Oracle Database 21c – PDB Management Practical Report

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1. Introduction

The aim of the task was focusing on how to work with **Oracle 21c Multitenant Architecture**, particularly the creation, management, and deletion of **Pluggable Databases (PDBs)** within a **Container Database (CDB)**.

The main objectives were:

- To understand and apply commands such as `CREATE, ALTER` and `DROP PLUGGABLE DATABASE`.
- To create a new pluggable database for classwork.
- To create and delete another pluggable database for practice.
- To verify the operations using **Oracle Enterprise Manager (OEM)**.

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2. Environment Setup

- **Operating System:** Windows 11 Pro
- **Oracle Version:** Oracle Database 21c
- **Tools Used:**
  - SQL*Plus
  - SQL Developer
  - Oracle Enterprise Manager (OEM)

NOTE: Before starting, the Oracle **listener** and **database services** were verified to be running using: `services.msc`

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3. Task 1 – Creating the First Pluggable Database

Objective:
Create a new PDB for classwork named `pdb_NIYIBIZI28248` and assign an admin user.

SQL Script:

```
CONNECT sys/your_password AS SYSDBA;

CREATE PLUGGABLE DATABASE pdb_NIYIBIZI28248
  ADMIN USER Niyibizi _plsqlauca_28248 IDENTIFIED BY oracle123
  ROLES = (DBA)
  CREATE_FILE_DEST = 'C:\ORACLE21C\ORADATA\ORCL\PDB_Niyibizi28248';

ALTER PLUGGABLE DATABASE pdb_Niyibizi28248 OPEN READ WRITE;
ALTER PLUGGABLE DATABASE pdb_28248 SAVE STATE;
SHOW PDBS;
```

Explanation:

- `CREATE PLUGGABLE DATABASE` – creates a new PDB within the container.
- `ADMIN USER` – defines the administrator for this PDB.
- `CREATE_FILE_DEST` – specifies where Oracle will store the new database files.
- `ALTER PLUGGABLE DATABASE ... OPEN READ WRITE` – opens the PDB for use.
- `SAVE STATE` – ensures it reopens automatically on database restart.

Result:
The PDB was created successfully and appeared under `SHOW PDBS` as **READ WRITE**.

```
SQL> CREATE PLUGGABLE DATABASE ni_pdb_28248
  2     ADMIN USER niyibizi_plsqlauca_28248 IDENTIFIED BY Oracle123
  3     FILE_NAME_CONVERT = (
  4         'C:\USERS\HP\DESKTOP\CORACLEORACLE21C\ORADATA\ORCL\PDBSEED\',
  5         'C:\app\oracle\oradata\ORCL\ni_pdb_28248\'
  6     );

Pluggable database created.
```

```
SQL> select name, open_mode from v$pdbs;

NAME
------------------------------------------------------------
OPEN_MODE
----------
PDB$SEED
READ ONLY

ORCLPDB
READ WRITE

NI_PDB_28248
READ WRITE
```

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4. Task 2 – Creating and Deleting a Second PDB

Objective:
Create another pluggable database named `NI_to_delete_pdb_28248` and then delete it to demonstrate full database lifecycle management.

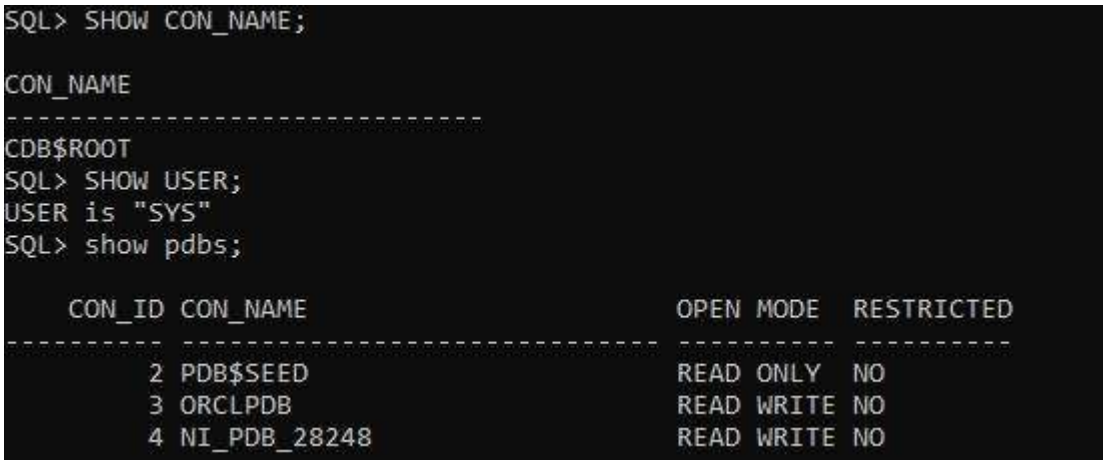
SQL Script (Creation):

```
CREATE PLUGGABLE DATABASE Ni_to_delete_pdb_28248
  ADMIN USER Niyibizi_plsqlauca_2828248 IDENTIFIED BY .
  ROLES = (DBA)
  CREATE_FILE_DEST = 'C:\ORACLE21C\ORADATA\ORCL\Ni_TO_DELETE_PDB_28248';
```

Open and Verify:

```
ALTER PLUGGABLE DATABASE NI_to_delete_pdb_28248 OPEN READ WRITE;
SHOW PDBS;
```

This screenshot showing `ol_to_delete_pdb_28248` in READ WRITE mode.



```
SQL> SHOW CON_NAME;

CON_NAME
------------------------------
CDB$ROOT
SQL> SHOW USER;
USER is "SYS"
SQL> show pdbs;

    CON_ID CON_NAME                       OPEN MODE  RESTRICTED
---------- ------------------------------ ---------- ----------
         2 PDB$SEED                       READ ONLY  NO
         3 ORCLPDB                        READ WRITE NO
         4 NI_PDB_28248                   READ WRITE NO
```

Deletion Procedure

SQL Script (Deletion):

```
ALTER PLUGGABLE DATABASE NI_to_delete_pdb_28248 CLOSE IMMEDIATE;
DROP PLUGGABLE DATABASE NI_to_delete_pdb_28248 INCLUDING DATAFILES;
SHOW PDBS;
```

Explanation:

- The PDB must be closed before deletion.
- `INCLUDING DATAFILES` ensures that all associated files are removed from disk.
- `SHOW PDBS` confirms removal from the container database.

Output after executing DROP command showing the PDB is no longer listed

```
SQL> SHOW CON_NAME;

CON_NAME
------------------------------
NI_PDB_28248
SQL>


SQL> CONNECT niyibizi_plsqlauca_28248/Oracle123@localhost:1521/NI_PDB_28248
Connected.
SQL>
```

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5. Task 3 – Managing PDBs via Oracle Enterprise Manager (OEM)

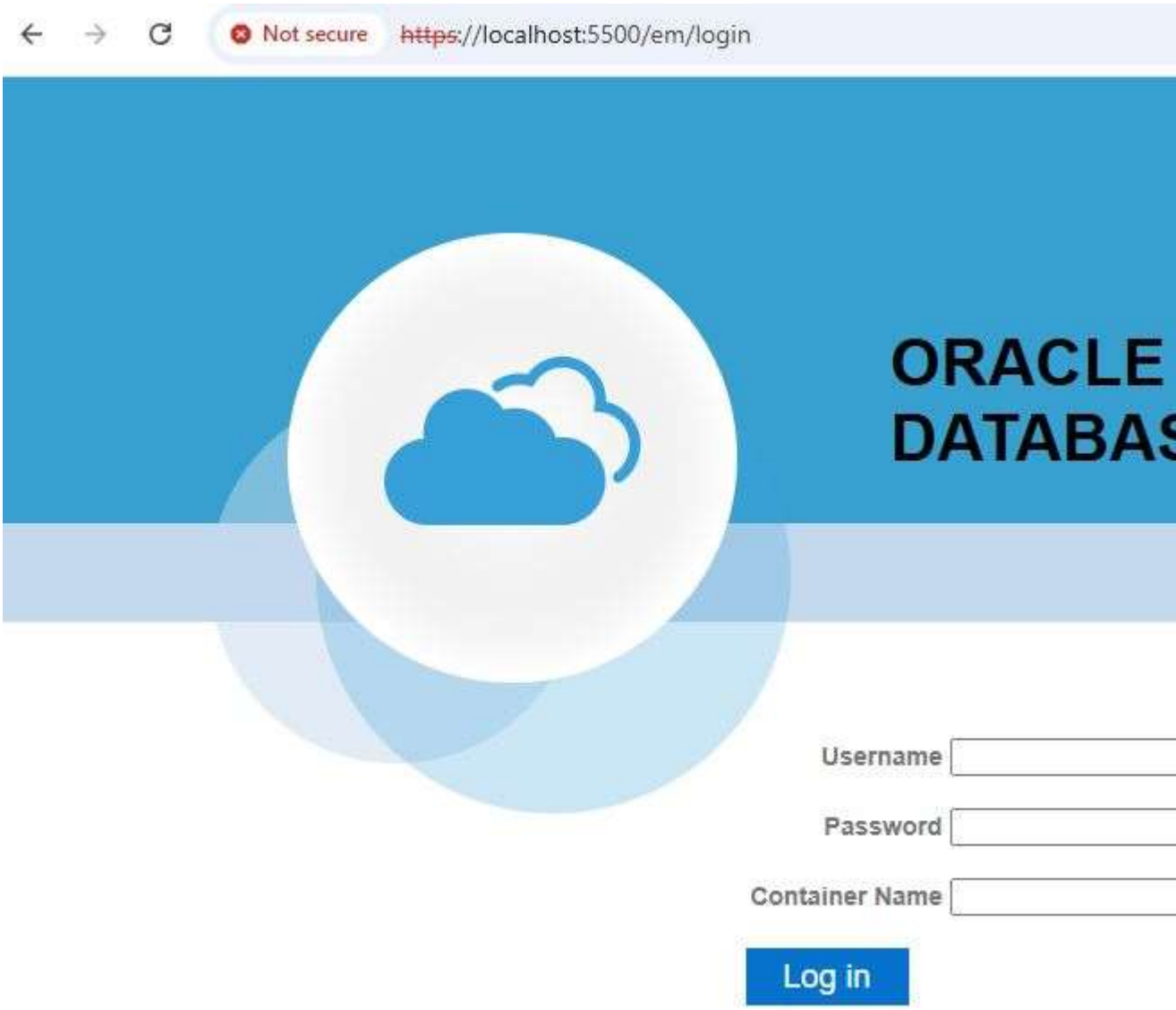
Objective:
Verify the existence and status of PDBs using the graphical interface of **Oracle Enterprise Manager**.

Procedure:

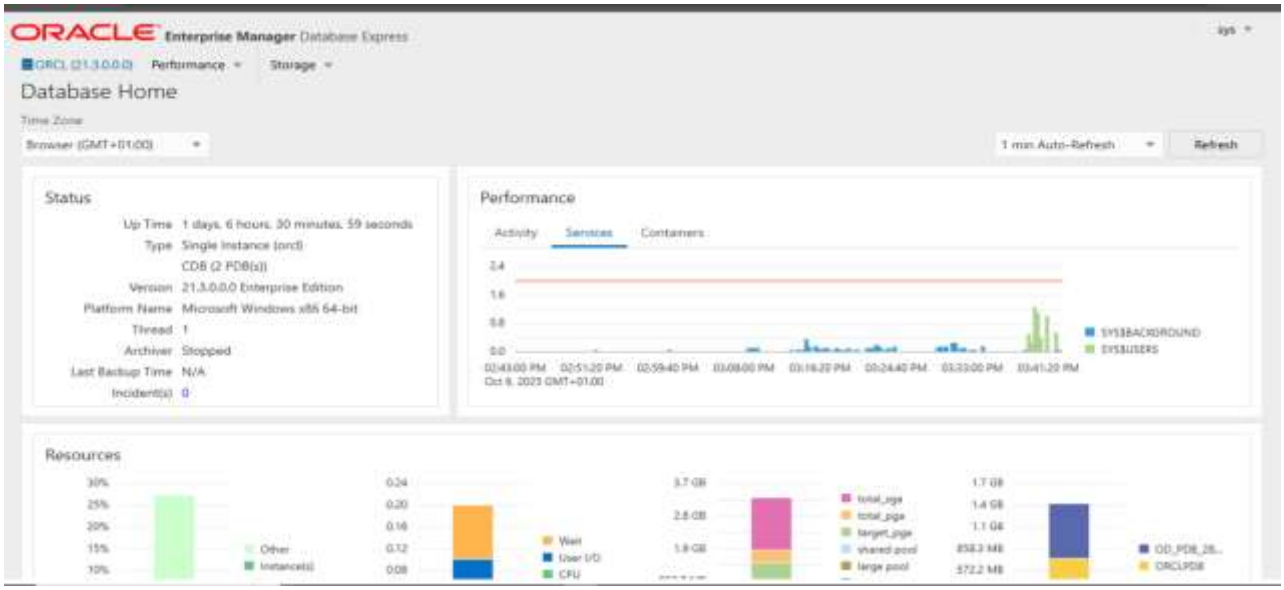
1. Accessed OEM at:
2. `https://localhost:5500/em`
3. Logged in using the **SYS** user in **Container Database (CDB)** mode.
4. Navigated to:
   Container Database → Pluggable Databases

- Verified: `pdb_ Niyibizi28248` appears as **OPEN (READ WRITE)**.
- `NI_to_delete_pdb_28248` no longer exists after deletion.
- *OEM interface showing the active PDBs list.*

HERE THIS IS THE IMAGE BEFORE LOGIN



FINALY AFTER LOGIN INTO ORACLE ENTERPRISE MANAGER DATABASE EXPRESS



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6. Error Handling and Troubleshooting

So some common errors that was faced during the extraction of our task and the methods that was used to handle them.

Error Code	Description	Solution Applied
ORA-65005	Invalid or missing file path in `FILE_NAME_CONVERT`	Replaced with `CREATE_FILE_DEST` for simplicity.
ORA-65011	PDB does not exist	Verified creation success before attempting `ALTER`.
ORA-00933	SQL command not properly ended	Executed one statement at a time; avoided chaining with semicolons.
ORA-12541	Listener not running	Started **Oracle Listener** service via `services.msc`.
ORA-65019	PDB already open	Checked current PDB state with `SHOW PDBS` before running `ALTER`.

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7. Understanding PDB States

State	Description	Purpose
MOUNTED	The PDB is recognized by Oracle but not yet opened.	Used during startup or maintenance.
READ ONLY	The PDB is open for reading data only.	Used for reports or seed databases (like PDB$SEED).

State	Description	Purpose
READ WRITE	The PDB is fully open and editable.	Allows all SQL operations (SELECT, INSERT, UPDATE, DELETE).

Example Commands:

```
ALTER PLUGGABLE DATABASE pdb_ Niyibizi28248 OPEN READ WRITE;
ALTER PLUGGABLE DATABASE pdb_ Niyibizi28248 OPEN READ ONLY;
ALTER PLUGGABLE DATABASE pdb_ Niyibizi28248 CLOSE IMMEDIATE;
```

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8. Role of the ALTER Command

`ALTER` is used to **modify the state or structure** of existing database objects.

- **In this assignment**, it was used to open, close, and save the state of PDBs:
- `ALTER PLUGGABLE DATABASE pdb_Niyibizi28248 OPEN READ WRITE;`
- `ALTER PLUGGABLE DATABASE pdb_ Niyibizi28248 SAVE STATE;`
- `ALTER PLUGGABLE DATABASE NI_to_delete_pdb_28248 CLOSE IMMEDIATE;`
- It changes **behaviour**, not structure — unlike `CREATE` (to make new) or `DROP` (to remove).

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9. Conclusion

This exercise provided hands-on experience with **Oracle Multitenant Architecture**, demonstrating:

- The process of **creating**, **opening**, **saving**, and **deleting** PDBs.
- The use of `ALTER` for managing database states.
- Troubleshooting common Oracle errors effectively.
- Confirming results using **Oracle Enterprise Manager (OEM)**.

Through this practical, I gained confidence in using Oracle SQL commands and better understanding the relationship between the **CDB** (Container Database) and **PDBs** (Pluggable Databases).

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so here is the source for the used data

References

1. **Oracle® Database 21c: Multitenant Administrator's Guide**
   Oracle Corporation, 2023.
   Available at: https://docs.oracle.com/en/database/oracle/oracle-database/21/multi/index.html

2. **Oracle® Database SQL Language Reference 21c**
   Oracle Corporation, 2023.
   Documentation for CREATE PLUGGABLE DATABASE, ALTER PLUGGABLE DATABASE, and DROP PLUGGABLE DATABASE commands.
   https://docs.oracle.com/en/database/oracle/oracle-database/21/sqlrf/index.html

3. **Oracle Learning Library (OLL)** – Tutorials on Oracle Multitenant Architecture.
   https://apexapps.oracle.com/pls/apex/f?p=44785:141:0

4. **Oracle LiveSQL** – Interactive SQL practice environment.
   https://livesql.oracle.com

5. **Stack Overflow Community Discussions** – Troubleshooting ORA-65005, ORA-65011, and ORA-12541 errors.
   https://stackoverflow.com/questions/tagged/oracle

6. **YouTube – Oracle DBA Channel**
   "Creating and Managing Pluggable Databases in Oracle 21c."
   Available at:
   https://www.youtube.com/results?search_query=oracle+21c+create+pluggable+database

7. **Oracle Enterprise Manager Express User's Guide**
   Oracle Documentation for managing PDBs via OEM.
   https://docs.oracle.com/en/database/oracle/oracle-database/21/emxug/index.html

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Citation Format:
Use APA or IEEE referencing depending on your instructor's preference. The above list follows a simple academic format suitable for GitHub or report documentation.

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