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# Using Logical Flashback Features

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## Objectives

After completing this lesson, you should be able to:

- Explain how to use flashback technologies to protect against and recover from various types of errors
- Perform flashback operations

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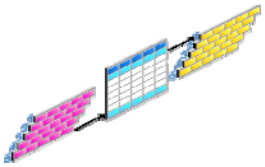
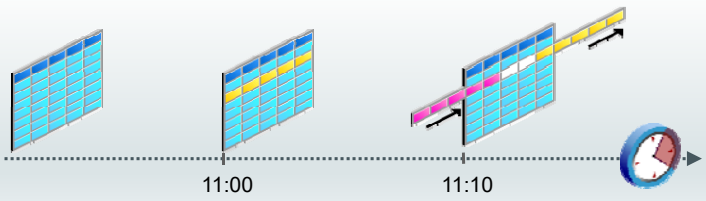
## Using Flashback Technology to Query Data



- Flashback Query
  - Query all data at a specified point in time.
- Flashback Version Query
  - See all versions of a row between two times.
  - See the transactions that changed the row.
- Flashback Transaction Query
  - See all changes made by a transaction.



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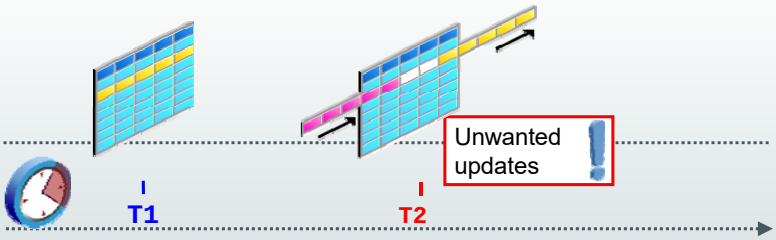
## Flashback Query

Use to query all data at a specified point in time or SCN.




```
SELECT employee_id, salary FROM employees
AS OF TIMESTAMP <T1>
WHERE employee_id = 200
```

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## Flashback Version Query

Flashback
- Query
➢ - Versions
- Table
- Transaction
- Drop
- Data Archive

The VERSIONS clause:

- Retrieves all the versions of the rows that exist between two points in time or two SCNs
- Retrieves only committed data
- *Cannot* be used to query external tables, temporary tables, fixed tables, or views
- Can be used to create views

```
SELECT versions_xid, salary FROM employees
VERSIONS BETWEEN TIMESTAMP <t1> and <t2>
WHERE employee_id = 200;
```

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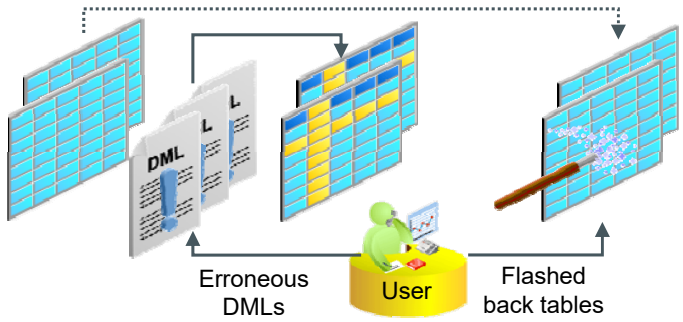
## Flashback Table: Overview

Flashback
- Query
- Versions
➢ - Table
- Transaction
- Drop
- Data Archive

- Flashback Table recovers tables to a specific point in time.
- Flashback Table is an in-place operation.
- The database stays online.

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## Flashback Table

- Recovering a table or tables with associated objects to a specific point in time without restoring a backup
- Using data from the undo tablespace
- Prerequisites:
  - The FLASHBACK ANY TABLE or the FLASHBACK object privilege on the specific table
  - SELECT, INSERT, DELETE, and ALTER privileges on the table
  - Enabled row movement
- Interfaces: Cloud Control and SQL*Plus

```
FLASHBACK TABLE hr.departments
TO_TIMESTAMP('2019-01-25 21:00:00','YYYY-MM-DD HH24:MI:SS');
```

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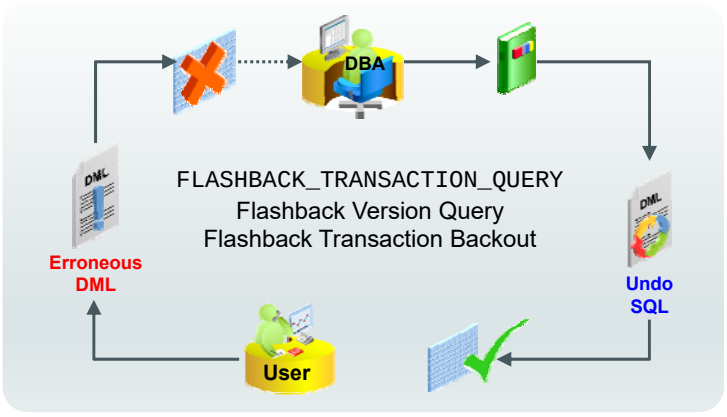
## Flashback Transaction Query




Flashback
- Query
- Versions
- Table
- Transaction
- Drop
- Data Archive

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## Flashback Transaction Backout

- Use Flashback Transaction to reverse a transaction and dependent transactions.
- Oracle Database determines the dependencies between transactions and, in effect, creates a compensating transaction that reverses the unwanted changes.
- Supplemental logging must be enabled.
- SELECT, FLASHBACK, and DML privileges on all affected tables must be granted.

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## Flashing Back a Transaction

- Use Enterprise Manager or the DBMS_FLASHBACK.TRANSACTION_BACKOUT procedure.
- If the PL/SQL call finishes successfully, it means that the transaction does not have any dependencies and a single transaction is backed out successfully.
- After choosing your back-out option, the dependency report is generated in the DBA_FLASHBACK_TXN_STATE and DBA_FLASHBACK_TXN_REPORT views.
- Review the dependency report that shows all transactions that were backed out.

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## Best Practices: Undo-Based Flashback Query, Flashback Table

- Use Undo Advisor in Enterprise Manager to obtain recommendations on available undo retention for various sizes.
- Use fixed size undo: Undo retention is automatically tuned for the best possible retention based on tablespace size and current system load.


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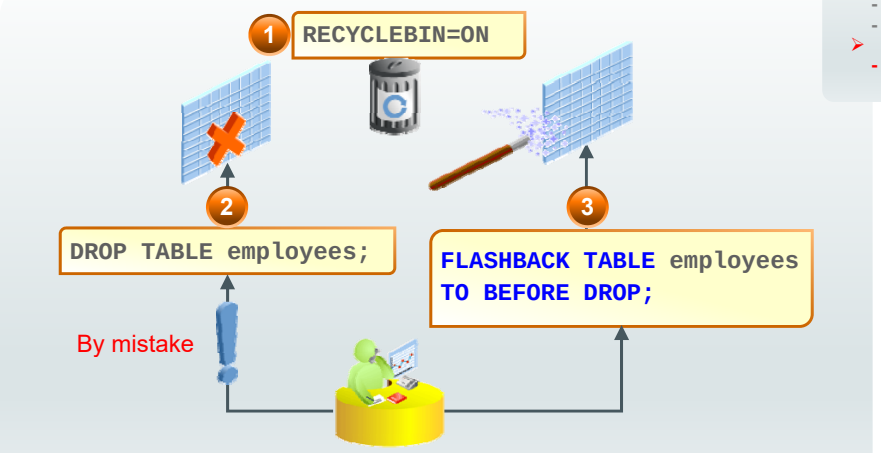
## Flashback Drop and the Recycle Bin

Flashback
- Query
- Versions
- Table
- Transaction
- Drop
- Data Archive





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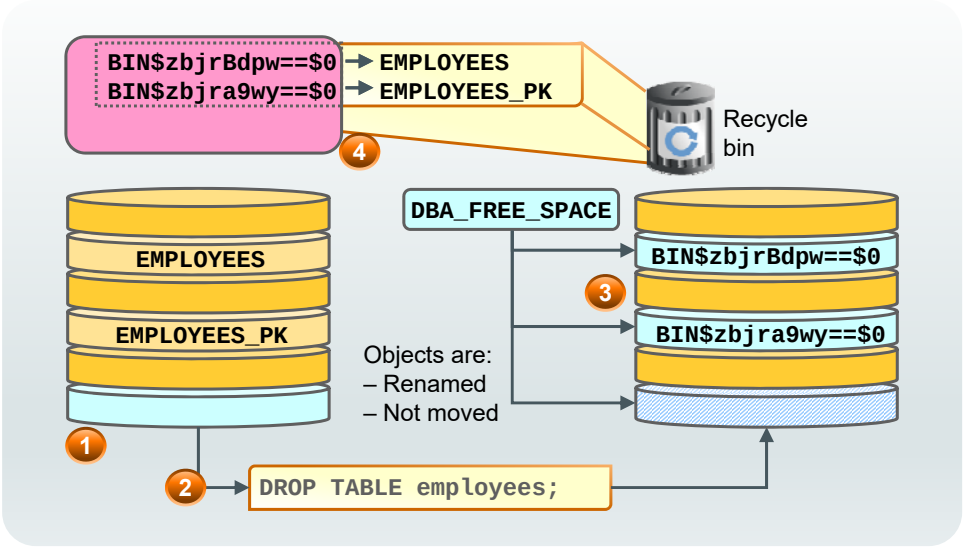
## Recycle Bin

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## Bypassing the Recycle Bin

```
DROP TABLE <table_name> [PURGE] ;
```

```
DROP TABLESPACE <ts_name>
[INCLUDING CONTENTS] ;
```

```
DROP USER <user_name> [CASCADE] ;
```

Security considerations for the recycle bin:

```
ALTER SYSTEM SET RECYCLEBIN=OFF SCOPE=SPFILE;
```

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## Using Flashback Data Archives

Flashback
- Query
- Versions
- Table
- Transaction
- Drop
- Data Archive

Automated tracking of historical database changes:

- Enable at the table level with your specified retention period.
- All subsequent changes are transparently stored and tamper proof.
- Records older than retention period are automatically removed.
- Use Flashback technologies to retrieve history.

```
SELECT … AS OF TIMESTAMP…
SELECT … VERSIONS BETWEEN TIMESTAMP and TIMESTAMP…
```


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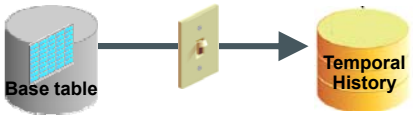
## Creating a Temporal History and Enabling Archiving

1. Create a new tablespace to hold the history data.
2. Create a flashback data archive, assign it to the tablespace, and specify its retention period. (It requires the FLASHBACK ARCHIVE ADMINISTER system privilege.)

```
CREATE FLASHBACK ARCHIVE fda1 TABLESPACE fda_tbs1
OPTIMIZE DATA QUOTA 10M RETENTION 1 YEAR;
```

3. Alter the base tables to enable archiving and assign it to a flashback archive. (It requires the FLASHBACK ARCHIVE object privilege.)

```
ALTER TABLE HR.EMPLOYEES FLASHBACK ARCHIVE fda1;
```

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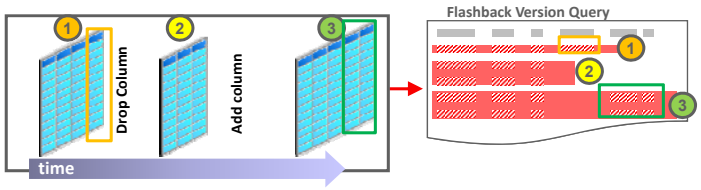
## Transparent Schema Evolution

- DDL support for:
  - Add, drop, rename, and modify column
  - Drop and truncate partition
  - Rename and truncate table




- Flashback queries work across the preceding DDL changes.
- All other DDL changes are *not* automatically supported.

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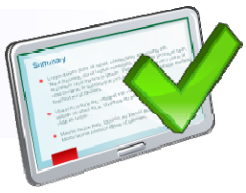
## Summary

In this lesson, you should have learned how to:

- Use flashback technologies to protect against and recover from various types of errors
- Perform flashback operations



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## Practice Overview

- Preparing to Use Flashback Technologies
- Restoring a Dropped Table
- Using Flashback Table

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