

Efficient Operations of Oracle Single Instance DBs

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Agenda

1. Festo facts
2. DB-Team Organization
3. Oracle service_name and aliases
4. Tablespace point in time analysis
5. Conclusion

Festo facts

- Automation und Didactic
- Festo Group registered sales of 2,74 billion EUR (2016)
- over 300.000 customers worldwide
- 18.800 employees in 176 countries
- 33.000 catalog products
- 2.600 patents worldwide

company

quality

added value

trends

continuity



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DB-Team Organisation

1. Oracle Enterprise Edition as Single Instance or Oracle Dataguard
2. Consolidated shared DBs consist of many applications
3. Application layer managed by many different departments
4. Minimally invasive Oracle DB connection are needed
5. International DBA Team

Requirements for the concept

1. DB-Team could define, and manage host aliases for Oracle Database physical hosts
2. Spfile-definition and Startup-Trigger (re)-creation is possible
3. Optionally, global TNS-Aliases definition via central tnsnames.ora, or LDAP product (OID)

- See Database Licensing Information User Manual

A restricted-use license for Oracle Identity Management Directory Services Plus component Oracle Internet Directory (OID) is included with all editions (except for Oracle Database Express Edition) if users use the Directory Naming feature to configure Oracle Net Services. OID may not be used or deployed for other uses.

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Oracle service_names and aliases

Motivation

„Lifelong“ minimal invasive Oracle Client Settings for Oracle database access

Standard definition for single instance

username/password + 1 hostname + 1 **SID** or default service_name + 1 port

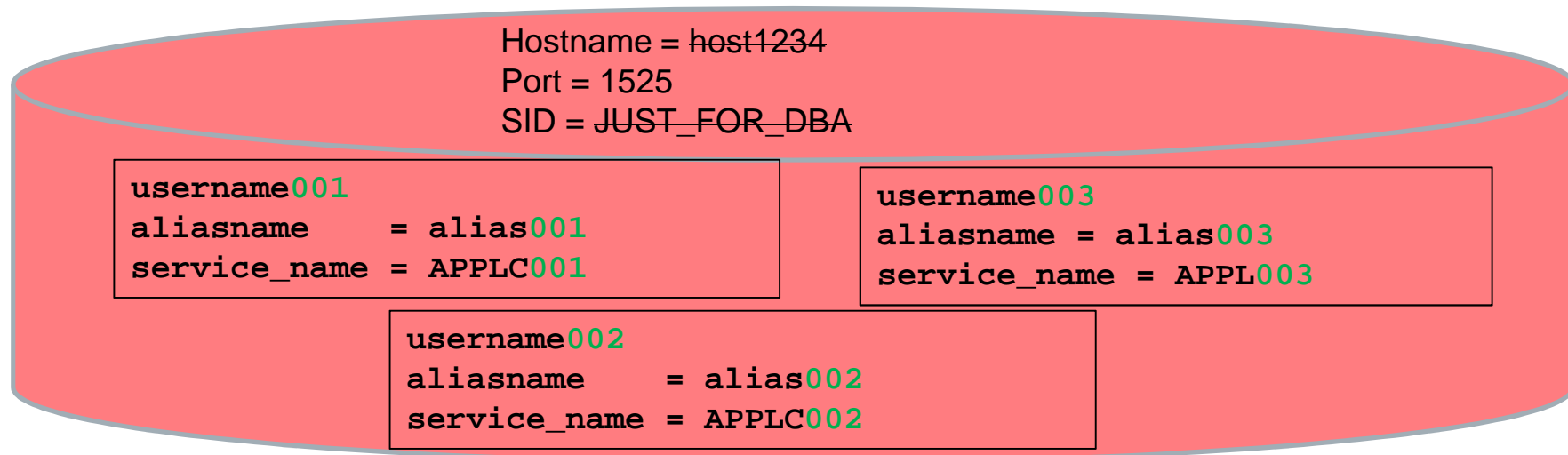
Flexible definition for single Instance, Service name ist case-sensitive !

username/password + 1 **alias name** + 1 **service_name** + 1 port

Flexible definition for Dataguard, Service name ist case-sensitive !

username/password + 2 **alias names** + 1 **service_name** + 1 or 2 port(s)

Flexible definition for single Instance



```
show parameter service_names
```

```
SELECT service_id, name, network_name
FROM v$active_services
WHERE name NOT IN ('SYS$BACKGROUND', 'SYS$USERS');
```

```
SELECT service_id, name, network_name
FROM dba_services
WHERE name NOT IN ('SYS$BACKGROUND', 'SYS$USERS');
```


Simple setting of listener.ora

```
LISTENERNAME =  
  (DESCRIPTION_LIST =  
    (DESCRIPTION =  
      (ADDRESS=(PROTOCOL = TCP)(HOST =<physicalhostname>)(PORT = 1234))))
```

Setting via init. parameter service_names

```
show parameter service_names
```

```
alter system set service_names=SOME_DEFAULT, APPLC001,APPLC002,APPLC003  
SCOPE=BOTH;
```

```
show parameter service_names
```

```
lsnrctl status
```

```
-----
```

```
Services Summary...
```

```
Service "APPLC001" has 1 instance(s).
```

```
Instance "XYZ", status READY, has 1 handler(s) for this service...
```

```
Service "APPLC002" has 1 instance(s).
```

```
Instance "XYZ", status READY, has 1 handler(s) for this service...
```

```
Service "APPLC003" has 1 instance(s).
```

```
Instance "XYZ", status READY, has 1 handler(s) for this service...
```

```
Service "SOME_DEFAULT" has 1 instance(s).
```

Client Settings for single instance

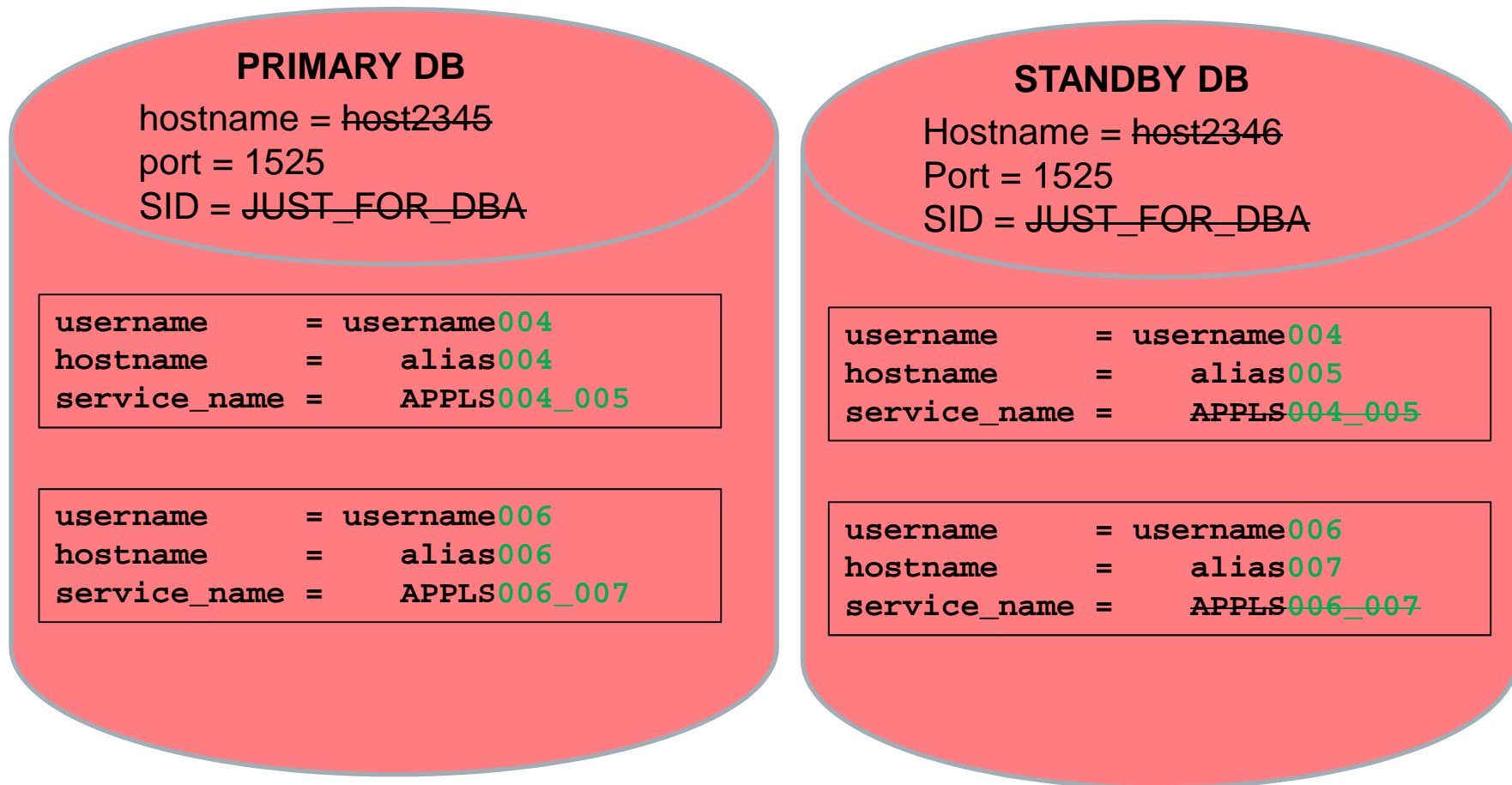
```
TNS_alias =  
(DESCRIPTION = (ADDRESS = (PROTOCOL = TCP)  
                    (HOST = alias001)(PORT = 1521))  
(CONNECT_DATA =  
(SERVICE_NAME = APPL001)))
```

Oracle OCI JDBC Driver => jdbc:oracle:oci8:@TNS_alias

OCI JDBC Driver => jdbc:oracle:oci:@alias001:1521/APPL001

Thin JDBC Driver => jdbc:oracle:thin:username/password@//alias001:1521/APPL001

Flexible definition for Oracle DataGuard DB



Flexible Client Setting to Oracle Dataguard

```
--Create and Start-Up Service for APPLS004_005
exec DBMS_SERVICE.CREATE_SERVICE (service_name=>'APPLS004_005',
                                   network_name=>'APPLS004_005');
exec DBMS_SERVICE.START_SERVICE(service_name=>'APPLS004_005');

--Create and Start-Up Service for APPLS006_007
exec DBMS_SERVICE.CREATE_SERVICE (service_name=>'APPLS006_007',
                                   network_name=>'APPLS006_007');
exec DBMS_SERVICE.START_SERVICE(service_name=>'APPLS006_007');

--View for Net Services
select service_id, name, network_name from dba_services;
```

After Startup Trigger

```
--Excerpt of (Re)-Creation of Logon-Trigger
CREATE OR REPLACE TRIGGER SYS.service_trigger  after startup on
database
BEGIN
    ...
    IF database_role = 'PRIMARY' THEN
        dbms_service.start_service('APPLS004_005');
        dbms_service.start_service('APPLS006_007');
    END IF;
END;
/
```

Management of flexible database/client connectivity

1. Oracle Service_Names in local Oracle Datenbank

Single Instance: `spfile - alter system set service_names=... SCOPE=BOTH;`

API Package `DBMS_SERVICE`

DataGuard: `DBMS_SERVICE + TRIGGER AFTER DB_ROLE_CHANGE ON DATABASE`

2. DNS Tool

- DNS alias names definition

3. Global Oracle TNS-Aliases Management (optional)

- Global `tnsnames.ora`
- Oracle Internet Directory

4. Some password safe tool is (optional)

- Management of user passwords

Pros

1. DB-Access is independent from Oracle SID or „default“ service_names
2. DB-Hosting is much more flexible
3. Any future migration will be easier
4. Tracing of an application with more connections is easy (e.g. Trace Analyzer)
5. Small number of Oracle Instances produces with low overhead:
 - virtualization layer
 - backup management
 - monitoring effort
6. CPU ressourcemangement via Oracle Ressource Manager (just for Oracle EE)
7. Performance analysis is simplier (AWR, ASH just for Oracle EE)
8. Suitable for shared DB environments with more applications (running on one single instance DB)

Most important question for DBA: How to restore in shared DB environment?

1. Restoring on original server
2. Restoring on some other DB server (test environment)
3. Using tablespace point-in-time recovery (TSPITR)



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Simple analysis of Oracle Enterprise DBs with TSPITR

```
SELECT *
  FROM SYS.TS_PITR_CHECK
 WHERE ( 'SYSTEM' IN (TS1_NAME, TS2_NAME)
        AND TS1_NAME <> TS2_NAME
        AND TS2_NAME <> '-1'
        AND OBJ1_OWNER not in
          ('SYS', 'SYSTEM', 'CTXSYS', 'WMSYS', 'XDB', '+++'))
)
OR ( TS1_NAME not in ('SYSTEM', 'SYS', 'SYSAUX', 'TEMP')
    AND TS2_NAME = '-1'
    AND OBJ1_OWNER not in
      ('SYS', 'SYSTEM', 'CTXSYS', 'GSMADMIN_INTERNAL', 'WMSYS', 'XDB')
);
```

Error messages and some examples for not allowed objects

| Examples for not allowed object | Error message |
|--|---|
| <pre>CREATE INDEX <Index name> ON <table name> (<Function><column name>),</pre> | Functional Indexes not supported |
| <pre>CREATE TABLE <table name> DR<>R (ROW_NO, DATA BLOB)</pre> | Secondary Objects not allowed in Recovery Set |
| <pre>CREATE TABLE <table name> ...; CREATE SNAPSHOT <snap name> as select * from <table name>;</pre> | Master table used for snapshots not allowed in recovery set |
| <pre>CREATE INDEX <index name> (INDEXTYPE IS CTXSYS.CONTEXT)</pre> | Tables and associated indexes not fully contained in the recovery set |
| <pre>CREATE SNAPSHOT MATERIALIZED VIEW</pre> | Snapshots not allowed in recovery set |
| <pre>CREATE USER <username> ... DEFAULT TABLESPACE <_name>; CREATE TABLE <table name> Missing default tablespace; Create some constraints;</pre> | constraint between tables not contained in recovery set |

TSPITR – what is the oldest possible Point in Time?

```
select owner, to_char(max(creation_time), 'DD.MM.YYYY HH24:MI:SS')
TSPITR_possible_until
  from SYS.TS_PITR_OBJECTS_TO_BE_DROPPED
 where tablespace_name not in ('SYSTEM', 'SYS', 'SYSAUX', 'TEMP')
    and owner not in ('SYS', 'SYSTEM', 'CTXSYS', 'WMSYS', 'XDB', '+++')
 group by owner
 order by 1;
```

| OWNER | TSPITR_POSSIBLE_UNTIL |
|----------|-----------------------|
| SCHEMA_A | 18.07.2017 08:53:30 |
| SCHEMA_B | 15.09.2016 12:36:12 |
| SCHEMA_C | 14.12.2016 15:50:06 |

Don't forget RETENTION TIME of your backup tool !!!

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Conclusion - Pros and cons for shared databases

Pros

1. Shared-DBs has smaller footprint and administrative efforts. Festo uses it for more than 10 years. (Servicenames for couple of years)
2. Charge back price is much lower because of license and maintenance costs comparing with single instance for one application.
3. It allows very fast deployment. Relocation to dedicated environment is possible even later. No effort on application side (client settings), if using Oracle Service-Names and aliases.

Cons

1. Guaranteed restore point is NOT instrument for maintenance tasks, if needing fallback for schemas, or having Oracle Standard Edition.
2. Tablespace Point In Time Recovery (TSPITR) is NOT possible all the time, and for all objects, and not possible in Oracle Standard Edition at all.
3. Noisy Neighbours affect other applications. Oracle Resource-Manager could help (just in Oracle Enterprise Edition)
4. Restore of some schemas via dedicated test server + Export/Import => Time !

Sources

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2. <https://docs.oracle.com/middleware/11119/core/INOIM/oid.htm#INOIM1041>
3. Restrictions/Limitations von RMAN TSPITR Tips and Tricks (Doc ID 1531202.1)
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5. Steps To Recover A Dropped Tablespace Using TSPITR (Doc ID 1277795.1)
6. RMAN TSPITR Tips and Tricks (Doc ID 1531202.1)
7. Connection-String for JDBC Thin-Clients in a Data guard-Environment (Doc ID 390923.1)
8. TSPITR:How to check dependency of the objects and identifying objects that will be lost after TSPITR (Doc ID 304308.1)

Thank you for your interests

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