

TEAM

Oracle Backup & Recovery Concepts, Implementation, Best Practice



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Zahlen und Fakten

Unternehmensgruppe Materna:

1.500 Mitarbeiter –
160 Mio. Euro Umsatz in 2014

Geschäftsführung:

Michael Baranowski - Heike Käferle

Mitarbeiterzahl:

65

ORACLE Platinum
Partner



Geschäftsfelder

Lösungen

- ProStore®
Intralogistik und
Warehousemanagement

OracleBusiness

- Lizenzierung
- Consulting
- Entwicklung
- Migration
- Schulung
- Support



Agenda

Introduction

Causes

Goals / Aspects

Concepts

Methods and Technology

Recovery

Conclusion



Introduction

There are two types of DBAs

- Those who have recovered

- Those who will recover

93% of companies that lost their data center for 10 days or more due to a disaster filed for bankruptcy within one year of the disaster. (National Archives and Records Administration U.S.A, Washington)

77% of those companies who do test their tape backups found back-up failures (Boston Computing Network, Data Loss Statistics)



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Causes

Category	Exemplary Cause	Troubleshooting
Statement Error	Logical error Missing authorization Exceeded quotas	Correct application Providing privileges Increase User Quota
User process Error	Session aborted Exit the application without Sign Out	PMON rolls back transactions and resources and locks are freed
User Error	Deleted data by mistake Changed data by mistake Deleted Table by mistake	DBA must restore data via Data Pump, LogMiner or Flashback
Network Error	Failure of a switch	Like user process error
Instance Error	Power failure Hardware error in memory or CPU Error in background process	Crash recovery at startup
Media Error	Read / Write File Error Failure of a hard disk drive Deleted data file by mistake	DBA has to perform recovery using a backup

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Goals

Protect database against data loss

Ensure availability of the database

Lowest possible Mean-Time-To-Recover (MTTR)



Aspects

Aspects of choosing the right backup strategy

Business Needs

Cost-benefit analysis for Backup & Recovery in relation to MTTR and MTBF

Operational Requirements

Availability of the database (e.g. 24/7)

Change frequency of data and database structure

Volume of data changes, transaction volume

Technical possibilities

Available memory resources

Server / System Resources

Legal framework



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Basic concept

Backup

Copying or backing up files or content

Restore

Restoring files or content from a backup

Recovery

Recovering changes that have occurred since the backup
Changes are logged separately (Redo Log-Dateien)



Basic strategies

Logical backup

Data Pump Export / Data Pump Import

Physical backup

Offline / Cold Backup

Online / Hot Backup



Offline Backup

Database closed

Consistent Backup

Advantages

- Simple preparation and implementation

- Minimal effort for administrator

- Requires low system resources

Disadvantages

- Database not continuously available

- Database cache structures are flushed



Online Backup

Datenbank opened

Inconsistent Backup

Advantages

- Database continuously available

- Database Cache structures remain unaffected

Disadvantages

- Complex in configuration

- Requires more system resources



Recovery possibilities

Datenbank		
ARCHIVE LOG		NO ARCHIVE LOG
online Redo Log	offline Redo Log	Online Redo Log
Instance Recovery	Media Recovery	Instance Recovery



Prerequisites

Correct configuration of the database system

Current, working backup

Exact error analysis

Proper recovery strategy



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Configuration

Activating Archive Log Mode

Directly during create database

Before going live



Tools

User managed Backup

- Backup and Restore mit Operating System Commands

- Recovery with SQL Kommandos

Recovery Manager (RMAN)

- Backup and Restore mit RMAN Commands

- Recovery with RMAN Commmands



User managed Backup

Advantages

- Simple implementation

- Easy to understand

Disadvantages

- Backups must be managed manually

- Files must always be completely backed up

- No incremental backup possible

- Backed up files must be checked manually (DBVERIFY)

- Redo Overhead during Online Backup



What is to be backed up

Files to back up

All data files

Controlfiles

Online Redo Log Files

Archived Redo Log Files

Parameter file

Password file

File information

V\$DATAFILE

V\$CONTROLFILE

V\$LOGFILE



Example Offline Sicherung

Batch File

```
set ORACLE_SID=TEAMDB
sqlplus -s / as sysdba @C:\oracle\admin\TEAMDB\SKRIPTTE\backup_TEAMDB.sql
```

SQL File

```
set heading off
set feedback off
set linesize 200
set trimspool on
set pagesize 0
__
spool C:\oracle\admin\TEAMDB\SKRIPTTE\copy_files.bat
select 'copy '||name||' c:\backup' from v$datafile;
select 'copy '||name||' c:\backup' from v$controlfile;
__
spool off
__
shutdown immediate
__
host C:\oracle\admin\TEAMDB\SKRIPTTE\copy_files.bat
__
startup
__
alter database backup controlfile to trace as 'c:\backup\ctl.trc' reuse;
__
exit
```



Online Backup Issue

The operating system does not know about our Oracle blocks

Affected

- Data File Header

- „Normal“ Data Blocks

Solution

- Freezing Data File Header

- Block Level Transaction logging



Example Offline Sicherung

Batch File

```
set ORACLE_SID=TEAMDB
sqlplus -s / as sysdba @C:\oracle\admin\TEAMDB\SKRIPTE\backup_TEAMDB.sql
```

SQL File

```
set heading off feedback off trimspool on
set linesize 200 pagesize 0
spool C:\oracle\admin\TEAMDB\SKRIPTE\copy_files_online.bat
select 'alter database begin backup;' from dual;
select 'ocopy '||name||' c:\backup' from v$datafile;
select 'alter database backup controlfile to
'||q#'C:\app\oracle\backup\ctl.back reuse'#'||';' from dual;
select 'alter database end backup;' from dual;
spool off
shutdown immediate
host C:\oracle\admin\TEAMDB\SKRIPTE\copy_files_online.bat
startup
alter database backup controlfile to trace as 'c:\backup\ctl.trc' reuse;
exit
```



RMAN Backup

Possibilities / Advantages

Backup possible at the following levels

- Database

- Tablespaces

- Data files

- Control files

- Archived Redo Log Files

Incremental backups at block level

Skip unused blocks

Detecting corrupt blocks during backup

No Redo Overhead during Online Backup



Example Online Sicherung

Batch File

```
set ORACLE_SID=TEAM  
RMAN target / cmdfile="C:\app\oracle\admin\team\skripte\backup_TEAMDB.rman"  
log="C:\app\oracle\admin\team\skripte\backup_TEAMDB.log" append
```

RMAN Command File

```
BACKUP DATABASE FILESERSET=6 format="C:\app\oracle\backup\TEAMDB_%u";
```



Log File

```
Recovery Manager: Release 12.1.0.2.0 - Production on Di Nov 10 18:22:12 2015  
Copyright (c) 1982, 2014, Oracle and/or its affiliates. All rights reserved.  
connected to target database: TEAM (DBID=807502986)
```

```
RMAN> BACKUP DATABASE FILESPERSET=6 format="C:\app\oracle\backup\TEAMDB_%u";
```

```
Starting backup at 10.11.15
```

```
using target database control file instead of recovery catalog
```

```
allocated channel: ORA_DISK_1
```

```
channel ORA_DISK_1: SID=130 device type=DISK
```

```
... ..
```

```
channel ORA_DISK_1: starting full datafile backup set
```

```
channel ORA_DISK_1: specifying datafile(s) in backup set
```

```
input datafile file number=00002 name=C:\APP\ORACLE\ORADATA\TEAM\SYSAUX01.DBF
```

```
input datafile file number=00009 name=C:\APP\ORACLE\ORADATA\TEAM\USERS05.DBF
```

```
input datafile file number=00010 name=C:\APP\ORACLE\ORADATA\TEAM\TEAM02.DBF
```

```
input datafile file number=00011 name=C:\APP\ORACLE\ORADATA\TEAM\TEAM03.DBF
```

```
input datafile file number=00012 name=C:\APP\ORACLE\ORADATA\TEAM\TEAM04.DBF
```

```
input datafile file number=00013 name=C:\APP\ORACLE\ORADATA\TEAM\TEAM05.DBF
```

```
channel ORA_DISK_1: starting piece 1 at 10.11.15
```

```
channel ORA_DISK_1: finished piece 1 at 10.11.15
```

```
piece handle=C:\APP\ORACLE\BACKUP\TEAMDB_0DQLUAMU tag=TAG20151110T182215 comment=NONE
```

```
channel ORA_DISK_1: backup set complete, elapsed time: 00:00:03
```

```
... ..
```

```
channel ORA_DISK_1: starting full datafile backup set
```

```
channel ORA_DISK_1: specifying datafile(s) in backup set
```

```
including current control file in backup set
```

```
including current SPFILE in backup set
```

```
channel ORA_DISK_1: starting piece 1 at 10.11.15
```

```
channel ORA_DISK_1: finished piece 1 at 10.11.15
```

```
piece handle=C:\APP\ORACLE\BACKUP\TEAMDB_0FQLUAN3 tag=TAG20151110T182215 comment=NONE
```

```
channel ORA_DISK_1: backup set complete, elapsed time: 00:00:01
```

```
Finished backup at 10.11.15
```



Recovery Manager complete.



Example Archived Redo Log Files

Batch File

```
set ORACLE_SID=TEAM  
RMAN target /  
cmdfile="C:\app\oracle\admin\team\skripte\backup_TEAMDB_redo.rman"  
log="C:\app\oracle\admin\team\skripte\backup_TEAMDB_redo.log" append
```

RMAN Command File

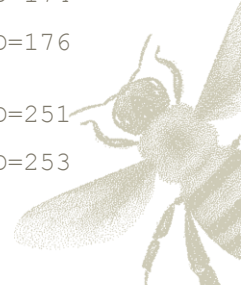
```
BACKUP ARCHIVELOG ALL DELETE INPUT  
format="C:\app\oracle\backup\TEAMDB_redo_%u";
```



Log File

```
Recovery Manager: Release 12.1.0.2.0 - Production on Di Nov 10 18:42:01 2015
Copyright (c) 1982, 2014, Oracle and/or its affiliates. All rights reserved.
connected to target database: TEAM (DBID=807502986)
RMAN> BACKUP ARCHIVELOG ALL DELETE INPUT format="C:\app\oracle\backup\TEAMDB_redo_%u";
2>
Starting backup at 10.11.15
current log archived
using target database control file instead of recovery catalog
allocated channel: ORA_DISK_1
channel ORA_DISK_1: SID=14 device type=DISK
channel ORA_DISK_1: starting archived log backup set
channel ORA_DISK_1: specifying archived log(s) in backup set
input archived log thread=1 sequence=134 RECID=174 STAMP=895073128
input archived log thread=1 sequence=135 RECID=176 STAMP=895073191
... ..
input archived log thread=1 sequence=173 RECID=251 STAMP=895430505
input archived log thread=1 sequence=174 RECID=253 STAMP=895430525
channel ORA_DISK_1: starting piece 1 at 10.11.15
channel ORA_DISK_1: finished piece 1 at 10.11.15
piece handle=C:\APP\ORACLE\BACKUP\TEAMDB_REDO_0KQLUBS0 tag=TAG20151110T184207 comment=NONE
channel ORA_DISK_1: backup set complete, elapsed time: 00:00:01
channel ORA_DISK_1: deleting archived log(s)
archived log file name=C:\APP\ORACLE\ADMIN\TEAM\ARCHIVE2\TEAM_1_894996554_0000000134.ARC RECID=174
STAMP=895073128
archived log file name=C:\APP\ORACLE\ADMIN\TEAM\ARCHIVE2\TEAM_1_894996554_0000000135.ARC RECID=176
STAMP=895073191
... ..
archived log file name=C:\APP\ORACLE\ADMIN\TEAM\ARCHIVE1\TEAM_1_894996554_0000000173.ARC RECID=251
STAMP=895430505
archived log file name=C:\APP\ORACLE\ADMIN\TEAM\ARCHIVE1\TEAM_1_894996554_0000000174.ARC RECID=253
STAMP=895430525
Finished backup at 10.11.15
```

Manager complete.



RMAN Configuration Parameter

```
RMAN> show all;
```

```
using target database control file instead of recovery catalog
```

```
RMAN configuration parameters for database with db_unique_name TEAM are:
```

```
CONFIGURE RETENTION POLICY TO REDUNDANCY 1; # default
```

```
CONFIGURE BACKUP OPTIMIZATION OFF; # default
```

```
CONFIGURE DEFAULT DEVICE TYPE TO DISK; # default
```

```
CONFIGURE CONTROLFILE AUTOBACKUP OFF; # default
```

```
CONFIGURE CONTROLFILE AUTOBACKUP FORMAT FOR DEVICE TYPE DISK TO '%F'; # default
```

```
CONFIGURE DEVICE TYPE DISK PARALLELISM 1 BACKUP TYPE TO BACKUPSET; # default
```

```
CONFIGURE DATAFILE BACKUP COPIES FOR DEVICE TYPE DISK TO 1; # default
```

```
CONFIGURE ARCHIVELOG BACKUP COPIES FOR DEVICE TYPE DISK TO 1; # default
```

```
CONFIGURE MAXSETSIZE TO UNLIMITED; # default
```

```
CONFIGURE ENCRYPTION FOR DATABASE OFF; # default
```

```
CONFIGURE ENCRYPTION ALGORITHM 'AES128'; # default
```

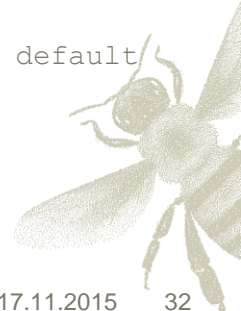
```
CONFIGURE COMPRESSION ALGORITHM 'BASIC' AS OF RELEASE 'DEFAULT' OPTIMIZE FOR LOAD TRUE ; # default
```

```
CONFIGURE RMAN OUTPUT TO KEEP FOR 7 DAYS; # default
```

```
CONFIGURE ARCHIVELOG DELETION POLICY TO NONE; # default
```

```
CONFIGURE SNAPSHOT CONTROLFILE NAME TO
```

```
'C:\APP\ORACLE\PRODUCT\12.1.0\DBHOME_1\DATABASE\SNCFTEAM.ORA'; # default
```



Example Archived Redo Log Files (2)

Batch File

```
set ORACLE_SID=TEAM
RMAN target /
cmdfile="C:\app\oracle\admin\team\skripte\backup_TEAMDB_redo.rman"
log="C:\app\oracle\admin\team\skripte\backup_TEAMDB_redo.log" append
```

RMAN Command File

```
CONFIGURE CONTROLFILE AUTOBACKUP ON;
BACKUP ARCHIVELOG ALL DELETE INPUT
format="C:\app\oracle\backup\TEAMDB_redo_%u";
```



Log File

```
Recovery Manager: Release 12.1.0.2.0 - Production on Di Nov 10 18:42:01 2015
Copyright (c) 1982, 2014, Oracle and/or its affiliates. All rights reserved.
connected to target database: TEAM (DBID=807502986)
RMAN> CONFIGURE CONTROLFILE AUTOBACKUP ON;
2> BACKUP ARCHIVELOG ALL DELETE INPUT format="C:\app\oracle\backup\TEAMDB_redo_%u";
3>
4>
using target database control file instead of recovery catalog
old RMAN configuration parameters:
CONFIGURE CONTROLFILE AUTOBACKUP ON;
new RMAN configuration parameters:
CONFIGURE CONTROLFILE AUTOBACKUP ON;
new RMAN configuration parameters are successfully stored

...

Starting Control File and SPFILE Autobackup at 10.11.15
piece handle=C:\APP\ORACLE\PRODUCT\12.1.0\DBHOME_1\DATABASE\C-807502986-20151117-03
comment=NONE
Finished Control File and SPFILE Autobackup at 10.11.15

Recovery Manager complete.
```



Tape Backup

Disk to Tape



No Storage required as an intermediate storage
Requires Media Manager License

Disk to Disk to Tape



Storage required as an intermediate storage
Possibly faster Restore
No Media Manager License required



Snapshots

Split Mirror



Copy On Write

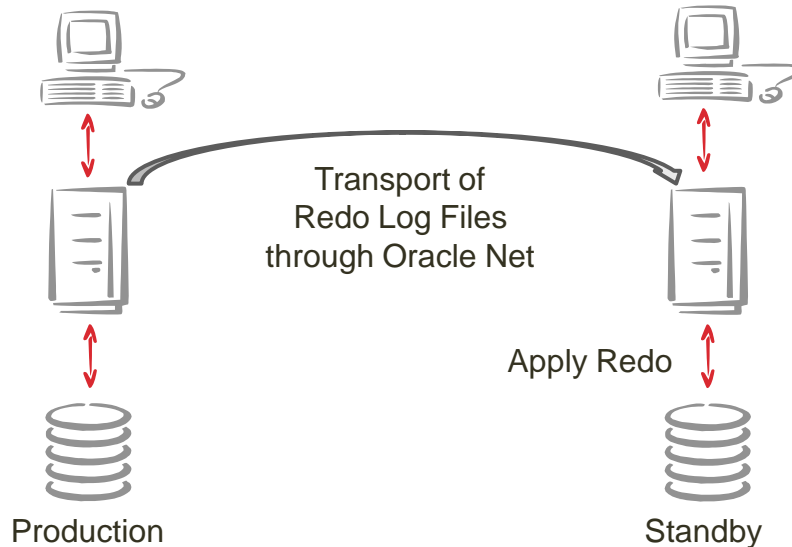


Standby Datenbank

Backup from Standby Database

Transparent to RMAN

Reduces the load on the Production Database



Test your Backup

Excerpt from a TOMA (Transactional Oracle Master Agreement):

„ Testing: For the purpose of testing physical copies of backups, Your license for the Oracle Database (Enterprise Edition, Standard Edition or Standard Edition One) **includes the right to run the database on an unlicensed computer for up to four times, not exceeding 2 days per testing, in any given calendar year.** The aforementioned right does not cover any other data recovery method - such as remote mirroring - where the Oracle Program binary files are copied or synchronized. “



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Current, working backup

Exact error analysis

Proper recovery strategy



Prerequisites

Exact error analysis

Proper recovery strategy



Error analysis

First source of information

Alert Log

`$ORACLE_BASE/diag/rdbms/<dbname>/<instname>/trace/alert_<instname>.log`

`C:\app\oracle\diag\rdbms\team\team\trace>alert_team.log`



Improve your database recovery competence

Excerpt from a TOMA (Transactional Oracle Master Agreement):

„ Testing: For the purpose of testing physical copies of backups, Your license for the Oracle Database (Enterprise Edition, Standard Edition or Standard Edition One) **includes the right to run the database on an unlicensed computer for up to four times, not exceeding 2 days per testing, in any given calendar year.** The aforementioned right does not cover any other data recovery method - such as remote mirroring - where the Oracle Program binary files are copied or synchronized. “



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Conclusion

With Backup and Recovery there is a wide range in terms of performance but also cost

Make sure that you have backed up all data. Always!

Create dynamic scripts

Test your backup periodically



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**Thank you
for your attention!**



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Markus Klenke · Janis Krasemann

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Tuning Oracle Web-Applications in WLS 12c

Markus Klenke

Mittwoch · Zeit: 11:00 - 11:45 Uhr · Raum: Prag

Oracle Backup & Recovery: Konzepte, Umsetzung, Best Practice

Andreas Kother

Mittwoch, · Zeit: 12:00 - 12:45 Uhr · Raum: St. Petersburg

Einfach erklärt: RAC Grundlagen für Dummies

Ralf Appelbaum

Donnerstag · Zeit: 09:00 - 09:45 Uhr · Raum: Seul

...or visit us at

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Finally

Yesterday,
All those backups seemed a waste to pay.
Now my database has gone away.
Oh I believe in yesterday.

Suddenly,
There's not half the files there used to be,
And there's a milestone hanging over me
The system crashed so suddenly.

I pushed something wrong
What it was I could not say.
Now all my data's gone
and I long for yesterday-ay-ay-ay

Yesterday,
The need for backup seemed so far away.
I knew my data was all here to stay,
Now I believe in yesterday.

Quelle:
Unix Backup & Recovery
W.Curtis Preston



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