15

Database Transaction

Objectives

After completing this lesson, you should be able to do the following:

- **Control transactions**

Database Transactions

A database transaction consists of one of the following:

- DML statements that constitute one consistent change to the data
- One DDL statement
- One data control language (DCL) statement

Database Transactions

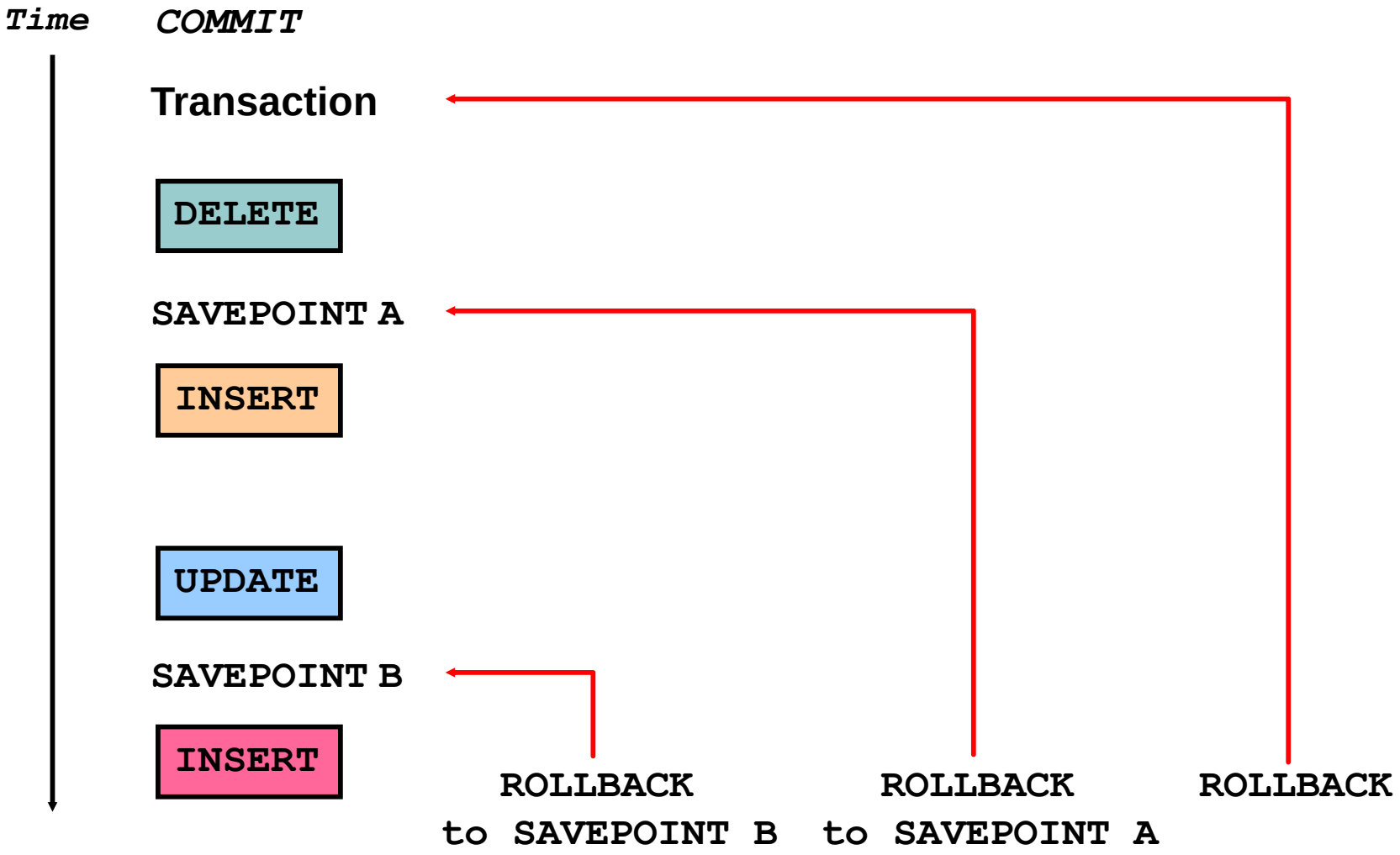
- Begin when the first DML SQL statement is executed.
- End with one of the following events:
  - A `COMMIT` or `ROLLBACK` statement is issued.
  - A DDL or DCL statement executes (automatic commit).
  - The user exits SQL*Plus.
  - The system crashes.

Advantages of COMMIT and ROLLBACK Statements

With COMMIT and ROLLBACK statements, you can:

- Ensure data consistency
- Preview data changes before making changes permanent

Controlling Transactions



Rolling Back Changes to a Marker

- Create a marker in a current transaction by using the `SAVEPOINT` statement.
- Roll back to that marker by using the `ROLLBACK TO SAVEPOINT` statement.

```
UPDATE...
SAVEPOINT update_done;
Savepoint created.
INSERT...
ROLLBACK TO update_done;
Rollback complete.
```

Implicit Transaction Processing

- An automatic commit occurs under the following circumstances:
  - DDL statement is issued
  - DCL statement is issued
  - Normal exit from SQL*Plus, without explicitly issuing `COMMIT` or `ROLLBACK` statements
- An automatic rollback occurs under an abnormal termination of SQL*Plus or a system failure.

State of the Data Before COMMIT or ROLLBACK

- The current user can review the results of the DML operations by using the SELECT statement.
- Other users *cannot* view the results of the DML statements by the current user.
- The affected rows are *locked*; other users cannot change the data in the affected rows.

State of the Data After COMMIT

- Data changes are made permanent in the database.
- The previous state of the data is permanently lost.
- All users can view the results.
- Locks on the affected rows are released; those rows are available for other users to manipulate.
- All savepoints are erased.

Committing Data

- **Make the changes:**

```
DELETE FROM employees
WHERE  employee_id = 99999;
1 row deleted.

INSERT INTO departments
VALUES (290, 'Corporate Tax', NULL, 1700);
1 row created.
```

- **Commit the changes:**

```
COMMIT;
Commit complete.
```

State of the Data After ROLLBACK

Discard all pending changes by using the ROLLBACK statement:

- Data changes are undone.
- Previous state of the data is restored.
- Locks on the affected rows are released.

```
DELETE FROM copy_emp;
22 rows deleted.
ROLLBACK ;
Rollback complete.
```

State of the Data After ROLLBACK

```
DELETE FROM test;
25,000 rows deleted.

ROLLBACK;
Rollback complete.

DELETE FROM test WHERE  id = 100;
1 row deleted.

SELECT * FROM   test WHERE  id = 100;
No rows selected.

COMMIT;
Commit complete.
```

Statement-Level Rollback

- If a single DML statement fails during execution, only that statement is rolled back.
- The Oracle server implements an implicit savepoint.
- All other changes are retained.
- The user should terminate transactions explicitly by executing a `COMMIT` or `ROLLBACK` statement.

Read Consistency

- Read consistency guarantees a consistent view of the data at all times.
- Changes made by one user do not conflict with changes made by another user.
- Read consistency ensures that on the same data:
  - Readers do not wait for writers
  - Writers do not wait for readers

Concurrent Transactions

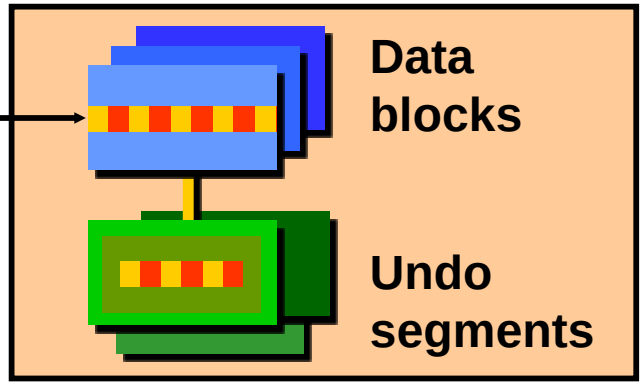
- **The Oracle database supports many users interacting with the database at the same time, with each user running their own transactions at the same time.**
- **If users are running transactions that affect the same table, the effects of those transactions are separated from each other until a COMMIT is performed.**

Transaction 1 T1	Transaction 2 T2
SELECT * FROM customers;	SELECT * FROM customers;
INSERT INTO customers (customer_id, first_name, last_name) VALUES (7, ‘Jason', ‘Price');	
UPDATE customers SET last_name = ‘Orange' WHERE customer_id = 2;	
SELECT * FROM customers; The returned result set contains the new row and the update.	SELECT * FROM customers; The returned result set doesn't contain the new row or the update made by T1. Instead, the result set contains the original rows.
COMMIT;	
	SELECT * FROM customers; The returned result set contains the new row and the update made by T1.

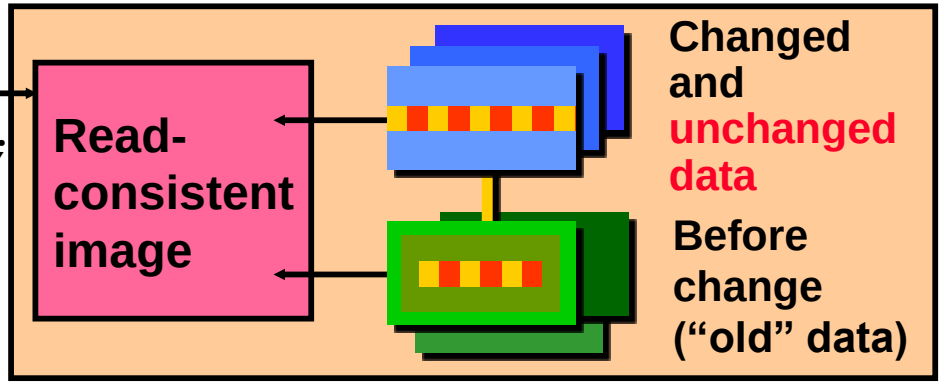
Implementation of Read Consistency

User A

```
UPDATE employees
SET    salary = 7000
WHERE  last_name = 'Grant';
```



```
SELECT  *
FROM userA.employees;
```



User B

Summary

In this lesson, you should have learned how to use the following statements:

Function	Description
`COMMIT`	Makes all pending changes permanent
`SAVEPOINT`	Is used to roll back to the savepoint marker
`ROLLBACK`	Discards all pending data changes

Practice 8: Overview

This practice covers the following topics:

- **Controlling transactions**