

Oracle Complete Data Recovery

Scenario Based Practical Example

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Scenario Overview

Backup Timeline:

- 5:00 PM - Full backup completed
- 5:15 PM - Incremental backup #1 completed
- 5:30 PM - Incremental backup #2 completed
- 5:44 PM - **Database crashed**
- 5:45 PM - Next incremental backup was scheduled (never executed)

Challenge:

Recover all data including the 14-minute gap (5:30 PM to 5:44 PM) for which no backup exists.

The Key: Archive Redo Logs

The critical component for recovering data between **5:30 PM** and **5:44 PM** is **archived redo logs**. These logs contain all committed transactions and are essential for point-in-time recovery.

Prerequisites

1. **Database must be in ARCHIVELOG mode**

```
SELECT log_mode FROM v$database;
```

Must return: ARCHIVELOG

2. **Archive logs must be available** for the period 5:00 PM to 5:44 PM
3. **Control file backup** or current control file must be available
4. **All RMAN backup pieces** must be accessible

Complete Recovery Process

Step 1: Verify Environment and Backups

Connect to RMAN

```
rman target /
```

Check available backups

```
RMAN> LIST BACKUP SUMMARY;
```

Verify archive logs are available

```
RMAN> LIST ARCHIVELOG ALL;
```

Check for any corruption

```
RMAN> VALIDATE DATABASE;
```

Step 2: Shutdown the Database (if not already down)

```
RMAN> SHUTDOWN IMMEDIATE;
```

If the database won't shut down cleanly:

```
RMAN> SHUTDOWN ABORT;
```

Step 3: Start Database in MOUNT Mode

RMAN> **STARTUP MOUNT;**

Step 4: Restore the Database

RMAN> **RESTORE DATABASE;**

What happens here:

- RMAN restores the full backup taken at 5:00 PM
- All datafiles are restored to their 5:00 PM state

Step 5: Recover the Database

RMAN> **RECOVER DATABASE;**

What happens during recovery:

1. **Applies Incremental Backup #1 (5:15 PM):**
 - Changes between 5:00 PM and 5:15 PM are applied
 - Database state advances to 5:15 PM
2. **Applies Incremental Backup #2 (5:30 PM):**
 - Changes between 5:15 PM and 5:30 PM are applied
 - Database state advances to 5:30 PM
3. **Applies Archive Redo Logs (5:30 PM to 5:44 PM):**
 - All committed transactions from archived redo logs are applied
 - This recovers the critical 14-minute gap
 - Database state advances to 5:44 PM (point of crash)

Step 6: Open the Database

RMAN> **ALTER DATABASE OPEN RESETLOGS;**

Note: RESETLOGS is required after incomplete recovery or when recovering beyond the current online redo logs.

How the 5:30-5:44 Data is Recovered

The Role of Archive Redo Logs

Archive redo logs act as a **continuous transaction journal**. Here's what they contain:

- Every DML operation (INSERT, UPDATE, DELETE)
- Every DDL operation (CREATE, ALTER, DROP)
- Every COMMIT statement
- System Change Numbers (SCNs) for each transaction

During the 5:30 PM to 5:44 PM period:

1. Users performed transactions
2. Oracle wrote these changes to online redo logs
3. As online redo logs filled, they were archived
4. These archive logs captured ALL committed work
5. Even though the database crashed at 5:44 PM, the archive logs survived

Alternative Recovery Scenarios

Scenario A: Recover to Exact Point Before Crash

```
RMAN> RECOVER DATABASE UNTIL TIME '2024-12-10 17:44:00';
```

Scenario B: Recover to Specific SCN

First, identify the SCN

```
SELECT current_scn FROM v$database;
```

Then recover to that SCN

```
RMAN> RECOVER DATABASE UNTIL SCN 8947562;
```

Scenario C: Recover to Before a Bad Transaction

```
RMAN> RECOVER DATABASE UNTIL TIME '2024-12-10 17:43:00';
```

Verification After Recovery

- Check database status

```
SELECT name, open_mode, log_mode FROM v$database;
```

- Verify last recovered time

```
SELECT to_char(checkpoint_time, 'DD-MON-YYYY HH24:MI:SS')  
FROM v$datafile;
```

- Check for any data loss

```
SELECT * FROM v$recover_file;
```

- Should return no rows if recovery is complete

- Verify transaction recovery

```
SELECT count(*) FROM your_critical_table  
WHERE transaction_time BETWEEN  
  TO_DATE('2024-12-10 17:30:00', 'YYYY-MM-DD HH24:MI:SS')  
  AND TO_DATE('2024-12-10 17:44:00', 'YYYY-MM-DD HH24:MI:SS');
```

What If Archive Logs Are Missing?

If archive logs for 5:30 PM to 5:44 PM are **NOT available**, you will experience data loss:

```
RMAN> RECOVER DATABASE;
```

- Recovery stops at 5:30 PM (last available backup)

```
RMAN> ALTER DATABASE OPEN RESETLOGS;
```

- Data between 5:30 PM and 5:44 PM is LOST

Prevention:

- Configure multiple archive log destinations
- Set up automatic archive log backup
- Monitor archive log generation and space

- Configure dual archive destinations

```
ALTER SYSTEM SET log_archive_dest_1='LOCATION=/arch1' SCOPE=BOTH;
```

```
ALTER SYSTEM SET log_archive_dest_2='LOCATION=/arch2' SCOPE=BOTH;
```

- Automatic archive log backup after each backup

```
RMAN> CONFIGURE ARCHIVELOG BACKUP COPIES FOR DEVICE TYPE DISK TO 2;
```

Best Practices

1. **Always run in ARCHIVELOG mode** for production databases
2. **Back up archive logs frequently** - don't wait for the next incremental
3. **Test your recovery procedures** regularly
4. **Monitor archive log space** to prevent log switches from failing
5. **Configure FRA (Fast Recovery Area)** for automatic space management
6. **Validate backups** regularly with RMAN VALIDATE commands

Common Issues and Solutions

Issue	Solution
Archive logs not found	Check archive_log_dest parameters; restore from backup
RMAN-06025: no backup of archive log found	Back up archive logs immediately after each backup
ORA-00312: online log thread 1	Use RESETLOGS to create new log sequence
Recovery stops before crash point	Missing archive logs; accept data loss or restore from alternate location

Summary

Complete recovery (5:00 PM to 5:44 PM) requires:

1. Full backup from 5:00 PM
2. Incremental backups from 5:15 PM and 5:30 PM
3. **Archive redo logs from 5:00 PM to 5:44 PM** ← This recovers the gap!

The archive logs are the hero - they contain every committed transaction and enable complete recovery without any data loss, even for periods without backups.

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