



Data Guard and Multitenant

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- Oracle Spezialist since 1992
 - 1992: Presales at Oracle in Dusseldorf
 - 1999: Projectmanager at Herrmann & Lenz Services GmbH
 - 2005: Technical Director ADM Presales at Quest Software GmbH
 - 2011: Executive Director at CarajanDB GmbH
- 2011 → Oracle ACE
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 - Oracle9i für den DBA, Oracle10g für den DBA, Oracle 11g Release 2 für den DBA
- DOAG Responsibility for Database Administration and Standard Edition
- Hobbys:
 - Kiting – esp. Indoor Kiting
 - Motorcykling
 - Singing in a Choir



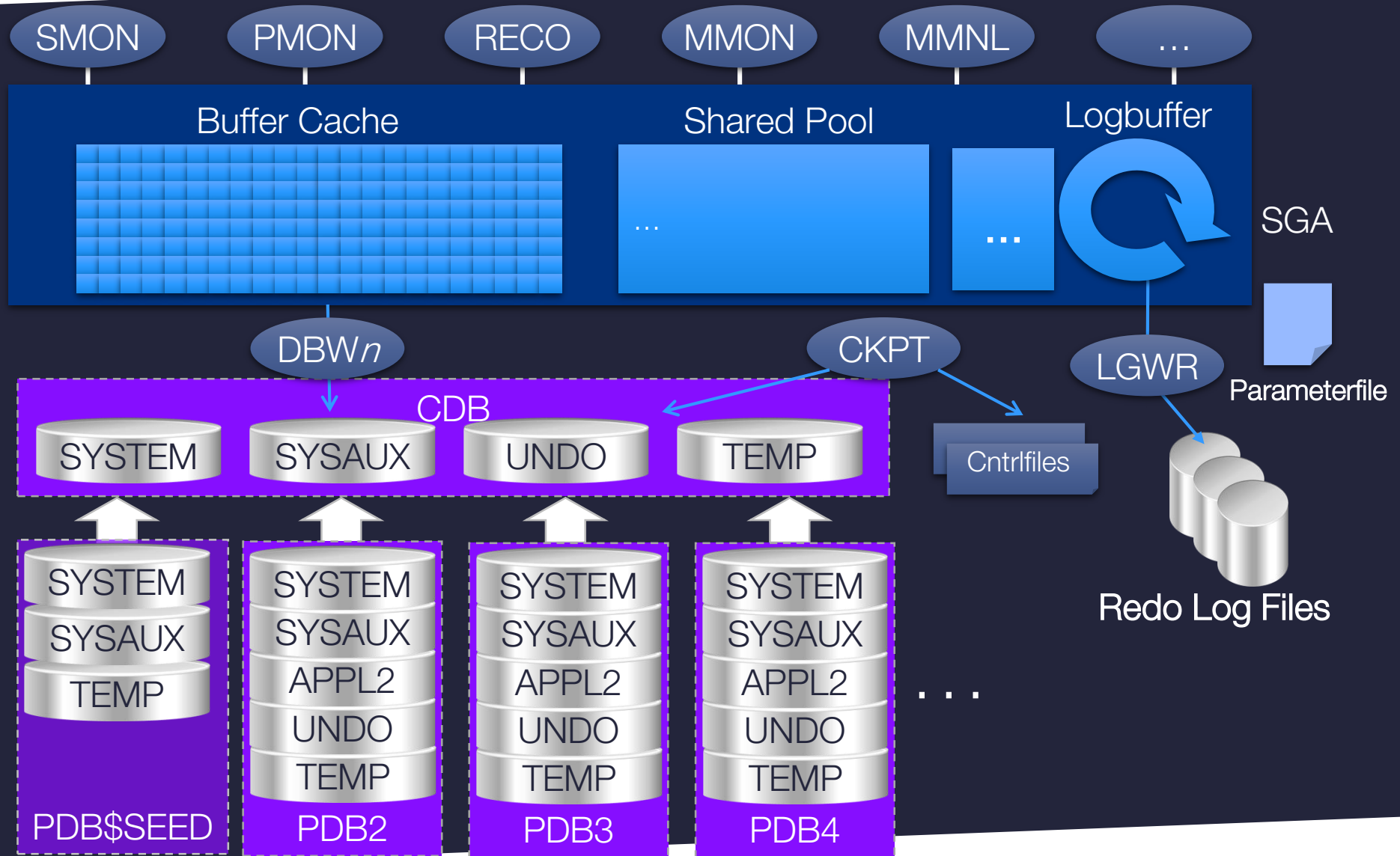


Multitenant Database

- NON-CDB
 - Architecture until Oracle 11.2
- Multitenant Architecture
 - New Architecture since 12.1 for all Oracle Editions (including Standard Edition!)
- Multitenant Option
 - Chargeble Option for Enterprise Edition only
 - Up to 253 PDBs per CDB (Exadata 4096 PDBs since 12.2)

The non-CDB architecture was deprecated in Oracle Database 12c. It can be desupported and unavailable in a release after Oracle Database 12c Release 2. Oracle recommends use of the CDB architecture.

Multitenant Database 12.2



- SE2: Standard Edition Two
- EE: Enterprise Edition
- EE-ES: EE on Engineered Systems
- DBCS: Database Cloud Service
- EE-HP: DBCS EE High Performance
- EE-EP: DBCS EE Extreme Performance
- ExaCS: Exadata Cloud Service

Table 1-2 Consolidation

Feature / Option / Pack	SE2	EE	EE-ES	DBCS SE	DBCS EE	DBCS EE-HP	DBCS EE-EP	ExaCS	Notes
Oracle Multitenant - # of PDBs	1	252	4096	1	1	4096	4096	4096	The number value in each column indicates the maximum number of pluggable databases (PDBs) that can be created for each offering. - For all offerings, if you are not licensed for Oracle Multitenant, then the container database architecture is available in single-tenant mode, that is, with one user-created PDB, one user-created application root, and one user-created proxy PDB. - EE: Extra cost option; if you are licensed for Oracle Multitenant, then you can create up to 252 PDBs. - EE-ES: Extra cost option; if you are licensed for Oracle Multitenant, then you can create up to 4096 PDBs. - DBCS EE-HP, DBCS EE-EP, and ExaCS: Included option; you can create up to 4096 PDBs.
CDB Fleet Management	N	N	Y	N	Y	Y	Y	Y	
PDB Snapshot Carousel	N	N	Y	N	Y	Y	Y	Y	
Refreshable PDB switchover	N	N	Y	Y	Y	Y	Y	Y	

Quelle: Database Licensing Information User Manual 18c E87202-07 October 2018

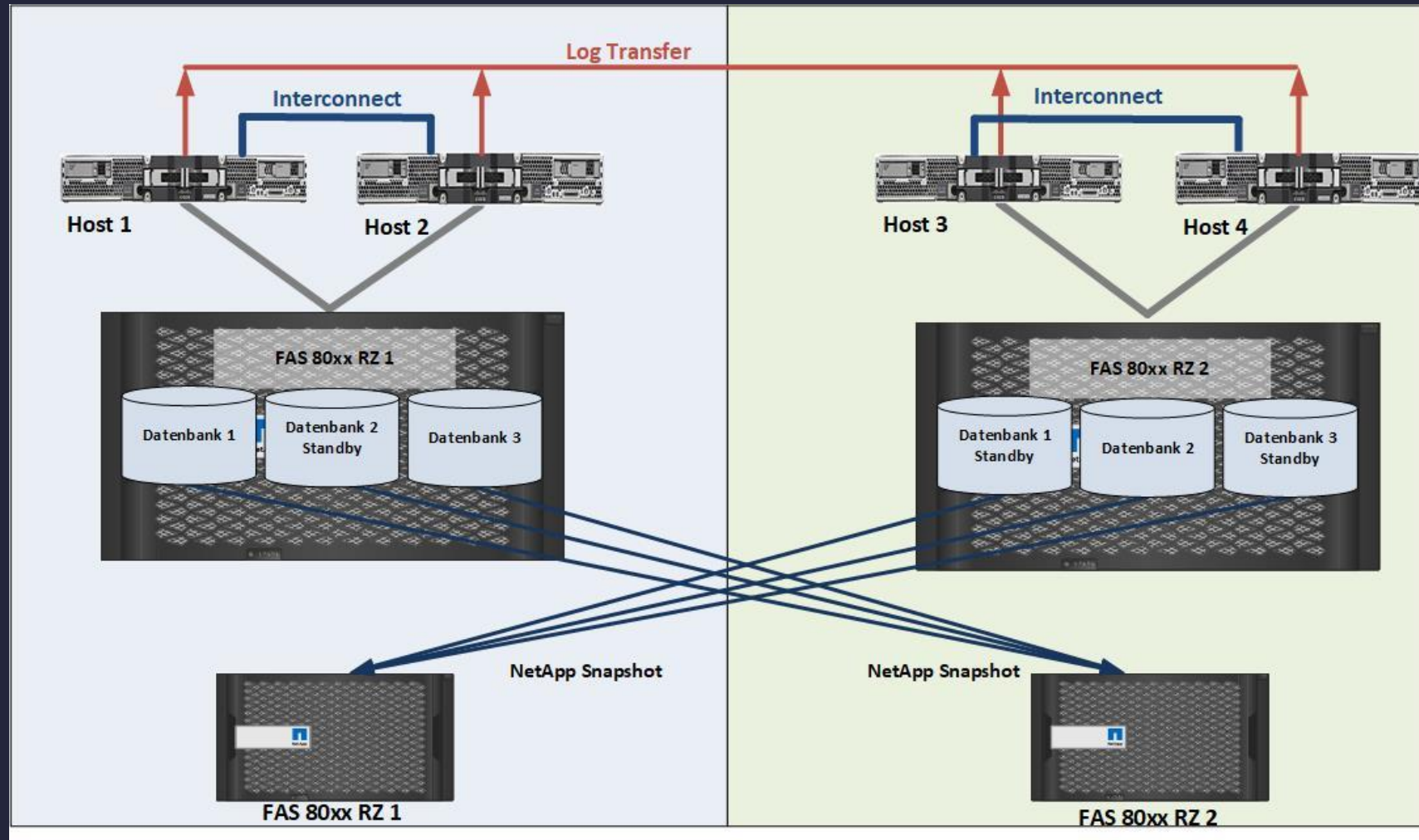
- For all offerings, if you are not licensed for Oracle Multitenant, then the container database architecture is available in single-tenant mode, that is, with one user-created PDB, one user-created application root, and one user-created proxy PDB.

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The Project

- Migration of 8 Oracle 11g Databases on 6 nodes stretched RAC to
 - Oracle 12c (12.2.0.1)
 - 2 node RAC
 - NetApp with Direct NFS
 - Data Guard
 - Multitenant
- 4 Stages (Maintenance, Test, Vorproduktion, Produktion)
 - Currently (March 2019): 7 Databases (CDBs) per stage
- Projectstart Migration August 2015
- Projectstart Multitenant January 2016



- Anzahl PDBs
 - Test: 154
 - Preproduction: 98
 - Production: 82
 - Total: 334

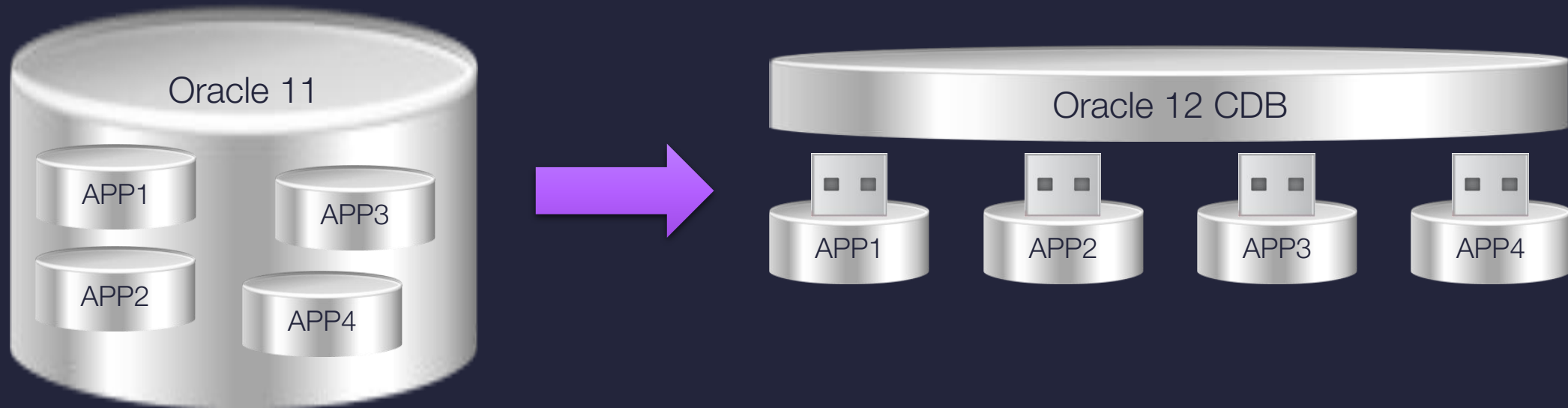


Migration / Upgrade

Action Plan for Migrations

- Identify the project → Find the project / application owner
 - What's the name of the application?
 - How to clients interact with the database(Java, App-Server, Direct, ...)?
 - Are there any restrictions?
- Create the PDB for the application
- Data Pump Schema Export
- Data Pump Schema Import
- Archive migration logfiles for the next 10 years

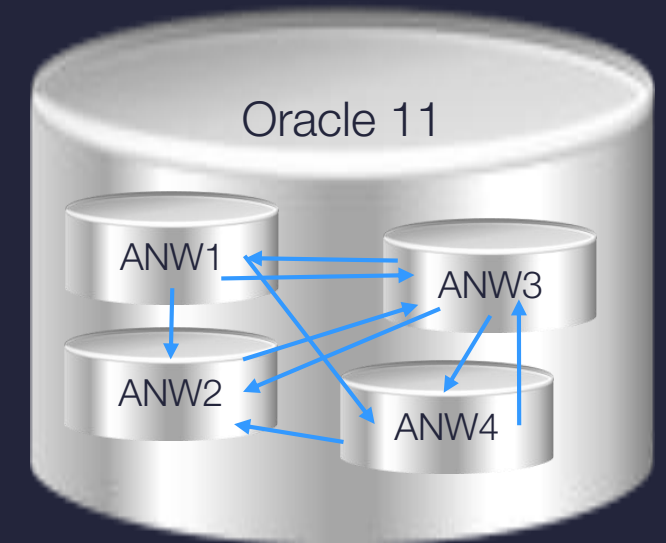
- Source: 8 Databases with about 120 Applications (Schemaconsolidation)
- Target: 7 Databases with about 120 Pluggable Databases



Application Needs

- Application 1: We need Oracle 12.1
- Application 2: We need 12.2 but not 18
- Application 3: We need WE8ISO8859P15
- Application 4: We need Unicode
- Application 5: We need an Oracle 10 Client

- APP1 uses data from APP3
- APP3 uses data from APP2
- ...
- A User changes data in APP1 and APP4
- A User retrieves data from APP2 and APP4



Restrictions (1)

- Schemanames have stage postfix (z.B. APP1_T, APP1_V, APP1_P)
 - Oracle doesn't allow schema rename (there are ways to ...)
- → PDB cloning restricted to the stage

Restrictions (2)

- Applications are using SID instead of service names
 - Impossible with PDBs
- Applications are using authentication with OPS\$ account
 - OPS\$ has to be created in the CDB (C##OPS\$)
 - On Logon Trigger with PDB redirect
- Connect string for application limited to 30 characters
 - No chance for multiple addresses in network description

- Oracle 11g:
 - Retrieving data from other schemas with simply granting access
- Oracle 12c with Multitenant:
 - Access to other PDBs only via database links
 - But database links do not allow synonyms
 - Solution:
 - Create view for remote database Objects
 - Create Synonyme on Views
 - But: fully qualified access no longer possible (Dummyuser?)

Why 7/8 Database?

- Every Competence Center (3) wanted to have their „own“ database
- One CDB for the biggest Document Management System
- One CDB for Databases using OJVM (Patching Issues)
- One CDB für Unicode (derzeit default noch WE8ISO)
- Eine CDB for Oracle 12.2
- One additional CDB for Management (OEM, RMAN Catalog, etc.) over all stages

Reasons for using Multitenant

- Old structure: Schemaconsolidation on 8 databases
- Minimizing downtime for patching and updates
- Flexible patching
- Public synonym conflicts
- Multi tenant applications
- DBA Privileges
- Application flashback



New Paradigms for Rapid Patching and Upgrades

The investment of time and effort to patch a multi-tenant container database results in patching all of its many pluggable databases. To patch a single pluggable database, you simply unplug/plug to a multi-tenant container database at a different Oracle Database software version.

To upgrade all hosted pluggable databases in a container database, simply upgrade the container database and all hosted pluggable databases are upgraded 'in-place'. To upgrade a single PDB, you simply unplug/plug the pluggable database in to a container database at a higher version and upgrade the pluggable database as described in the [Database Upgrade Guide](#).

<http://www.oracle.com/technetwork/database/multitenant/overview/index.html>

ALTERNATE FACTS

- Suggestion: Out-Of-Place Patching
 - Database can be patched online (no mpgrade mode required accept OJVM)
- Project:
 - RAC Rolling Upgrade
 - Data Guard First Apply

- Activate Optimizer via dbms_optim_bundle package
 - GETBUGSFORBUNDLE → List fixes for specific Release Update or Bundle Patch
 - ENABLE_OPTIM_FIXES → Activate fixes
- Works for 12.1 and 12.2

```
SQL> execute dbms_optim_bundle.enable_optim_fixes('ON','BOTH','YES');
```

- Doesn't work for Standby Database!
 - Switchover / Failover after patching
 - Or:

```
SQL> ALTER SYSTEM SET _fix_control='patch_nr1','patch_nr2',...
```


- SQLNET.ALLOWED_LOGON_VERSION_SERVER
 - Oracle 12.1 → Default 11 → All password algorithm allowed (10,11,12)
 - Oracle 12.2 → Default 12 → Only Oracle 11 and 12 allowed

```
ORA-28040: No matching authentication protocol error or an ORA-03134: Connections  
to this server version are no longer supported
```

- Most secure : 12a → Only encryption algorithm of version 12 allowed

PDB Naming Convention

- Quote:
„The PDB name must be unique in the CDB, and it must be unique within the scope of all the CDBs whose instances are reached through a specific listener.“
- Creating NetApp Snapshots
 - Snapshot PDBs will have the same name as the original PDBs
 - Standard Services cannot be assigned correctly
- ONLY USE APPLICATION SPECIFIC SERVICES



Application Switchover / Failover

Net Timeout

- Maintenance or poweroutage CC1
- Probleme: VIP and Scan addresses no longer available
- Timeout for all connects using CC1 as primary side

- Result

```
<ALIAS> =  
  (DESCRIPTION =  
    (CONNECT_TIMEOUT=15) (RETRY_COUNT=20) (RETRY_DELAY=3)  
    (TRANSPORT_CONNECT_TIMEOUT=3)  
    (ADDRESS_LIST =  
      (LOAD_BALANCE=ON)  
      (FAILOVER=ON)  
      (ADDRESS = (PROTOCOL = TCP) (HOST = scan_rz1) (PORT = 1521))  
      (ADDRESS = (PROTOCOL = TCP) (HOST = scan_rz2) (PORT = 1521))  
    )  
    (CONNECT_DATA =  
      (SERVER = DEDICATED)  
      (SERVICE_NAME = <SERVICENAME>)  
    )  
  )
```

- Ergebnis

Normale Operation:

===== TEST1 =====

```
1 OK (10 msec)
2 OK (10 msec)
3 OK (0 msec)
4 OK (0 msec)
5 OK (0 msec)
6 OK (0 msec)
7 OK (0 msec)
8 OK (0 msec)
9 OK (0 msec)
10 OK (0 msec)
```

Clusterware stop

===== TEST1 =====

```
11 OK (10 msec)
12 OK (3000 msec)
13 OK (10 msec)
14 OK (0 msec)
15 OK (3010 msec)
16 OK (3010 msec)
17 OK (3000 msec)
18 OK (3000 msec)
19 OK (3010 msec)
20 OK (3000 msec)
```



Challenges using Multitenant and Data Guard



Create PDB from SEED

- Create PDB from PDB\$SEED

```
SQL> CREATE PLUGGABLE DATABASE konstantin ADMIN USER pdb_admin IDENTIFIED BY manager  
      DEFAULT TABLESPACE users DATAFILE SIZE 10M AUTOEXTEND ON NEXT 10M MAXSIZE 100M;
```

```
SQL> ALTER PLUGGABLE DATABASE KONSTANTIN OPEN;
```

```
SQL> ALTER PLUGGABLE DATABASE konstantin SAVE STATE;
```

- It works
- Oracle Managed Files will be created „correct“(db_unique_name!)
- ... but

- Tempfiles are not created automatically

```
KONSTANTIN(3):*****
KONSTANTIN(3):WARNING: The following temporary tablespaces in container(KONSTANTIN)
KONSTANTIN(3):          contain no files.
KONSTANTIN(3):          This condition can occur when a backup controlfile has
KONSTANTIN(3):          been restored.  It may be necessary to add files to these
KONSTANTIN(3):          tablespaces.  That can be done using the SQL statement:
KONSTANTIN(3):
KONSTANTIN(3):          ALTER TABLESPACE <tablespace_name> ADD TEMPFILE
KONSTANTIN(3):
KONSTANTIN(3):          Alternatively, if these temporary tablespaces are no longer
KONSTANTIN(3):          needed, then they can be dropped.
KONSTANTIN(3):          Empty temporary tablespace: TEMP
KONSTANTIN(3):*****
```

- After Switchover or Failover:

```
SQL> ALTER SESSION SET CONTAINER=konstantin;  
SQL> ALTER TABLESPACE temp ADD TEMPFILE SIZE 100M AUTOEXTEND ON NEXT 100M MAXSIZE 1000M;
```

- Not useful because:
 - A failover might be stressful (Database crashed)!
 - After switchover you might be too happy about the success ...
 - The new tempfile might have a different layout than the original
- Recommendation:
 - Create tempfile right after creating the PDB

- Stop Data Guard Apply

```
DGMGRL> EDIT DATABASE "HANNES_S2" set state=apply-off;
```

- Open Standby CDB Read Only

```
SQL> ALTER DATABASE OPEN READ ONLY;
```

- Open Standby PDB Read Only

```
SQL> ALTER PLUGGALBE DATABASE konstantin OPEN READ ONLY;
```

- Create TEMPFILE

```
SQL> ALTER SESSION SET CONTAINER=konstantin;
```

```
SQL> ALTER TABLESPACE temp ADD TEMPFILE SIZE 100M AUTOEXTEND ON NEXT 100M MAXSIZE 1000M;
```

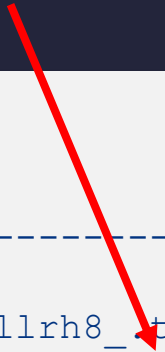
- Restart Database
- Restart Data Guard Apply

- Primary Database

```
SQL> SELECT con_id, name FROM v$tempfile;
```

```
CON_ID NAME
```

```
-----  
1 /u02/oradata/HANNES_S1/datafile/o1_mf_temp_fs4llrd3_.tmp  
2 /u02/oradata/HANNES_S1/7545F34645AA2773E053261E10ACD46B/datafile/o1_mf_temp_fs4llrh8_.tmp  
3 /u02/oradata/HANNES_S1/75485B52050859A9E053261E10ACB2CF/datafile/o1_mf_temp_fs4wmv53_.dbf
```



- Standby Database

```
SQL> SELECT con_id, name FROM v$tempfile;
```

```
CON_ID NAME
```

```
-----  
1 /u02/oradata/HANNES_S2/datafile/o1_mf_temp_fs4wqjqb_.tmp  
2 /u02/oradata/HANNES_S2/7545F34645AA2773E053261E10ACD46B/datafile/o1_mf_temp_fs4wqyys_.tmp  
3 /u02/oradata/HANNES_S2/75485B52050859A9E053261E10ACB2CF/datafile/o1_mf_temp_fs50cn4s_.tmp
```



Create PDB from PDB

- Clone PDB

```
SQL> CREATE PLUGGABLE DATABASE reinhard FROM konstantin;
```

```
SQL> ALTER PLUGGABLE DATABASE reinhard OPEN;
```

```
SQL> ALTER PLUGGABLE DATABASE reinhard SAVE STATE;
```

- It works!?

```
DGMGRL> show configuration
```

```
...
```

```
Configuration Status:
```

```
SUCCESS (status updated 32 seconds ago)
```

- Data Guard Validate

```
DGMGRL> validate database "HANNES_S2"
```

```
Database Role:      Physical standby database  
Primary Database:   HANNES_S1
```

```
Ready for Switchover:  Yes  
Ready for Failover:   Yes (Primary Running)
```

- Alert-Log

```
SWITCHOVER VERIFY: Send VERIFY request to switchover target HANNES_S2  
SWITCHOVER VERIFY WARNING: switchover target has offline datafiles. Verify that those  
datafiles should remain offline.
```


- Datafiles are created as „Dummy“ on the standby database

```
SQL> SELECT con_id, name FROM v$datafile WHERE con_id=4;
```

CON_ID	NAME
--------	------

4	/u01/app/oracle/product/18/dbhome_1/dbs/UNNAMED00012
4	/u01/app/oracle/product/18/dbhome_1/dbs/UNNAMED00013
4	/u01/app/oracle/product/18/dbhome_1/dbs/UNNAMED00014
4	/u01/app/oracle/product/18/dbhome_1/dbs/UNNAMED00015

- Disable Recovery for PDB – but not for CDB

```
DGMGRL> EDIT DATABASE "HANNES_S2" SET STATE=APPLY-OFF;
```

```
SQL> ALTER SESSION SET CONTAINER=reinhard;
```

```
SQL> ALTER PLUGGABLE DATABASE DISABLE RECOVERY;
```

```
DGMGRL> EDIT DATABASE "HANNES_S2" SET STATE=APPLY-ON;
```

- Restore Datafiles on Standby

```
RMAN> run{
```

```
    SET NEWNAME FOR PLUGGABLE DATABASE reinhard TO NEW;
```

```
    RESTORE PLUGGABLE DATABASE reinhard FROM SERVICE HANNES_S1;
```

```
    SWITCH DATAFILE ALL;
```

```
}
```

```
DGMGRL> EDIT DATABASE "HANNES_S2" SET STATE=APPLY-OFF;
```

```
SQL> RECOVER STANDBY DATABASE;
```

- Enable Recovery for PDB

- Data file location is correct now

```
SQL> SELECT name FROM v$datafile WHERE con_id=4;
```

```
NAME
```

```
-----  
/u02/oradata/HANNES_S2/7548A887FB635F7FE053261E10ACC383/datafile/o1_mf_system_fs4zfztf_.dbf  
/u02/oradata/HANNES_S2/7548A887FB635F7FE053261E10ACC383/datafile/o1_mf_sysaux_fs4zg6x8_.dbf  
/u02/oradata/HANNES_S2/7548A887FB635F7FE053261E10ACC383/datafile/o1_mf_undotbs1_fs4zgg38_.dbf  
/u02/oradata/HANNES_S2/7548A887FB635F7FE053261E10ACC383/datafile/o1_mf_users_fs4zgo70_.dbf
```



Create PDB Snapshot Copy

- Requirements:
 - Suitable Storage (e.g. NFS)
 - Parameter clonedb = TRUE (Instance Restart)
 - Be careful: The default location for the bitmap file is \$ORACLE_HOME/dbs
 - Source PDB must be read only

```
SQL> ALTER SYSTEM SET clonedb = TRUE SCOPE=SPFILE;  
SQL> ALTER SYSTEM SET clonedb_dir='/u02/oradata/HANNES_S1/bitmap' scope=spfile;
```

- Create PDB

```
SQL> CREATE PLUGGABLE DATABASE karl FROM konstantin SNAPSHOT COPY;
```

- Cloned DB Files

```
ls -l /u02/oradata/HANNES_S1/754AA536C9C006B7E053261E10AC2048/datafile
total 2148
-rw-r-----. 1 oracle oinstall 173023232 Sep  7 17:33 o1_mf_sysaux_fs568wxv_.dbf
-rw-r-----. 1 oracle oinstall 220209152 Sep  7 17:33 o1_mf_system_fs568wx7_.dbf
-rw-r-----. 1 oracle oinstall  20979712 Sep  7 17:28 o1_mf_temp_fs568wy9_.dbf
-rw-r-----. 1 oracle oinstall 230694912 Sep  7 17:33 o1_mf_undotbs1_fs568wy2_.dbf
-rw-r-----. 1 oracle oinstall  10493952 Sep  7 17:33 o1_mf_users_fs568wyw_.dbf
```

- Real size

```
du -sh /u02/oradata/HANNES_S1/754AA536C9C006B7E053261E10AC2048/datafile
148K /u02/oradata/HANNES_S1/754AA536C9C006B7E053261E10AC2048/datafile
```

```
DGMGRL> show database "HANNES_S2"
```

```
Database - HANNES_S2
```

```
Role:                PHYSICAL STANDBY
Intended State:       APPLY-ON
Transport Lag:        0 seconds (computed 1 second ago)
Apply Lag:            16 minutes 30 seconds (computed 0 seconds ago)
Average Apply Rate:   5.00 KByte/s
Real Time Query:      OFF
Instance(s):
  HANNES
```

```
Database Error(s):
  ORA-16766: Redo Apply is stopped
```

```
Database Warning(s):
  ORA-16853: apply lag has exceeded specified threshold
```

```
Database Status:
ERROR
```

- OMF Wrong Directory!!!

```
SQL> SELECT name FROM v$datafile WHERE con_ID=6;
```

```
NAME
```

```
-----  
/u02/oradata/HANNES_s1/754AA536C9C006B7E053261E10AC2048/datafile/o1_mf_system_fs568wx7_.dbf
```

- Currently no valid solution
- Need to recreate standby database

- Cloned DB Files (Standby)

```
ls -l /u02/oradata/HANNES_S2/754AA536C9C006B7E053261E10AC2048/datafile
total 620576
-rw-r-----. 1 oracle oinstall 173023232 Sep  7 18:22 o1_mf_sysaux__101dm5z3_.dbf
-rw-r-----. 1 oracle oinstall 220209152 Sep  7 18:22 o1_mf_system__10150cyy_.dbf
-rw-r-----. 1 oracle oinstall  20979712 Sep  7 18:22 o1_mf_temp__1016g7gz_.tmp
-rw-r-----. 1 oracle oinstall 230694912 Sep  7 18:22 o1_mf_undotbs1__1011s5ng_.dbf
-rw-r-----. 1 oracle oinstall  10493952 Sep  7 18:22 o1_mf_users__10221yv9_.dbf
```

- Real Size

```
du -h /u02/oradata/HANNES_S2/754AA536C9C006B7E053261E10AC2048/datafile
607M /u02/oradata/HANNES_S2/754AA536C9C006B7E053261E10AC2048/datafile
```

- ➔ No Snapshot Copy!

Option STANDBYS=NONE

- Create PDB

```
SQL> CREATE PLUGGABLE DATABASE franz FROM konstantin SNAPSHOT COPY STANDBYS=NONE;
```

- Created DB Files (Primary)

```
ls -l /u02/oradata/HANNES_S1/754AA536C9C006B7E053261E10AC2048/datafile
total 628516
-rw-r----- 1 oracle oinstall 173023232 Sep  8 09:33 o1_mf_sysaux__00yq4l9v_.dbf
-rw-r----- 1 oracle oinstall 220209152 Sep  8 09:35 o1_mf_system__00yjd5ow_.dbf
-rw-r----- 1 oracle oinstall  20979712 Sep  8 09:27 o1_mf_temp__019ff6fv_.tmp
-rw-r----- 1 oracle oinstall 230694912 Sep  8 09:33 o1_mf_undotbs1__00yxk3qs_.dbf
-rw-r----- 1 oracle oinstall  10493952 Sep  8 09:30 o1_mf_users__00z5d0y3_.dbf
```

- Real Size

```
du -sh /u02/oradata/HANNES_S1/ 75581F3D60726B11E053261E10AC5313/datafile
148K /u02/oradata/HANNES_S1/ 75581F3D60726B11E053261E10AC5313/datafile
```

Alertfile (Standby)

```
2018-09-11T18:19:51.181573+02:00
Recovery created pluggable database FRANZ
FRANZ(4):File #12 added to control file as 'UNNAMED00012'. Originally created as:
FRANZ(4):'/u02/oradata/HANNES_S1/759BD432D4B801ABE053261E10AC8FAD/datafile/o1_mf_system
_fshts56v_.dbf'
FRANZ(4):because the pluggable database was created with nostandby
FRANZ(4):or the tablespace belonging to the pluggable database is
FRANZ(4):offline.
```

```
SQL> SELECT con_id, name FROM v$datafile;
```

```
CON_ID NAME
```

```
-----  
7 /u01/app/oracle/product/18/dbhome_1/dbs/UNNAMED00033  
7 /u01/app/oracle/product/18/dbhome_1/dbs/UNNAMED00034  
7 /u01/app/oracle/product/18/dbhome_1/dbs/UNNAMED00035  
7 /u01/app/oracle/product/18/dbhome_1/dbs/UNNAMED00036
```

- Disable Recovery for PDB

```
DGMGRL> EDIT DATABASE "HANNES_S2" SET STATE=APPLY-OFF;
```

```
SQL> ALTER SESSION SET CONTAINER=franz;
```

```
SQL> ALTER PLUGGABLE DATABASE DISABLE RECOVERY;
```

```
DGMGRL> EDIT DATABASE "HANNES_S2" SET STATE=APPLY-ON;
```

- Restore Datafiles on Standby

```
RMAN> run{  
    SET NEWNAME FOR PLUGGABLE DATABASE franz TO NEW;  
    RESTORE PLUGGABLE DATABASE franz FROM SERVICE HANNES_S1;  
    SWITCH DATAFILE ALL;  
}  
DGMGRL> EDIT DATABASE "HANNES_S2" SET STATE=APPLY-OFF;  
SQL> RECOVER STANDBY DATABASE;
```

- Enable Recovery for PDB

- Created DB Files (Standby)

```
ls -l /u02/oradata/HANNES_S2/75581F3D60726B11E053261E10AC5313/datafile
total 1280064
-rw-r----- 1 oracle oinstall 193994752 Sep  8 09:31 o1_mf_sysaux__1l1l2l4l_.dbf
-rw-r----- 1 oracle oinstall 193994752 Sep  8 09:44 o1_mf_sysaux__1l1xdgbv_.dbf
-rw-r----- 1 oracle oinstall 220209152 Sep  8 09:30 o1_mf_system__1l15dd2b_.dbf
-rw-r----- 1 oracle oinstall 220209152 Sep  8 09:44 o1_mf_system__1l1hhrr0_.dbf
-rw-r----- 1 oracle oinstall 230694912 Sep  8 09:31 o1_mf_undotbs1__1l1rt6k8_.dbf
-rw-r----- 1 oracle oinstall 230694912 Sep  8 09:44 o1_mf_undotbs1__1lm46vvy_.dbf
-rw-r----- 1 oracle oinstall 10493952 Sep  8 09:31 o1_mf_users__1l1z805s_.dbf
-rw-r----- 1 oracle oinstall 10493952 Sep  8 09:44 o1_mf_users__1lmb5g8r_.dbf
```

- Be aware that every attempt will create new datafiles!!!
- No Snapshot Clone!

```
du -h /u02/oradata/HANNES_S2/75581F3D60726B11E053261E10AC5313/datafile
626M      /u02/oradata/HANNES_S2/75581F3D60726B11E053261E10AC5313/datafile
```



Active Data Guard

Active Data Guard

- Enterprise Edition Option (\$ 10.000,00 per Processor)
- Standby opened Datenbank Read Only
- Apply still running
- Use for report offloading
- Ability to use inMemory and other features on Standby

- Standby Datenbank without Clusterware

```
SQL> SHUTDOWN IMMEDIATE  
SQL> STARTUP
```

- Standby Datenbank with Clusterware

```
srvctl modify database <DBUNAME> -startoption read only;
```

- Example

```
SQL> ALTER SYSTEM set "_query_on_physical" = TRUE SCOPE=SPFILE;  
SQL> SHUTDOWN IMMEDIATE  
SQL> STARTUP
```

```
DGMGRL> show database "HANNES_S2"
```

```
Database - HANNES_S2
```

```
Role:                PHYSICAL STANDBY
Intended State:       APPLY-ON
Transport Lag:        0 seconds (computed 0 seconds ago)
Apply Lag:            0 seconds (computed 0 seconds ago)
Average Apply Rate:   1.00 KByte/s
Real Time Query:     ON
Instance(s):
    HANNES
```

```
Database Status:
SUCCESS
```

```
SQL> show pdbs
```

CON_ID	CON_NAME	OPEN	MODE	RESTRICTED
2	PDB\$SEED	READ ONLY		NO
3	KONSTANTIN	MOUNTED		
4	REINHARD	MOUNTED		
6	KARL	MOUNTED		
7	FRANZ	MOUNTED		

```
SQL> ALTER PLUGGABLE DATABASE ALL OPEN;
```

- Clone PDB

```
SQL> CREATE PLUGGABLE DATABASE kokain FROM konstantin;
```

```
SQL> ALTER PLUGGABLE DATABASE kokain OPEN;
```

```
SQL> ALTER PLUGGABLE DATABASE kokain SAVE STATE;
```

- It works!

```
DGMGRL> show configuration
```

```
...
```

```
Configuration Status:
```

```
SUCCESS (status updated 32 seconds ago)
```

- But TEMPFILE still missing!

```
SQL> ALTER SESSION SET CONTAINER= kokain;  
SQL> ALTER TABLESPACE temp ADD TEMPFILE SIZE 100M AUTOEXTEND ON NEXT 100M MAXSIZE 1000M;
```

Other PDB Features

DROP PDB

- It works!!!
- All files are dropped on primary and standby
- GUID persists

- E.g. create named data file with OMF

```
SQL> ALTER SESSION SET CONTAINER=reinhard;  
SQL> CREATE TABLESPACE noomf DATAFILE '/u02/oradata/keinomf01.dbf' size 100M  
      AUTOEXTEND ON NEXT 10M MAXSIZE 1000M;
```

- Will be created as OMF on standby
- Need to be modified on primary only

```
SQL> ALTER SESSION SET CONTAINER=reinhard;  
SQL> ALTER DATABASE MOVE DATAFILE '/u02/oradata/noomf01.dbf';
```

- Create Restore Point

```
SQL> ALTER SESSION SET CONTAINER=konstantin;  
SQL> CREATE RESTORE POINT insert30 GUARANTEE FLASHBACK DATABASE;
```

- Flashback PDB

```
SQL> ALTER PLUGGABLE DATABASE CLOSE IMMEDIATE;  
SQL> FLASHBACK PLUGGABLE DATABASE TO RESTORE POINT insert30;  
SQL> PLUGGABLE DATABASE OPEN RESETLOGS;
```

- Standby DB

```
(3):Recovery of pluggable database KONSTANTIN aborted due to pluggable database open  
resetlog marker.  
(3):To continue recovery, restore all data files for this PDB to checkpoint SCN lower  
than 948798, or timestamp before 09/08/2018 14:55:32, and restart recovery
```

- Start CDB in Mount – only if you are using ADG

```
SQL> SHUTDOWN IMMEDIATE  
SQL> STARTUP MOUNT
```

- Flashback PDB

```
SQL> ALTER SESSION SET CONTAINER=konstantin;  
SQL> FLASHBACK PLUGGABLE DATABASE TO SCN 948797;
```

- Start Apply Process

```
DGMGRL> EDIT DATABASE "HANNES_S2" SET STATE=apply-on;
```

- Generell
 - Tempfile must be created manually
- „Passiv“ Data Guard
 - Create from SEED
 - okay
 - Create from PDB
 - Multiple manual changes required
 - Create Snapshot Copy
 - Snapshot is still a full clone – not useful for Data Guard
 - Flashback PDB
 - Works with minimum touch up
- Active Data Guard
 - Create from SEED
 - okay
 - Create from PDB
 - okay
 - Create Snapshot Copy
 - Snapshot is still a full clone – not useful for Data Guard
 - Flashback PDB
 - Works with minimum touch up

- RAC
 - + Rolling Upgrade works
 - + Robust
- Data Guard
 - + Easy to create
 - Problem if first address is not available (TCP Timeout)
- Multitenant
 - + Delegate DBA responsibility to departments (local DBAs)
 - Not yet fully functional with Data Guard
 - Different behaviour with schema separation

- More than 30 years experience in Database Administration
- Specialists for
 - Database Administration (Oracle and PostgreSQL)
 - High Availability (RAC, Data Guard, Replication, etc.)
 - Migration (Unicode, PostgreSQL)
 - Performance Tuning
 - Monitoring (OEM, Foglight, CheckMK, PEM)
- Remote Support
- Trainings and Workshops
 - PostgreSQL
 - Oracle
 - Toad



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Questions?