

Infrastructure at your Service.

DOAG 2013– Oracle 12c Backup & Recovery



Invention & Infrastructure
at your service.



About me

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Who we are dbi services

Experts At Your Service

- > 30 specialists in IT infrastructure
- > Certified, experienced, passionate

Based In Switzerland

- > 100% self-financed Swiss company
- > CHF 3.6 million turnover

Leading In Infrastructure Services

- > Over 80 customers in CH, D, & F
- > 30 SLAs **dbi FlexService** contracted



Agenda

1. RMAN new features overview
2. What are pluggable databases?
3. Backing up pluggable databases
4. Restoring pluggable databases
5. Demo

RMAN new features overview



RMAN new features overview

Multi-Section – Extended support

Based on parameter `SECTION_SIZE`

Allows to multiplex data files backups

- > Split in multiple section
- > Backed up through multiple channel

Supported for

- > Full backups
- > Incremental backups – New in 12c
- > Image copies – New in 12c
- > Duplicate

RMAN new features overview

Network-enabled restores

Direct restore database to database over the network

- > Physical Standby to Primary Database

No need to share the backup files

Available for

- > Database
- > Tablespace & Data Files
- > Control File & spfile

Based on `FROM SERVICE` clause

Supports

- > Compression
- > Encryption
- > Multi-Section

```
RMAN> Restore datafile 12 from service  
DBPROD_SITE2 using compressed  
backupset;
```

RMAN new features overview

Cross-platform transport

Support for backupsets and Image Copies transport

Based on new BACKUP command options

- > FOR TRANSPORT
- > TO PLATFORM

Incompatible with

- > CUMULATIVE
- > KEEP
- > notBackedUp
- > SECTION SIZE
- > TAG
- > VALIDATE

```
RMAN> BACKUP TO PLATFORM='Linux x86 64-bit'  
FORMAT '/tmp/xplat_backups/full_db.bck'  
DATABASE;
```

```
RMAN> BACKUP FOR TRANSPORT FORMAT  
'/tmp/dbprod_backups/HR_readonly.bck'  
TABLESPACE HR DATAPUMP  
FORMAT '/tmp/dbprod_backups/HR_dmp.bck';
```


RMAN new features overview

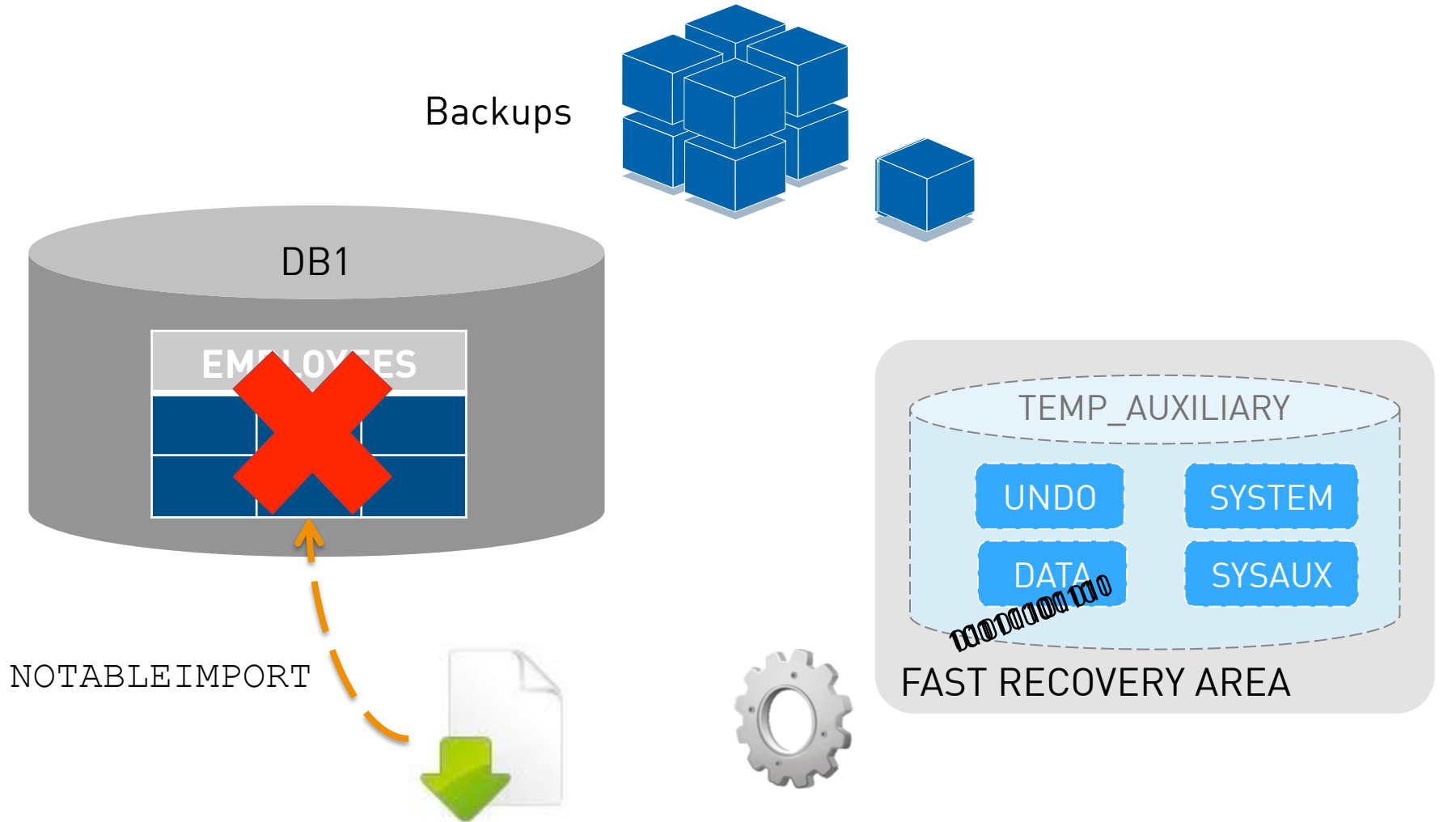
Table recover

Allows tables or tables' partitions Point In Time Restore

- > Requires a backup of current state of
 - > SYSTEM
 - > SYSAUX
 - > UNDO
 - > Tablespace containing the table
- > Uses a temporary **AUXILIARY DATABASE**
- > Uses Data Pump
- > **Not supported for**
 - > Tables or Partitions belonging to SYS
 - > Tables or Partition from SYSTEM or SYSAUX tablespaces
 - > Tables or Partition on a standby database

Table Point In Time Restore

How it works



RMAN new features overview

Active duplicate

Support for **Compression** and **Multi-Section**

Disable auxiliary database automatic open

Pull-based duplicate

- > Processes run on auxiliary side
- > Uses Backupset
- > Requires Service connection to the TARGET
- > Activated either if
 - > Nb auxiliary channels \geq Nb target channel
 - > Use of option `USING <COMPRESSED> BACKUPSET`

RMAN new features overview

RMAN command line

RMAN supports SELECT and DESC commands

SQL Keyword not required for all statement

```
RMAN> alter system archive log current;
```

```
Statement processed
```

```
RMAN> select THREAD#,SEQUENCE#,FIRST_CHANGE#,NEXT_CHANGE#  
        from v$archived_log;
```

THREAD#	SEQUENCE#	FIRST_CHANGE#	NEXT_CHANGE#
1	161	1721500	1734793
1	162	1734793	1782254
1	163	1782254	1791196
1	164	1791196	1835787
1	165	1835787	1866475
1	166	1866475	1906894

```
16 rows selected
```

What are pluggable databases



What are pluggable databases

Containers & container databases

Container DataBase – CDB

- > Oracle database that includes the Root Container and the Pluggable databases
- > CDB = Container of databases

Container

- > **Any** component containing a collection of schema or non-schema data
- > CDB\$ROOT, PDB\$SEED or any PDB
- > Generic name for identification through **Container ID**

Do not mix-up a Container and the Container DataBase (CDB)

What are pluggable databases

Containers & container databases

Root database (**CDB\$ROOT**)

- > Collection of Schema and non-schema information
- > Accessible to all Pluggable Databases (PDBs)
- > Only one CDB\$ROOT can exist per CDB

Seed pluggable database (**PDB\$SEED**)

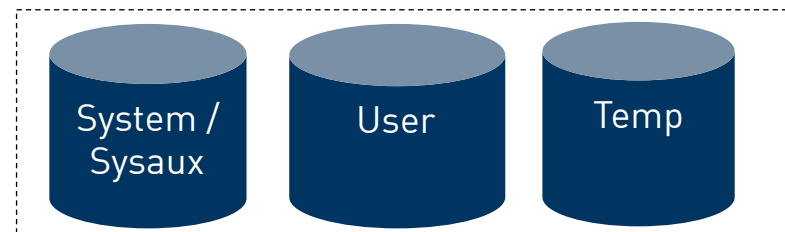
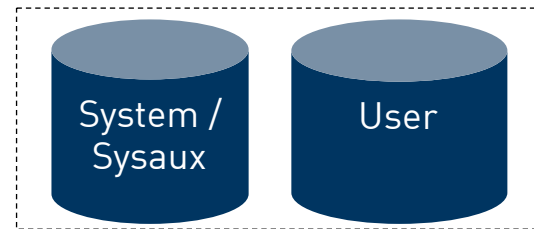
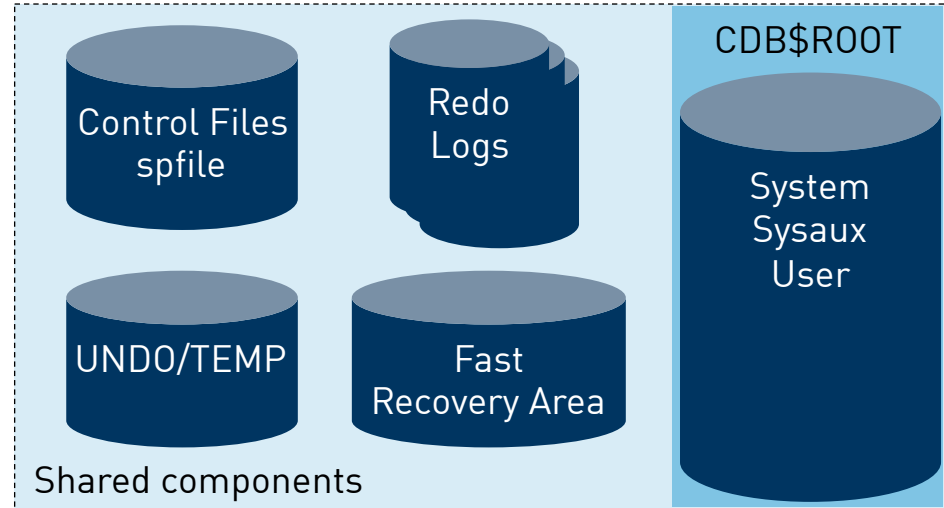
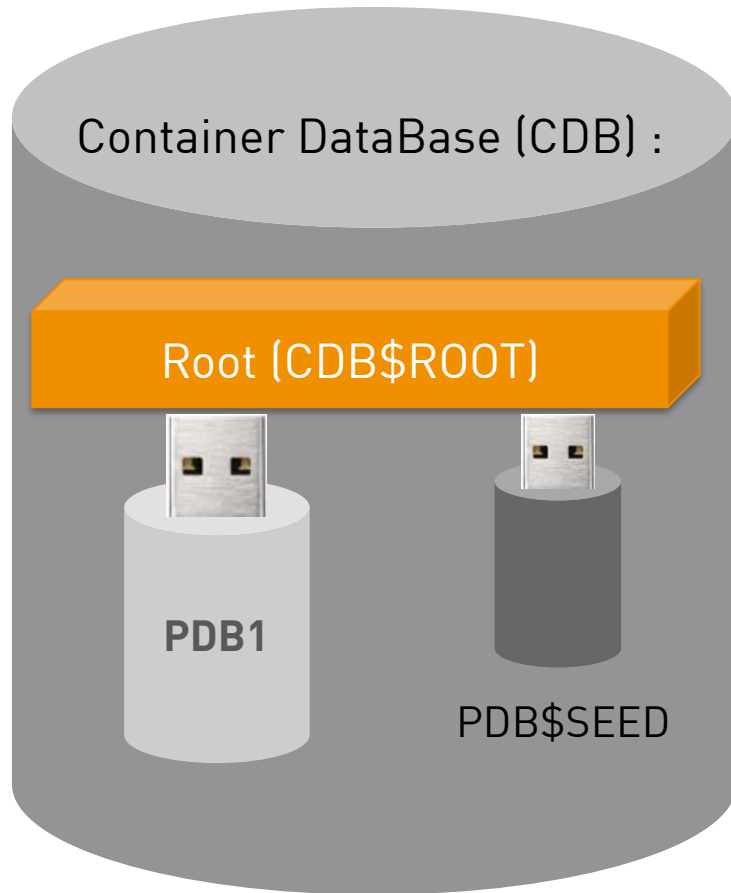
- > The seed PDB is a system-supplied template
- > CDB can use it to create new PDBs
- > Objects in PDB\$SEED cannot be modified nor added
- > Only one PDB\$SEED can exist per CDB

Pluggable DataBase (**PDB**)

- > User created collection of schema for a specific application

What are pluggable databases

Containers & container databases



Backing up pluggable databases



Backing up pluggable databases

Which commands?

All usual backup operations available

- > Offline backup
- > Online backup
- > Incremental backup
- > Image copies

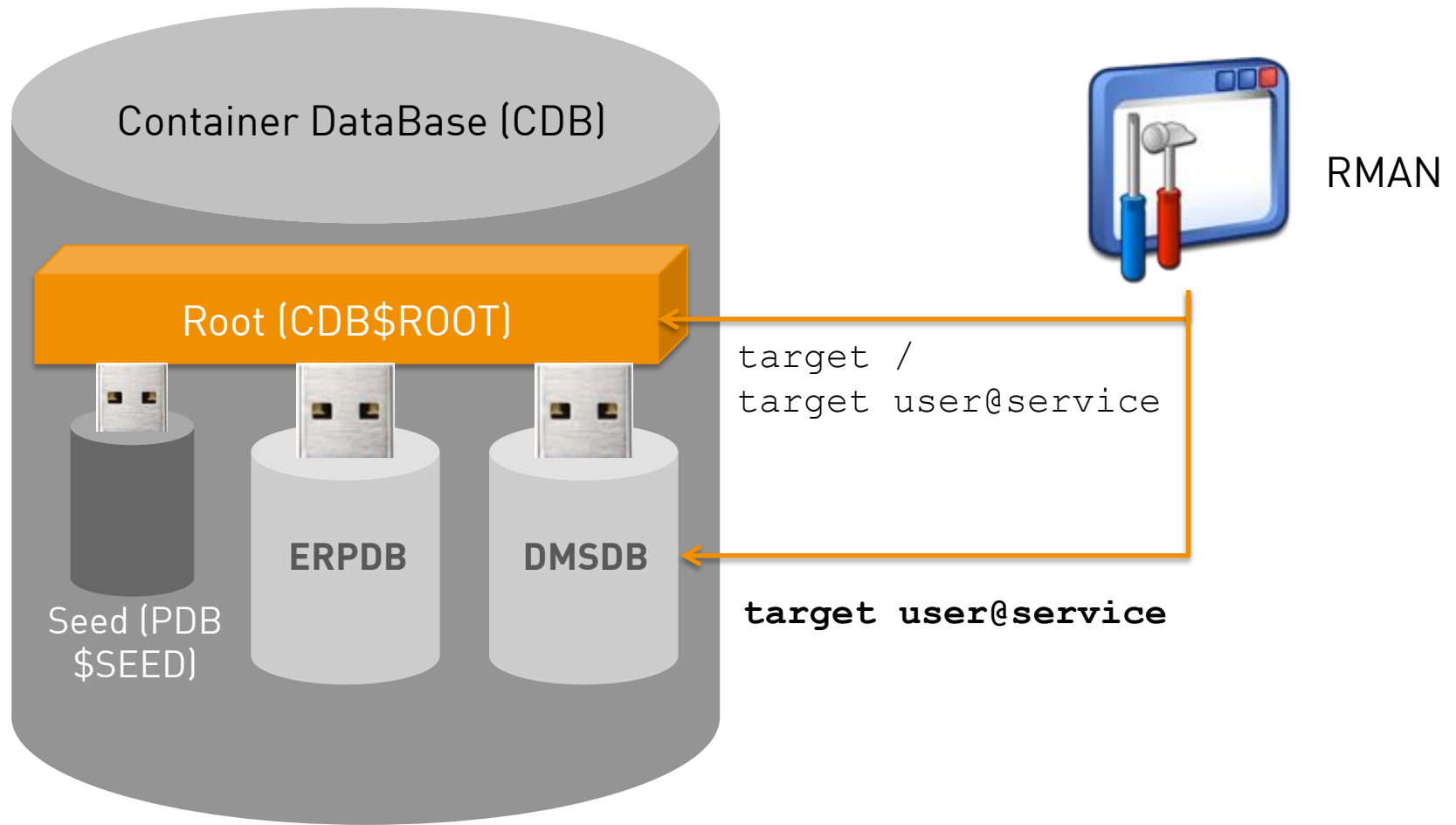
Runs on multiple levels

- > CONTAINER DATABASE
- > PLUGGABLE DATABASE

Commands format depends on connection target

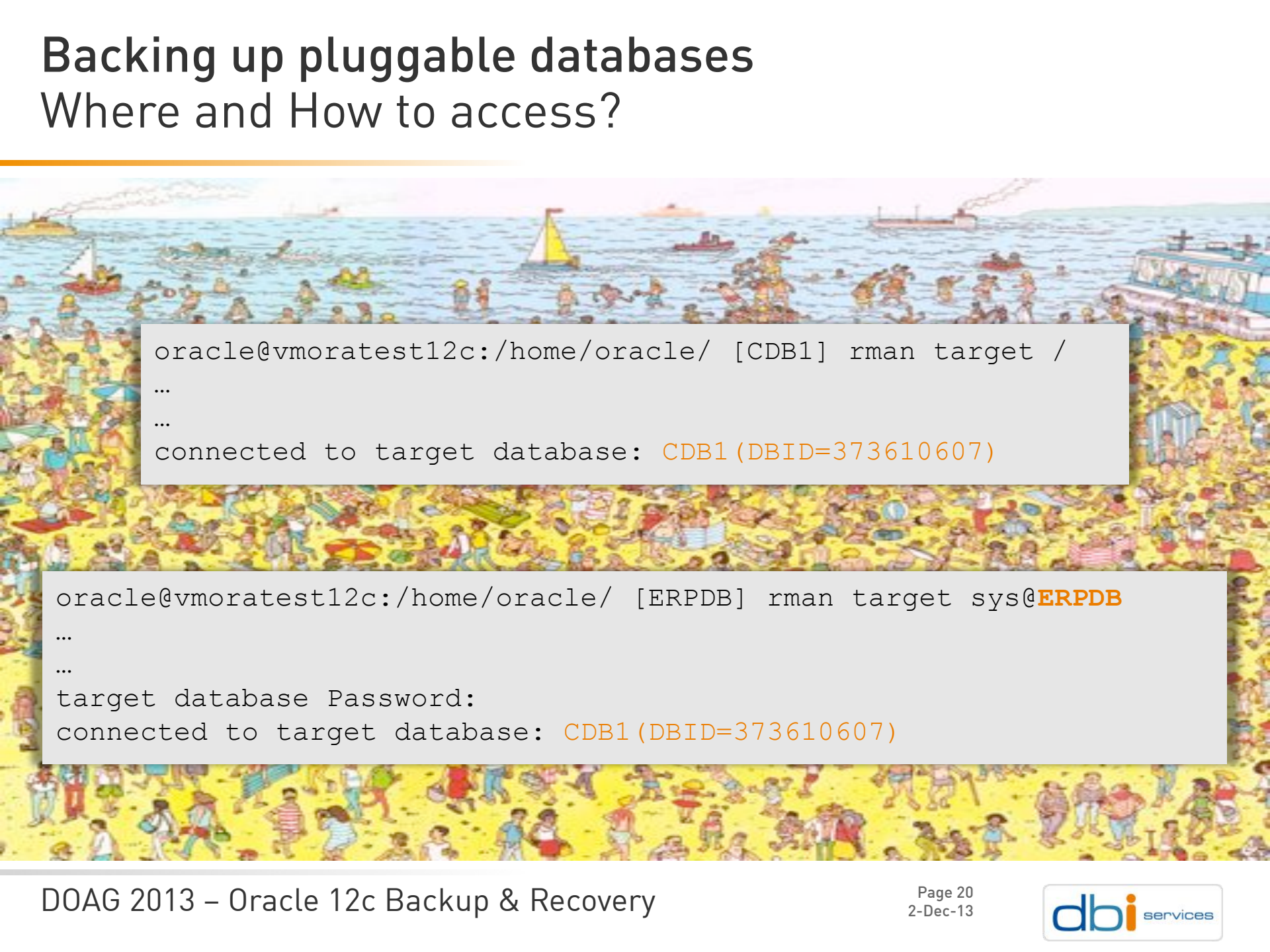
Backing up pluggable databases

Where and How to access?



Backing up pluggable databases

Where and How to access?



```
oracle@vmoratest12c:/home/oracle/ [CDB1] rman target /  
...  
...  
connected to target database: CDB1 (DBID=373610607)
```

```
oracle@vmoratest12c:/home/oracle/ [ERPDB] rman target sys@ERPDB  
...  
...  
target database Password:  
connected to target database: CDB1 (DBID=373610607)
```

Backing up pluggable databases

Backup on container database level

Connected to CDB\$ROOT

Run standard **BACKUP DATABASE** command

- > Control File
- > spfile
- > CDB\$ROOT datafiles
- > All pluggable databases

Backup a specific pluggable database

- > Use keyword **PLUGGABLE**

```
RMAN> BACKUP PLUGGABLE DATABASE ERPDB, DMSDB;
```

Backing up pluggable databases

Backup on pluggable level

Connected to PDB\$XXX

- > Requires a service
- > Run standard **BACKUP** commands

Includes

- > Control File
- > spfile
- > PDB Data Files

```
RMAN> BACKUP INCREMENTAL LEVEL 0 DATABASE;
```

Backing up pluggable databases

Duplicate pluggable databases

Available for

- > Whole container database
- > Single pluggable databases

Options

- > PLUGGABLE DATABASE PDB_NAME
- > SKIP PLUGGABLE DATABASE PDB_NAME
- > TABLESPACE PDB_NAME:TBS_NAME
- > SKIP TABLESPACE PDB_NAME:TBS_NAME

Pluggable database duplicate includes CDB\$ROOT & PDB\$SEED

Restoring pluggable databases



Restoring pluggable databases

Principle

Container Database Restore

- > Connected to the CDB\$ROOT
- > Run standard RESTORE & RECOVER commands
- > All traditional features integrated

Pluggable Database Restore

- > Connected to the PDB
- > Run standard RESTORE & RECOVER commands
- > Full restore requires connection to CDB\$ROOT

Supports Data Recovery Advisor!

Restoring pluggable databases

Point In Time Restore

Complete and Point In Time Restore supported for

- > CONTAINER DATABASE
- > **PLUGGABLE DATABASE**

PITR restore shall be run from CDB

Pluggable Database PITR does

- > **Not** change the CDB Incarnation
- > **Change the PDB incarnation (V\$PDB_INCARNATION)**
- > **Not** reset the log sequence

Restoring pluggable databases

Point In Time Restore

Each PDB has its own incarnation history

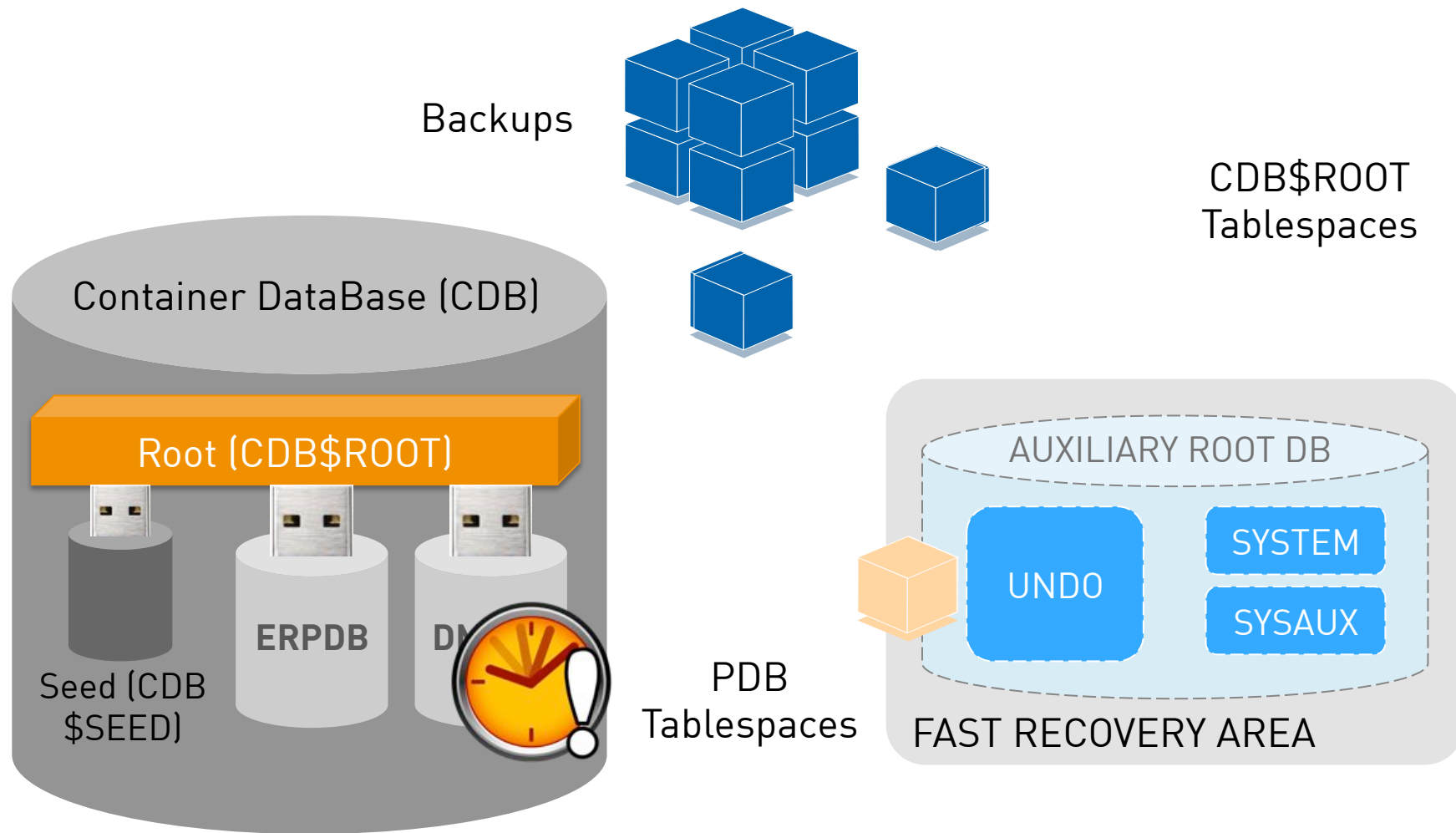
CON_ID	NAME	DB_INC	PDB_INC	STATUS	INC_SCN	BEGIN_SCN	END_SCN
1	CDB\$ROOT	1	0	CURRENT	1	1	1
2	PDB\$SEED	1	0	CURRENT	1	1	1
2	PDB\$SEED	1	0	CURRENT	1	1	1
3	PDB1	1	2	CURRENT	1791110	1839176	1839187
3	PDB1	1	0	PARENT	1	1	1
3	PDB1	1	1	ORPHAN	1791110	1792087	1792098

Challenge for Point In Time Restore?

- > Requires UNDO Data
- > Located in CDB\$ROOT
- > Shared across all PDBs

Restoring pluggable databases

Point In Time Restore – How it works



Demo



Demo

Does it work?

Demo 1

- > Backup whole Container Database
- > Backup a single Pluggable Database
- > Restore Pluggable Database Data File

Demo 2

- > Pluggable Database Point in Time Restore

Demo 3

- > Restoring a lost Pluggable Database
 - > See dbi services' blog



Any questions? Please do ask.

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We look forward to working with you!