdb1;  
ALTER PLUGGABLE DATABASE pdb2 OPEN INSTANCES=ALL;
```

- In RAC, to register the cloned PDB in the clusterware:

```
srvctl add service -db cdbrac -pdb pdb2 -s pdb2srv  
-preferred cdbrac1 -available cdbrac2  
  
srvctl start service -db cdbrac -s pdb2srv
```



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Dropping a PDB

- Remove its service:

```
srvctl stop service -db cdbrac -s pdb2srv  
srvctl remove service -db cdbrac -s pdb2srv
```

- Drop the PDB including its datafiles:

```
ALTER PLUGGABLE DATABASE  pdb2 CLOSE INSTANCES=ALL;  
DROP PLUGGABLE DATABASE  pdb2 INCLUDING DATAFILES;
```



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Oracle Multitenant Architecture: Further Learning

- Non-CDB is obsolete
- Information sources:
 - Courses
 - Books
 - Blogs



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Summary

In this lecture, you should have learnt how to perform the following:

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