Managing a PDB Snapshot Carousel

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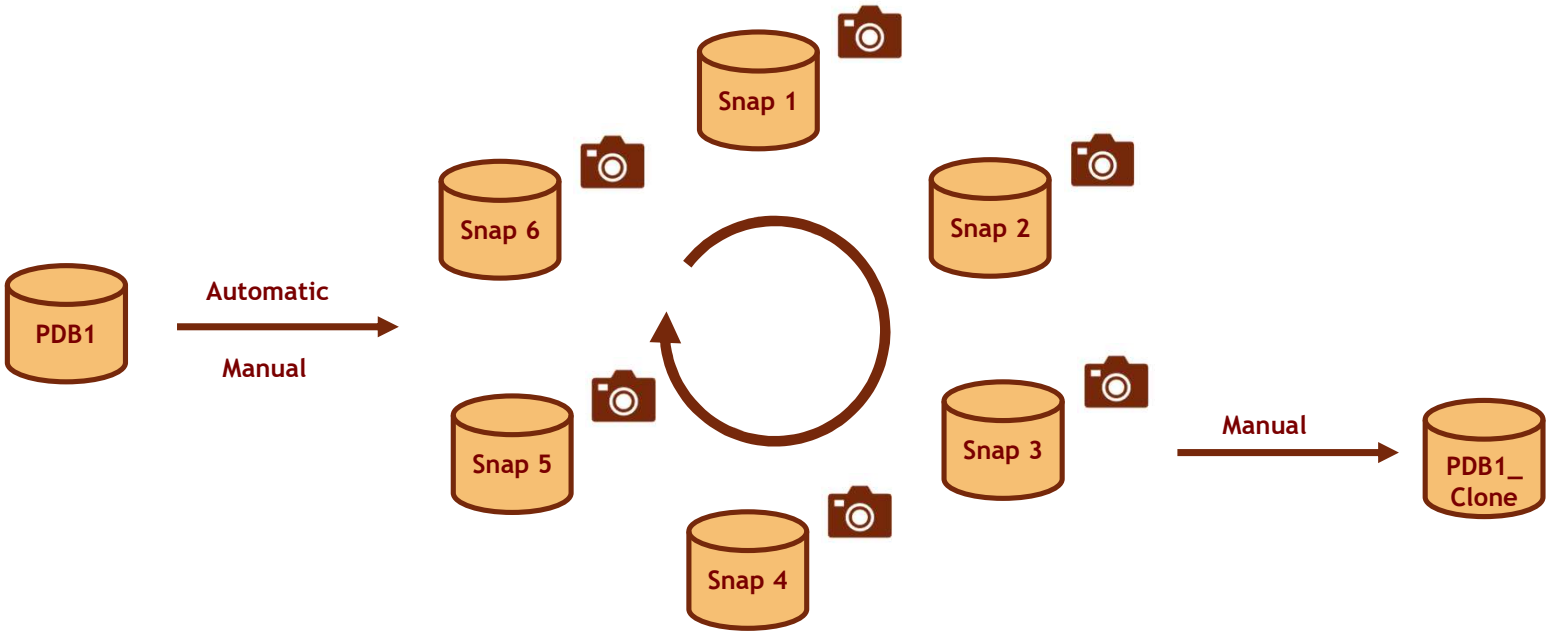
Objectives

By the end of this lecture, you should be able to:

- Describe how PDB Snapshot Carousel works
- Enable Snapshot Carousel for PDBs
- Create PDB Snapshots
- Understand how PDB Snapshot file locations are set
- Use Sparse Files with PDB Snapshots
- Describe how to get benefit from PDB Snapshot Copy in PDB Snapshot Carousel

PDB Snapshot Carousel



About PDB Snapshot Carousel

- Is a library of PDB snapshots for a specific PDB
- A PDB snapshot is a point-in-time copy of a PDB
- The source PDB can be open in r/o or r/w mode
  - For r/w mode: local undo tablespace must be configured
- Snapshots can be automatically or manually created
- Can be configured to have maximum 8 snapshots
- Designed to be used by testing teams

Snapshot Carousel Modes

- Can be set using the command:

```
ALTER SESSION SET CONTAINER=PDB1;
ALTER PLUGGABLE DATABASE SNAPSHOT MODE <required-mode>
```

Mode	Description
MANUAL	To create a snapshot on demand
EVERY n [MINUTES|HOURS]	To automatically create a snapshot after n internal of time
NONE	To disable PDB snapshot creation on the PDB

Enabling the Automatic PDB Snapshot Carousel

- By default, an error will be returned:

```
SQL> ALTER PLUGGABLE DATABASE SNAPSHOT MODE EVERY 24 HOURS;

ORA-12754: Feature PDB SNAPSHOT CAROUSEL is disabled due to
missing capability.
```

- We must set an undocumented parameter:

```
ALTER SYSTEM SET "_exadata_feature_on"=TRUE SCOPE=SPFILE;
shutdown immediate
startup
```

- Alternatively, create a Scheduler job

Setting PDB_MAX_SNAPSHOTS

- To set the maximum number of Snapshots in a PDB Snapshot Carousel

```
ALTER SESSION SET CONTAINER=PDB1;
ALTER PLUGGABLE DATABASE SET MAX_PDB_SNAPSHOTS=7;
```

- To retrieve the value of this property for a PDB:

```
SELECT PROPERTY_VALUE AS value
FROM CDB_PROPERTIES r, CDB_PDBS p WHERE r.CON_ID = p.CON_ID
AND PDB_NAME ='PDB1'AND PROPERTY_NAME = 'MAX_PDB_SNAPSHOTS';
```

- Setting the property to zero deletes all the PDB snapshots

Creating a PDB Snapshot

- To create a PDB snapshot with a system generated name:

```
ALTER SESSION SET CONTAINER=PDB1;
ALTER PLUGGABLE DATABASE SNAPSHOT;
```

- To create a PDB snapshot with a user defined name:

```
ALTER PLUGGABLE DATABASE SNAPSHOT pdb1_sunday;
```

PDB Snapshot Default File Location: Sparse Files not used

- In a single archive file (.pdb)
  - OMF is set:
    - Under the OMF directory
  - OMF is not set:
    - $ORACLE_BASE/oradata/DB_UNIQUE_NAME
- Does not apply when sparse files are used

Setting PDB Snapshot File Location

- To set the PDB Snapshot file location, set the OMF at the session level:

```
ALTER SESSION SET CONTAINER=PDB1;
ALTER SESSION SET DB_CREATE_FILE_DEST='/u02/pdb1/snapshots';
ALTER PLUGGABLE DATABASE SNAPSHOT;
```

- FILE_NAME_CONVERT clause cannot be used

Obtaining Information about PDB Snapshot Carousel

View	Description
*_PDBS	Retrieve the PDB Snapshot Carousel Mode
*_PDB_SNAPSHOTS	Display the PDB snapshots in the database
*_PROPERTIES	Display the value of MAX_PDB_SNAPSHOTS (link to *_PDBS)
*_SCHEDULER_JOBS	Obtain more details on the job that starts the automatic PDB snapshot creation
*_PDB_SNAPSHOTFILE	Retrieve list of PDB Snapshot files. It is empty when using sparse files is turned off.

Creating a Full PDB from PDB Snapshots

- To create a full PDB from a PDB Snapshot:

```
CREATE PLUGGABLE DATABASE pdb1_clone
FROM pdb1 USING SNAPSHOT <SNAP_Name> ;
```

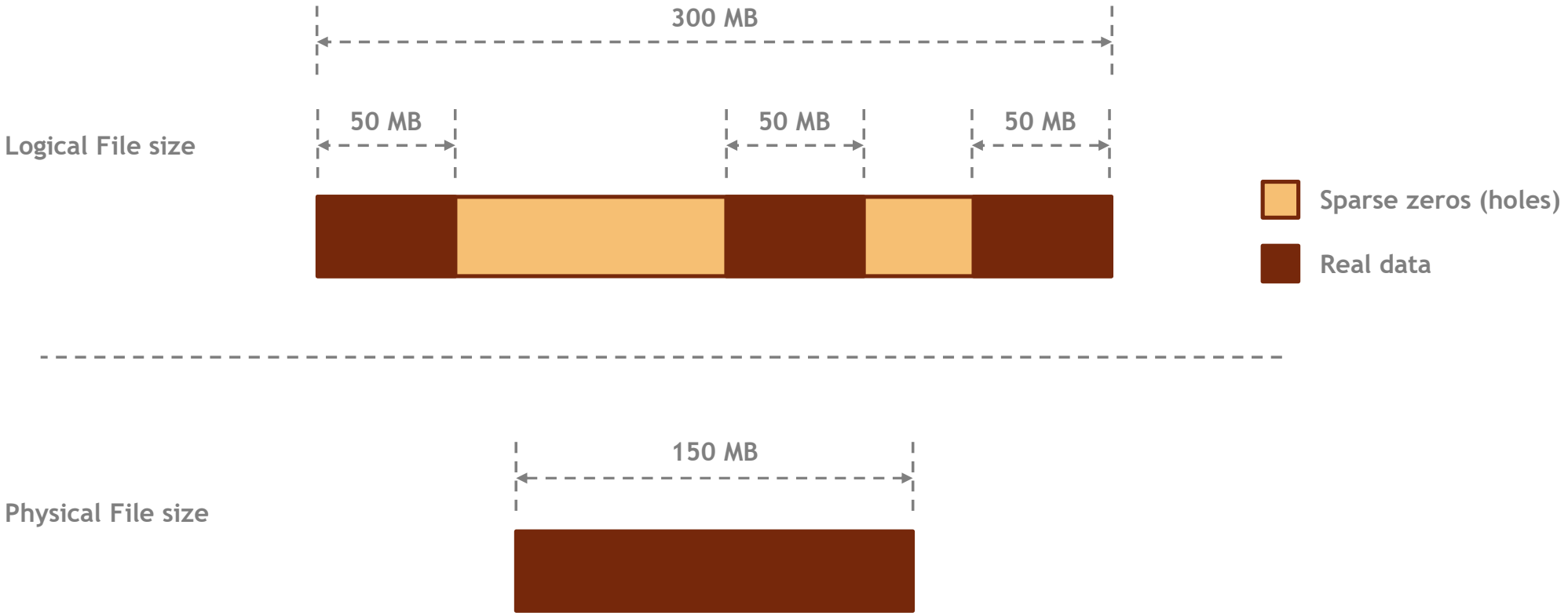
- If OMF is not enabled (bug):

```
ORA-65016: FILE_NAME_CONVERT must be specified
```

- Solution:

```
ALTER SESSION SET DB_CREATE_FILE_DEST='...';
CREATE PLUGGABLE DATABASE pdb1_clone
FROM pdb1 USING SNAPSHOT <SNAP_NAME> ;
```

Sparse File Concept

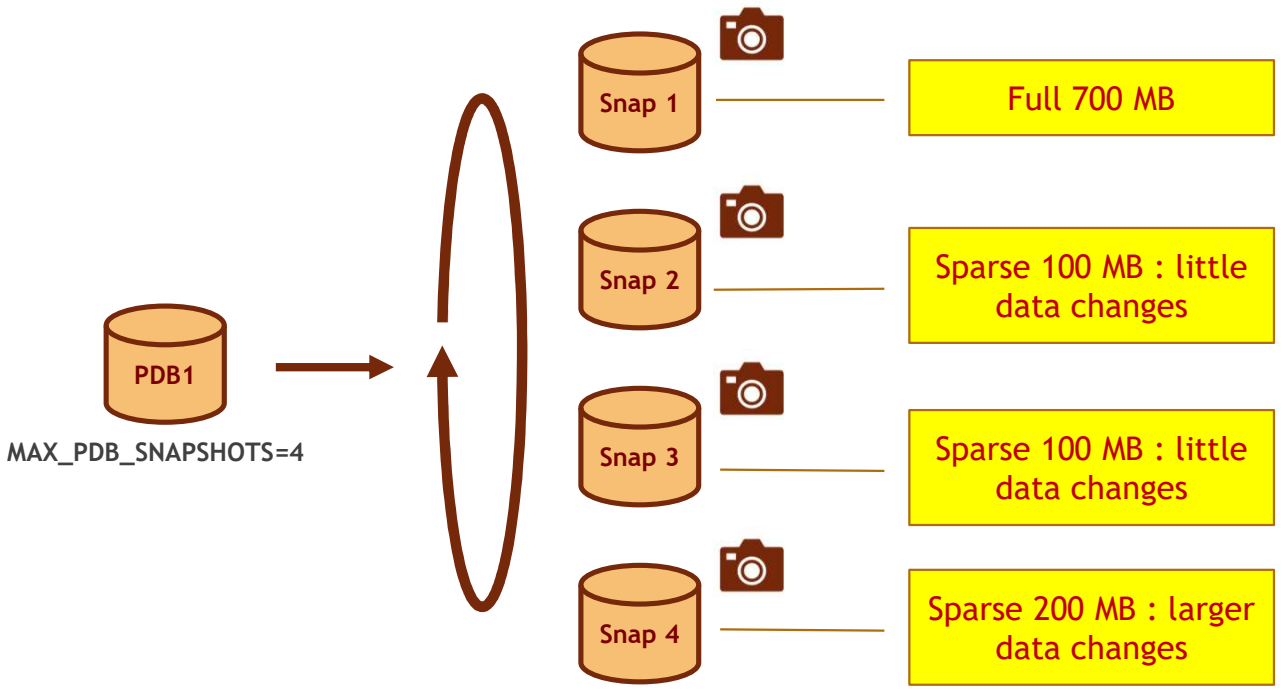


Identifying Space Size Taken from Disk

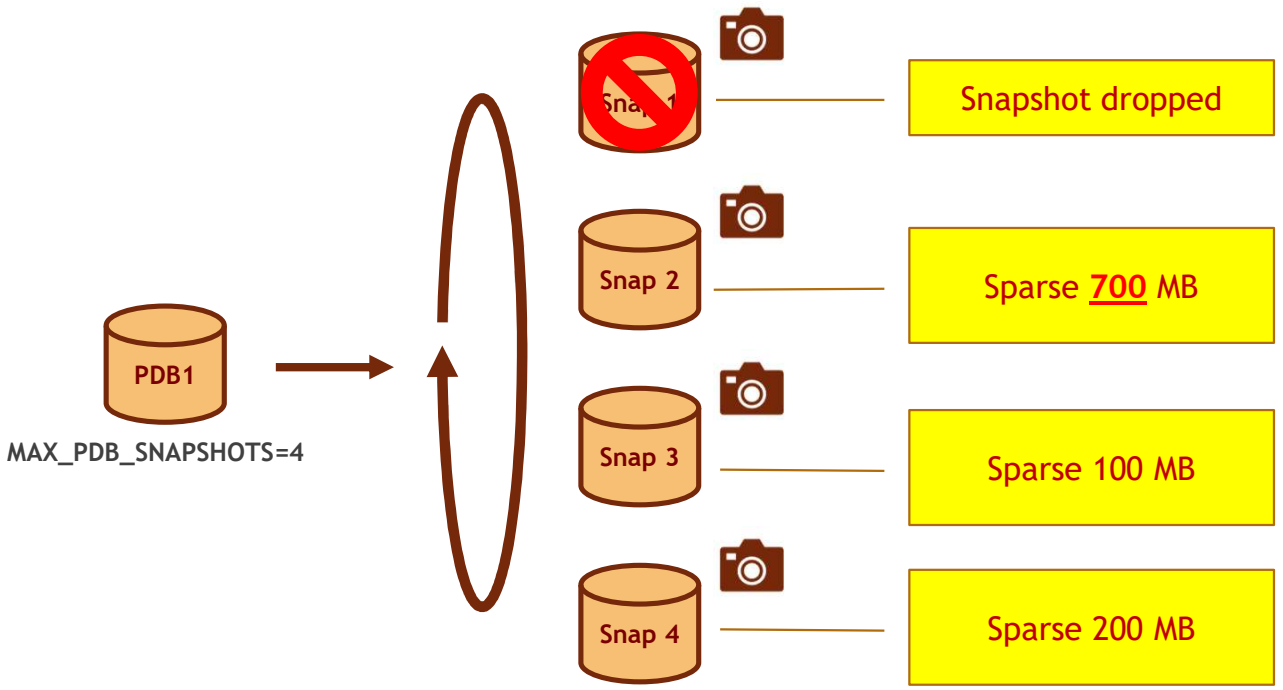
- Use the command **`ls -slh`**

```
126M -r--r-----. 1 oracle oinstall 126M Aug 27 20:46 file1.dbf
16M  -r--r-----. 1 oracle oinstall 321M Aug 27 20:46 file2.dbf
```

Using Sparse Files in PDB Snapshot Carousel



Using Sparse Files in PDB Snapshot Carousel



Enabling Sparse Files in Oracle Database

- To enable using sparse files in Oracle Database, enable the parameter **CLONEDB** :

```
conn / as sysdba
ALTER SYSTEM SET CLONEDB=TRUE SCOPE=SPFILE;
shutdown immediate
startup
```

- The underlying file system must support it
- Not only Snapshot files are affected
- For production systems, its impact must be tested

PDB Snapshot File Location: Sparse Files are used

- Direct files are saved in
  $ORACLE_BASE/oradata/<CDB Name>/<pdb-name>/<snap-id>/

```
cd /u01/app/oracle/product/19.0.0/db_1/dbs/snapshots/pdb_0939955962/4164931

o1_mf_1_30_jll5lp6h_.arc ->
/u01/app/oracle/fra/ORADB/foreign_archivelog/PDB1/2021_09_27/4164931/o1_mf_1_30
_jll5lp6h_.arc
PDB1.xml
sysaux01.dbf -> /u01/app/oracle/oradata/ORADB/pdb1/4164931/sysaux01.dbf
system01.dbf -> /u01/app/oracle/oradata/ORADB/pdb1/4164931/system01.dbf
undotbs01.dbf -> /u01/app/oracle/oradata/ORADB/pdb1/4164931/undotbs01.dbf
users01.dbf -> /u01/app/oracle/oradata/ORADB/pdb1/4164931/users01.dbf
```

PDB Snapshot File Location: Sparse Files are used

- PDB Snapshot data files are saved in
  $ORACLE_BASE/oradata/ORADB/pdb1/<snap-id>/

```
$ cd /u01/app/oracle/oradata/ORADB/pdb1/4164931
$ ls -hsl .

3.7M -rw-r-----. 1 oracle oinstall 391M Sep 27 20:44 sysaux01.dbf
3.6M -rw-r-----. 1 oracle oinstall 321M Sep 27 20:44 system01.dbf
7.6M -rw-r-----. 1 oracle oinstall 126M Sep 27 20:44 undotbs01.dbf
 16K -rw-r-----. 1 oracle oinstall 246M Sep 27 20:44 users01.dbf
```

- OMF independent.

Creating Full PDB from Sparse-files-based Snapshots

- As of Oracle 19.8 non-engineered system, it returns internal error:

```
SQL> CREATE PLUGGABLE DATABASE pdb1_copy FROM pdb1 USING SNAPSHOT
SNAP_939955962_1081388772 ;
CREATE PLUGGABLE DATABASE pdb1_copy FROM pdb1 USING SNAPSHOT
SNAP_939955962_1081388772
*
ERROR at line 1:
ORA-00600: internal error code, arguments: [kpdbOpenArchive : archive
open failure], [1], [],
```

Querying CDB_PDB_SNAPSHOTFILE

- PDB_SNAPSHOTFILE retrieves PDB snapshot sparse files

```
SELECT CON_ID, SNAPSHOT_SCN, SNAPSHOT_FILENAME, SNAPSHOT_FILETYPE FROM
CDB_PDB_SNAPSHOTFILE ORDER BY SNAPSHOT_SCN;

CON_ID SNAPSHOT_SCN SNAPSHOT_FILENAME                                    SNAPSHOT
------ ------------ ------------------------------------------------- --------
     3      3848076 /u01/app/oracle/product/19.0.0/db_1/dbs/snapshots/ XML
                    pdb_0939955962/3848076/PDB1.xml
     3      3848076 /u01/app/oracle/product/19.0.0/db_1/dbs/snapshots/ DATA
                    pdb_0939955962/3848076/system01.dbf
     3      3848076 /u01/app/oracle/product/19.0.0/db_1/dbs/snapshots/ DATA
                    pdb_0939955962/3848076/sysaux01.dbf
...
```

Dropping a PDB Snapshots

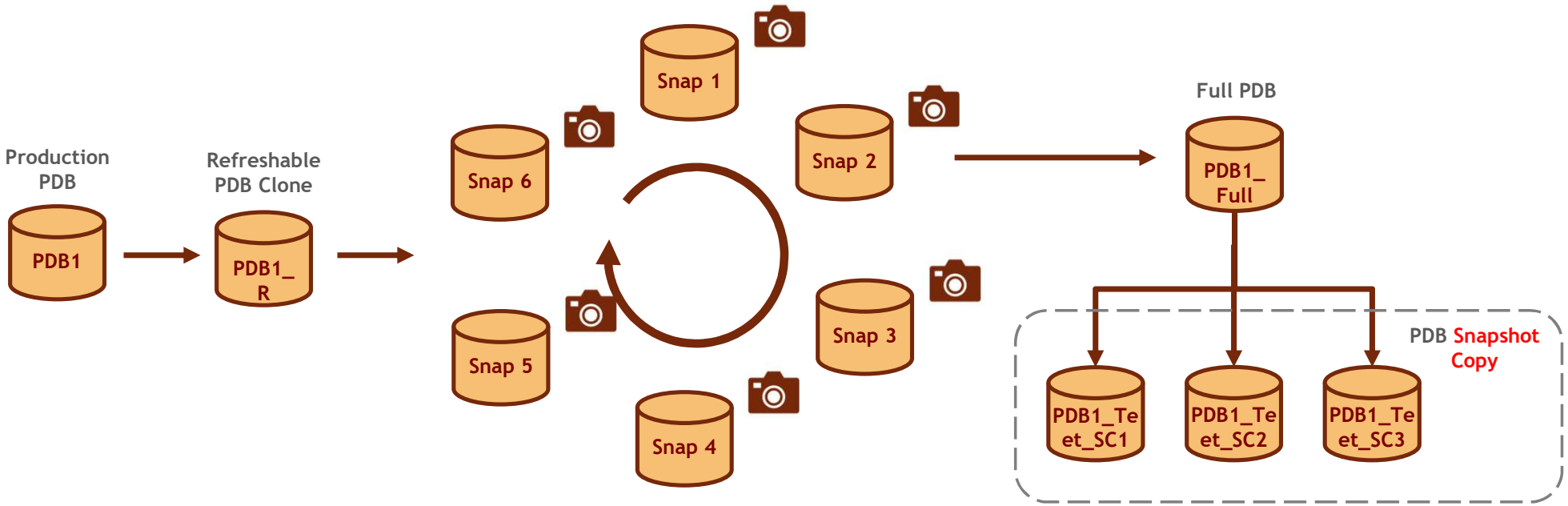
- To drop specific PDB Snapshot:

```
ALTER SESSION SET CONTAINER=pdb1;
ALTER PLUGGABLE DATABASE DROP SNAPSHOT <snapshot_name>
```

- To drop all the snapshots in the PDB Snapshot Carousel:

```
ALTER PLUGGABLE DATABASE SET MAX_PDB_SNAPSHOTS=0;
```

Creating PDB Snapshot Copies from PDB Snapshot Carousel



Notes on the Suggested Model

- As of Oracle non-engineered 19c (19.8) systems, we cannot configure PDB Snapshot Carousel on refreshable PDBs

Summary

By the end of this lecture, you should have learnt how to:

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- Enable Snapshot Carousel for PDBs
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- Understand how PDB Snapshot file locations are set
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