Managing Undo Data

Objectives

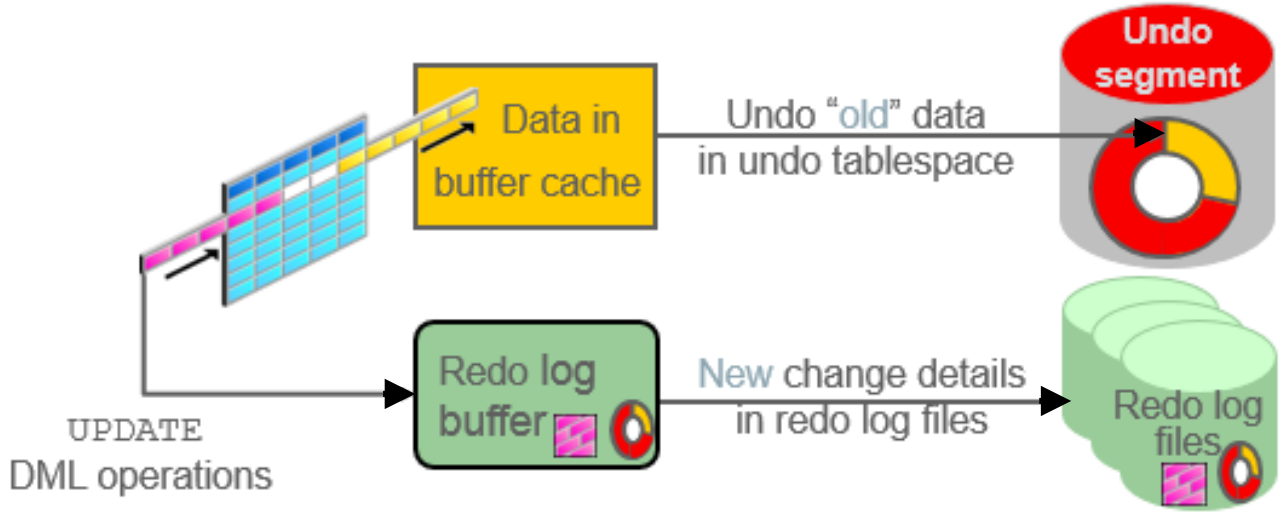
- After completing this lesson, you should be able to:
  - Explain DML and undo data generation
  - Monitor and administer undo data
  - Describe the difference between undo data and redo data
  - Configure undo retention
  - Guarantee undo retention
  - Enable temporary undo
  - Use the Undo Advisor

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.

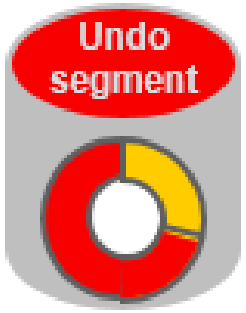


Storing Undo Information

- 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

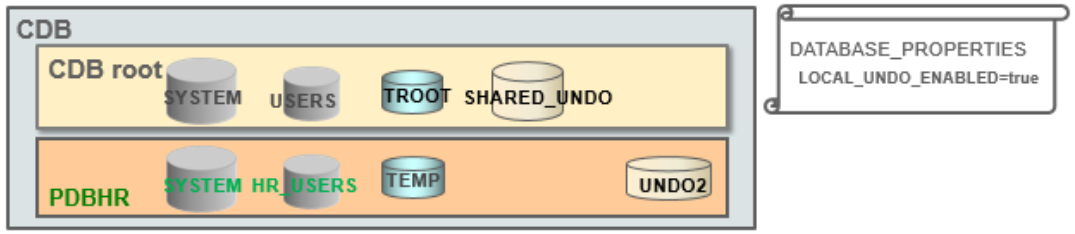


Managing Undo

- 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

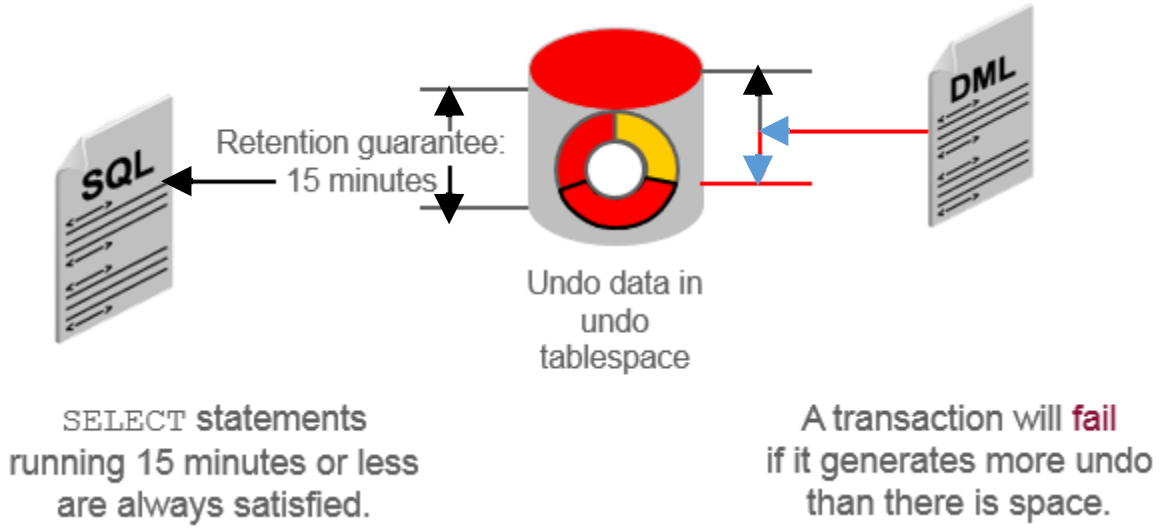
- UNDO_RETENTION specifies (in seconds) how long already committed undo information is to be retained.
- Set this parameter when:
  - The undo tablespace has the AUTOEXTEND option enabled
  - You want to set undo retention for LOBs
  - You want to guarantee retention

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;
```

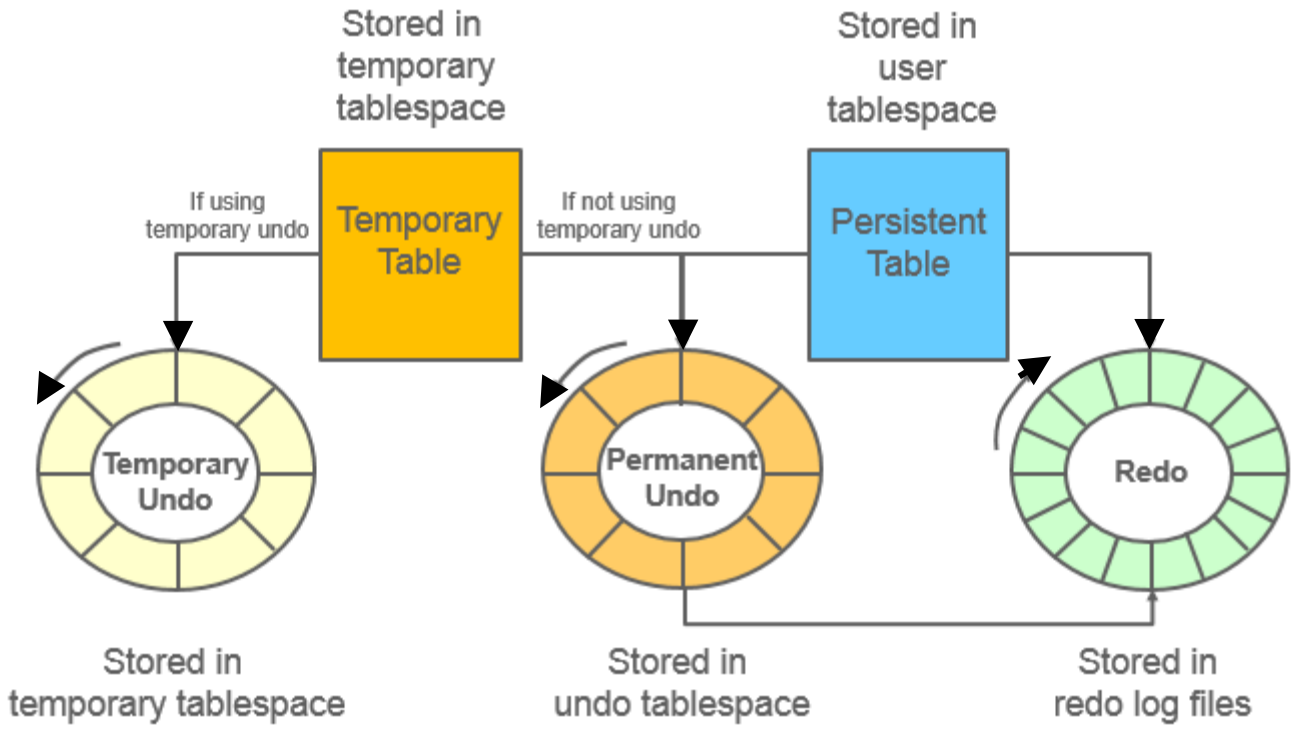


This example is based on an UNDO_RETENTION setting of 900 seconds (15 minutes).

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:

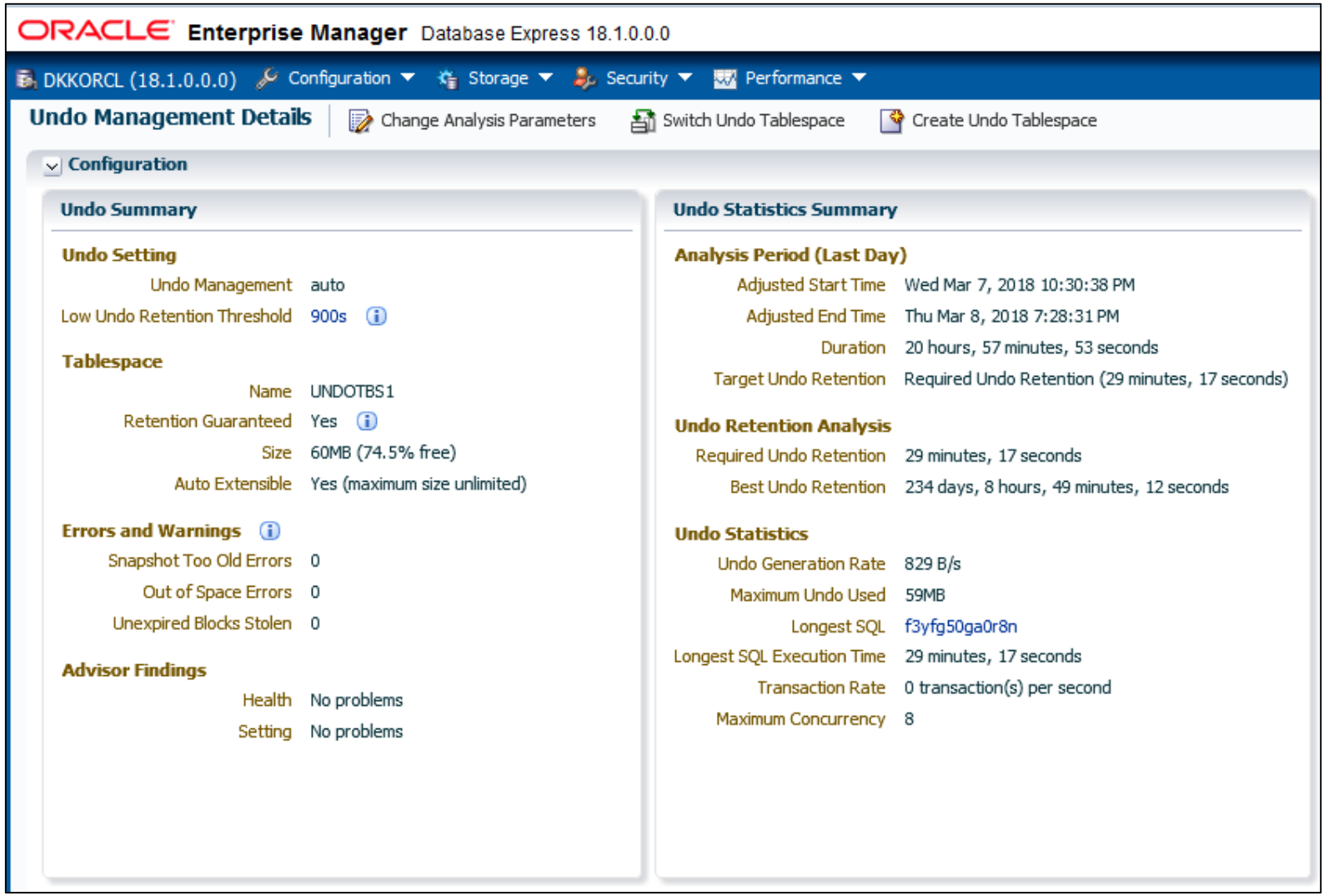
```
SQL> ALTER SYSTEM SET temp_undo_enabled = true;
```

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

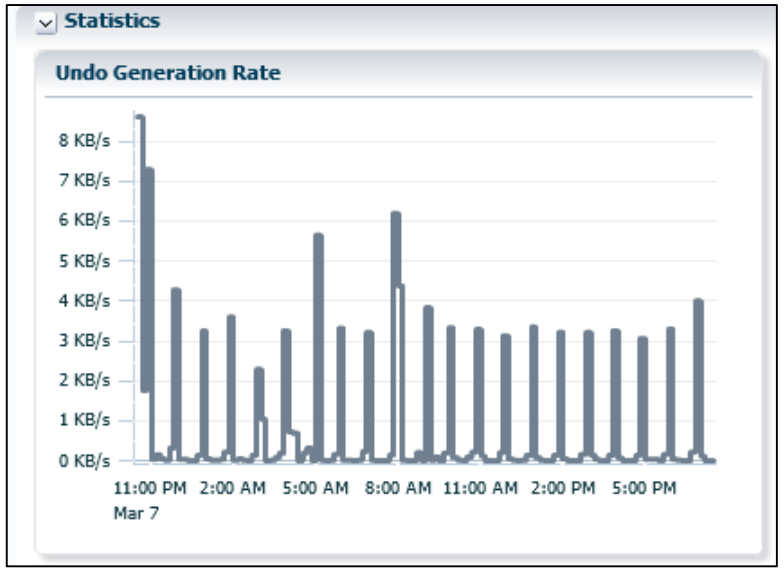
Monitoring Temporary Undo

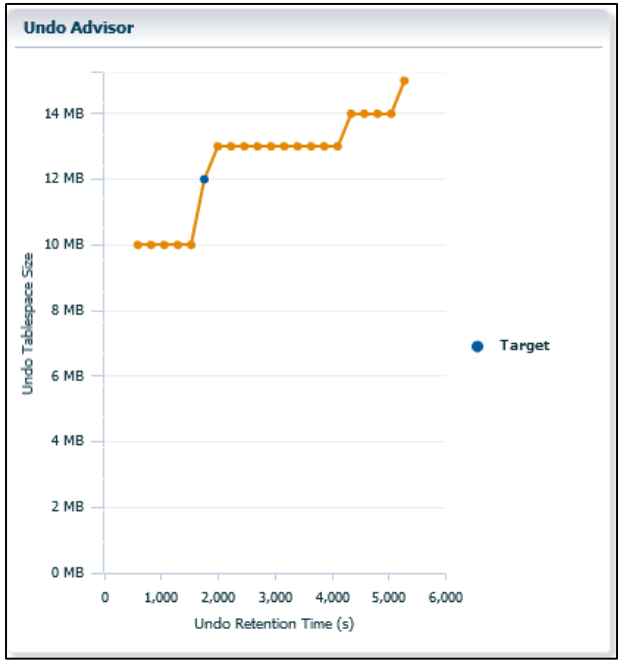
```
SQL> SELECT to_char(BEGIN_TIME,'dd/mm/yy hh24:mi:ss') "BEGIN TIME",
  2  txncount "TXNCNT", maxconcurrency, undoblkcnt, uscount "USCNT",
  3  nospaceerrcnt "NOSPEERRCNT"
  4  FROM  v$tempundostat;

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>
```

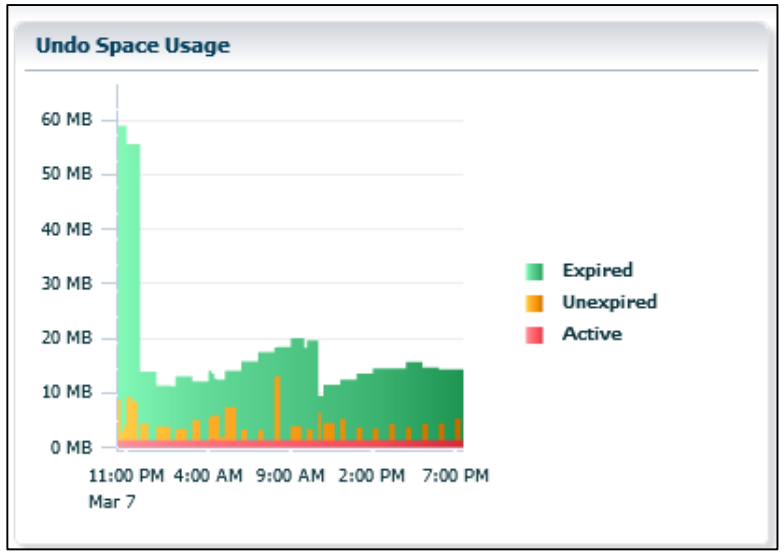
Viewing Undo Information

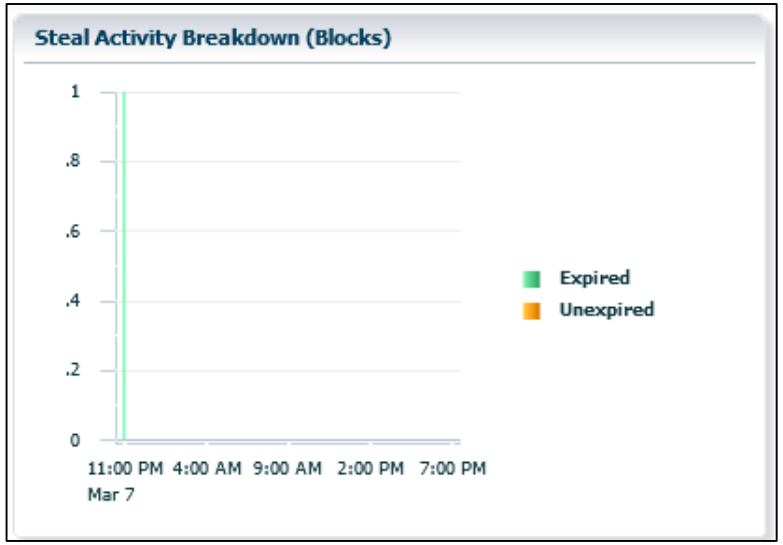


Viewing Undo Activity









Summary

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  - 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
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Practice 14: Overview

- 14-1: Managing Undo Data