

Managing Undo Data

Objectives

- After completing this lesson, you should be able to:
 - Explain DML and undo data generation
 - Monitor and administer undo data
 - Describe the difference between undo data and redo data
 - Configure undo retention
 - Guarantee undo retention
 - Enable temporary undo
 - Use the Undo Advisor

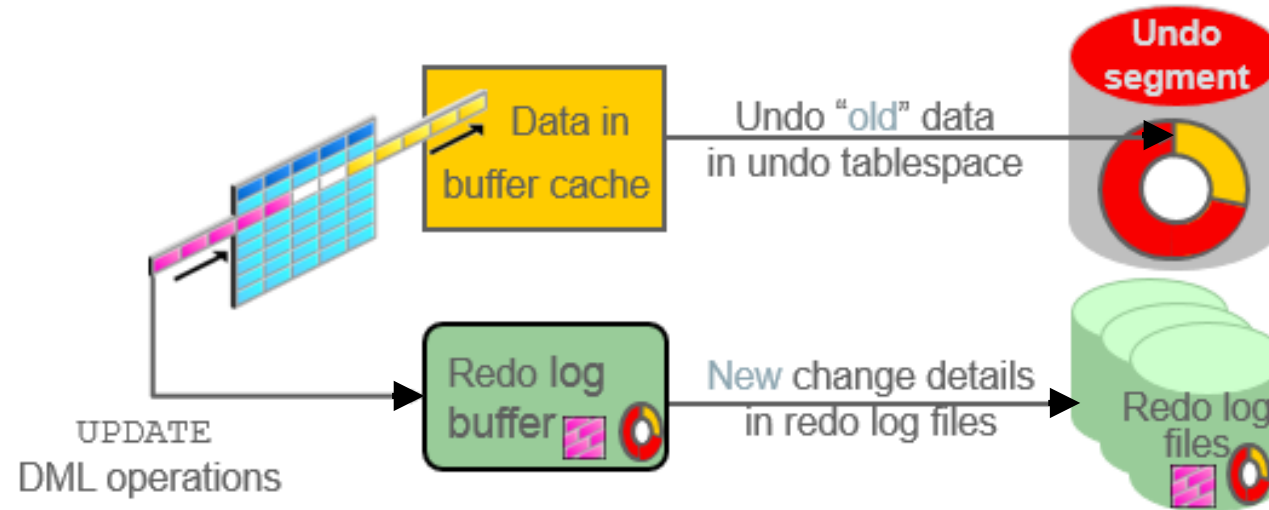


Undo Data: Overview

- Undo data is:
 - A record of the action of a transaction
 - Captured for every transaction that changes data
 - Retained at least until the transaction is ended
 - Used to support:
 - Rollback operations
 - Read-consistent queries
 - Oracle Flashback Query, Oracle Flashback Transaction, and Oracle Flashback Table
 - Recovery from failed transactions

Transactions and Undo Data

- Each transaction is assigned to only one undo segment.
- An undo segment can service more than one transaction at a time.

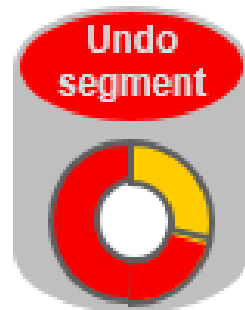


Storing Undo Information

- Undo information is stored in undo segments, which are stored in an undo tablespace.
- Undo tablespaces:
 - Are used only for undo segments
 - Have special recovery considerations
 - May be associated with only a single instance
 - Require that only one of them be the current writable undo tablespace for a given instance at any given time

Comparing Undo Data and Redo Data

	Undo	Redo
Record of	How to undo a change	How to reproduce a change
Used for	Rollback, read consistency, flashback	Rolling forward of database changes
Stored in	Undo segments	Redo log files

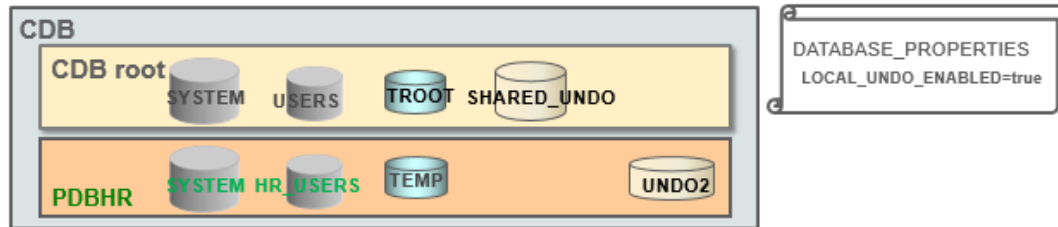


Managing Undo

- Automatic undo management:
 - Fully automated management of undo data and space in a dedicated undo tablespace
 - For all sessions
 - Self-tuning in `AUTOEXTEND` tablespaces to satisfy long-running queries
 - Self-tuning in fixed-size tablespaces for best retention
- DBA tasks in support of Flashback operations:
 - Configuring undo retention
 - Changing the undo tablespace to a fixed size
 - Avoiding space and “snapshot too old” errors

Comparing SHARED Undo Mode and LOCAL Undo Mode

- There are two undo modes in the multitenant architecture: SHARED and LOCAL .
 - There is only one SHARED undo tablespace (in CDB root).
 - There can be a LOCAL undo tablespace in each PDB.



- When is LOCAL undo mode required?
 - Hot cloning
 - Near-zero down time PDB relocation

```
SQL> STARTUP UPGRADE;  
SQL> ALTER DATABASE LOCAL UNDO ON;
```


Configuring Undo Retention

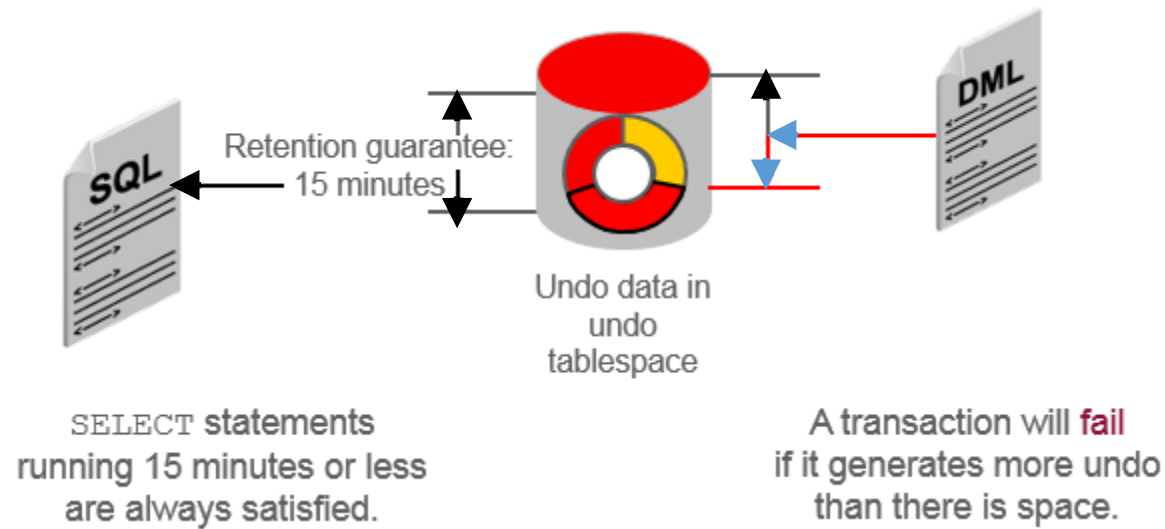
- `UNDO_RETENTION` specifies (in seconds) how long already committed undo information is to be retained.
- Set this parameter when:
 - The undo tablespace has the `AUTOEXTEND` option enabled
 - You want to set undo retention for LOBs
 - You want to guarantee retention

Categories of Undo

Category	Description
Active: Uncommitted undo information	Supports an active transaction and is never overwritten
Unexpired: Committed undo information	Is required to meet the undo retention interval
Expired: Expired undo information	Overwritten when space is required for an active transaction

Guaranteeing Undo Retention

```
SQL> ALTER TABLESPACE undotbs1 RETENTION GUARANTEE;
```

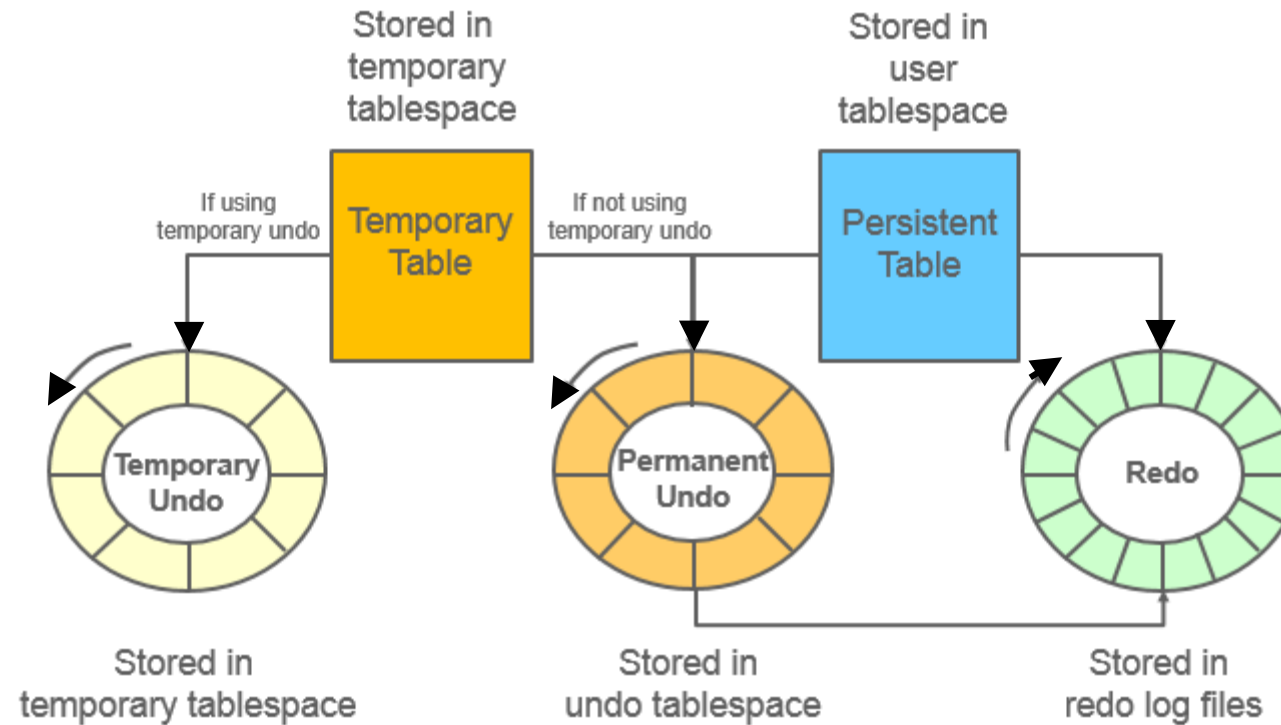


This example is based on an `UNDO_RETENTION` setting of 900 seconds (15 minutes).

Changing an Undo Tablespace to a Fixed Size

- Rationale:
 - Supporting Flashback operations
 - Limiting tablespace growth
- Steps:
 - Run the regular workload.
 - The self-tuning mechanism establishes the minimum required size.
 - (Optional) Use the Enterprise Manager Cloud Control Undo Advisor, which calculates the required size for future growth.
 - (Optional) Change the undo tablespace to a fixed size.

Temporary Undo: Overview



Temporary Undo Benefits

- Reduces the amount of undo stored in the undo tablespaces
- Reduces the amount of redo data written to the redo log
- Enables DML operations on temporary tables in a physical standby database with the Oracle Active Data Guard option

Enabling Temporary Undo

- Enable temporary undo for a session:

```
SQL> ALTER SESSION SET temp_undo_enabled = true;
```

- Enable temporary undo for the database instance:

```
SQL> ALTER SYSTEM SET temp_undo_enabled = true;
```

- Temporary undo mode is selected when a session first uses a temporary object.

Monitoring Temporary Undo

```
SQL> SELECT to_char(BEGIN_TIME, 'dd/mm/yy hh24:mi:ss') "BEGIN TIME",  
2   txncount "TXNCNT", maxconcurrency, undoblkcnt, uscount "USCNT",  
3   nospaceerrcnt "NOSPEERRCNT"  
4   FROM   v$tempundostat;
```

BEGIN TIME	TXNCNT	MAXCONCURRENCY	UNDOBLKCNT	USCNT	NOSPEERRCNT
-----	-----	-----	-----	-----	-----
...					
19/08/12 22:19:44	0	0	0	0	0
19/08/12 22:09:44	0	0	0	0	0
...					
19/08/12 13:09:44	0	0	0	0	0
19/08/12 12:59:44	3	1	24	1	0
576 rows selected.					
SQL>					

Viewing Undo Information

The screenshot displays the Oracle Enterprise Manager Database Express interface for the 'DKKORCL (18.1.0.0.0)' instance. The 'Undo Management Details' page is active, showing configuration and statistics for the UNDOTBS1 tablespace.

Configuration

Undo Summary

Undo Setting

- Undo Management: auto
- Low Undo Retention Threshold: 900s

Tablespace

- Name: UNDOTBS1
- Retention Guaranteed: Yes
- Size: 60MB (74.5% free)
- Auto Extensible: Yes (maximum size unlimited)

Errors and Warnings

- Snapshot Too Old Errors: 0
- Out of Space Errors: 0
- Unexpired Blocks Stolen: 0

Advisor Findings

- Health: No problems
- Setting: No problems

Undo Statistics Summary

Analysis Period (Last Day)

- Adjusted Start Time: Wed Mar 7, 2018 10:30:38 PM
- Adjusted End Time: Thu Mar 8, 2018 7:28:31 PM
- Duration: 20 hours, 57 minutes, 53 seconds
- Target Undo Retention: Required Undo Retention (29 minutes, 17 seconds)

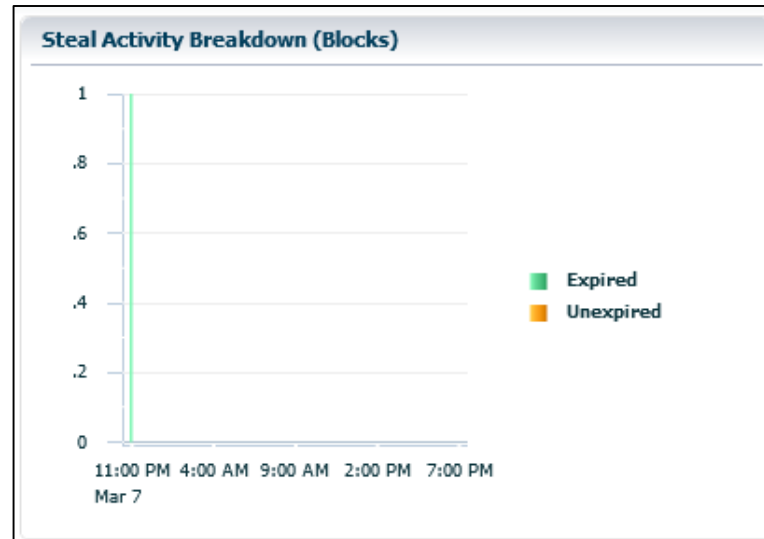
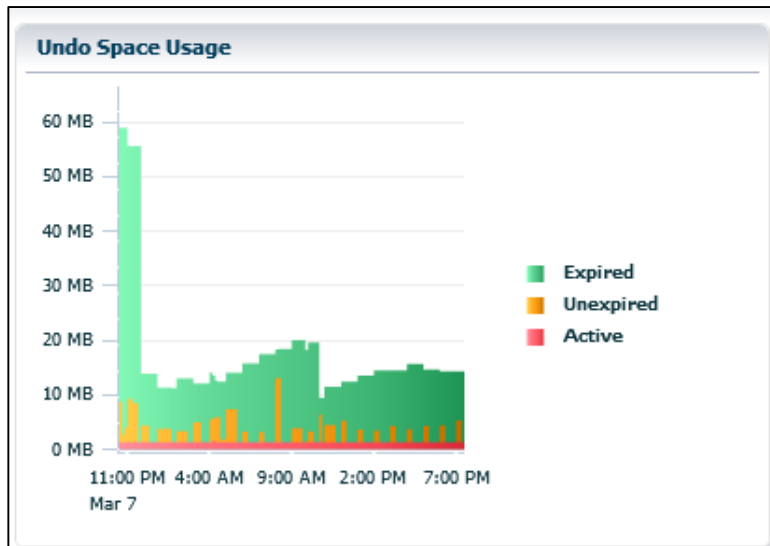
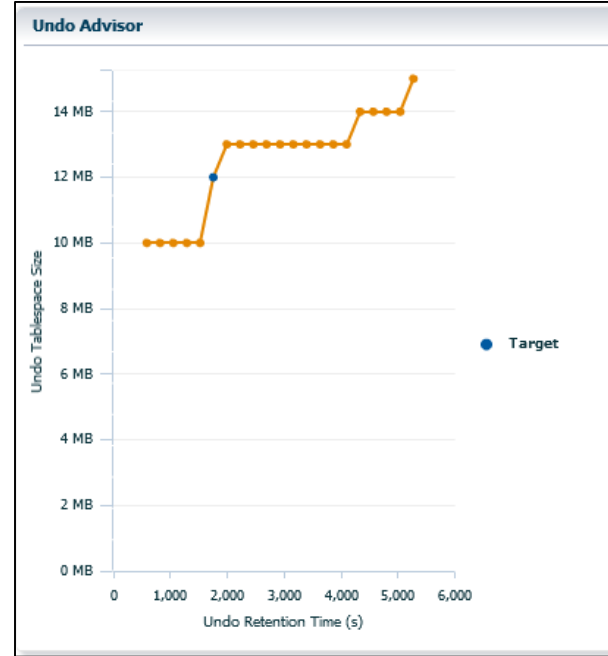
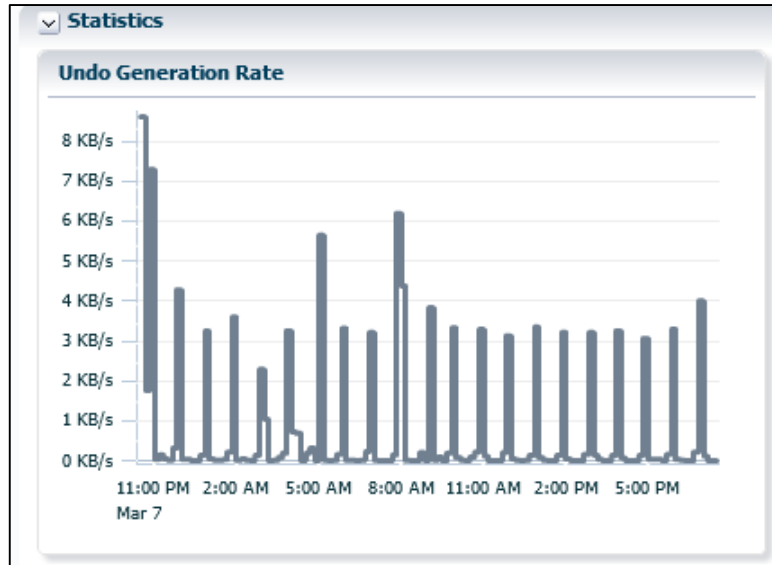
Undo Retention Analysis

- Required Undo Retention: 29 minutes, 17 seconds
- Best Undo Retention: 234 days, 8 hours, 49 minutes, 12 seconds

Undo Statistics

- Undo Generation Rate: 829 B/s
- Maximum Undo Used: 59MB
- Longest SQL: f3yfg50ga0r8n
- Longest SQL Execution Time: 29 minutes, 17 seconds
- Transaction Rate: 0 transaction(s) per second
- Maximum Concurrency: 8

Viewing Undo Activity



Summary

- In this lesson, you should have learned how to:
 - Explain DML and undo data generation
 - Monitor and administer undo data
 - Describe the difference between undo data and redo data
 - Configure undo retention
 - Guarantee undo retention
 - Enable temporary undo
 - Use the Undo Advisor



Practice 14: Overview

- 14-1: Managing Undo Data