10

Managing Tables Using DML Statements

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Objectives

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

- Describe each data manipulation language (DML) statement
- Control transactions

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Lesson Agenda

- Adding new rows in a table
  - INSERT statement
- Changing data in a table
  - UPDATE statement
- Removing rows from a table:
  - DELETE statement
  - TRUNCATE statement
- Database transaction control using COMMIT, ROLLBACK, and SAVEPOINT
- Read consistency
- FOR UPDATE clause in a SELECT statement

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Data Manipulation Language

- A DML statement is executed when you:
  - Add new rows to a table
  - Modify existing rows in a table
  - Remove existing rows from a table
- A *transaction* consists of a collection of DML statements that form a logical unit of work.

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Adding a New Row to a Table

DEPARTMENTS

DEPARTMENT_ID	DEPARTMENT_NAME	MANAGER_ID	LOCATION_ID
10	Administration	200	1700
20	Marketing	201	1800
50	Shipping	124	1500
60	IT	103	1400
80	Sales	149	2500
90	Executive	100	1700
110	Accounting	205	1700
190	Contracting	(null)	1700

70	Public Relations	100	1700

New row

Insert new row into the DEPARTMENTS table.

	DEPARTMENT_ID	DEPARTMENT_NAME	MANAGER_ID	LOCATION_ID
1	70	Public Relations	100	1700
2	10	Administration	200	1700
3	20	Marketing	201	1800
4	50	Shipping	124	1500
5	60	IT	103	1400
6	80	Sales	149	2500
7	90	Executive	100	1700
8	110	Accounting	205	1700
9	190	Contracting	(null)	1700

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INSERT Statement Syntax

- Add new rows to a table by using the INSERT statement:

```
INSERT INTO   table [(column [, column...])]
VALUES        (value [, value...]);
```

- With this syntax, only one row is inserted at a time.

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Inserting New Rows

- Insert a new row containing values for each column.
- List values in the default order of the columns in the table.
- Optionally, list the columns in the `INSERT` clause.

```
INSERT INTO departments(department_id,
       department_name, manager_id, location_id)
VALUES (70, 'Public Relations', 100, 1700);
```

```
1 rows inserted
```

- Enclose character and date values within single quotation marks.

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Inserting Rows with Null Values

- Implicit method: Omit the column from the column list.

```
INSERT INTO  departments (department_id,
                          department_name)
VALUES       (30, 'Purchasing');
1 rows inserted
```

- Explicit method: Specify the NULL keyword in the VALUES clause.

```
INSERT INTO  departments
VALUES       (100, 'Finance', NULL, NULL);
1 rows inserted
```


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Inserting Special Values

The SYSDATE function records the current date and time.

```
INSERT INTO employees (employee_id,
                       first_name, last_name,
                       email, phone_number,
                       hire_date, job_id, salary,
                       commission_pct, manager_id,
                       department_id)
VALUES                (113,
                       'Louis', 'Popp',
                       'LPOPP', '515.124.4567',
                       CURRENT_DATE, 'AC_ACCOUNT', 6900,
                       NULL, 205, 110);
1 rows inserted
```


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Inserting Specific Date and Time Values

- Add a new employee.

```
INSERT INTO employees
VALUES      (114,
             'Den', 'Raphealy',
             'DRAPHEAL', '515.127.4561',
             TO_DATE('FEB 3, 2003', 'MON DD, YYYY'),
             'SA_REP', 11000, 0.2, 100, 60);
```

```
1 rows inserted
```

- Verify your addition.

	EMPLOYEE_ID	FIRST_NAME	LAST_NAME	EMAIL	PHONE_NUMBER	HIRE_DATE	JOB_ID	SALARY	COMMISSION_PCT	MANAGER_ID
1	114	Den	Raphealy	DRAPHEAL	515.127.4561	03-FEB-03	SA_REP	11000	0.2	10(

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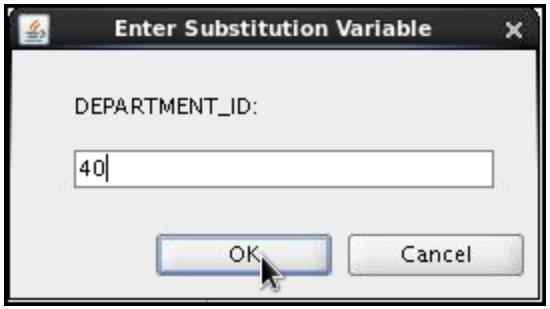
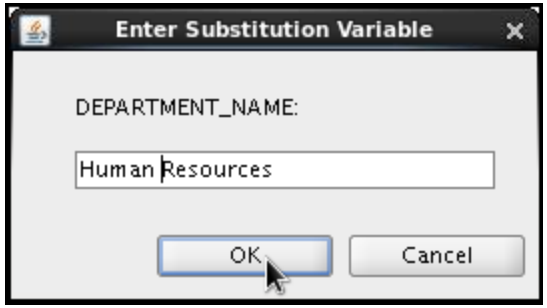
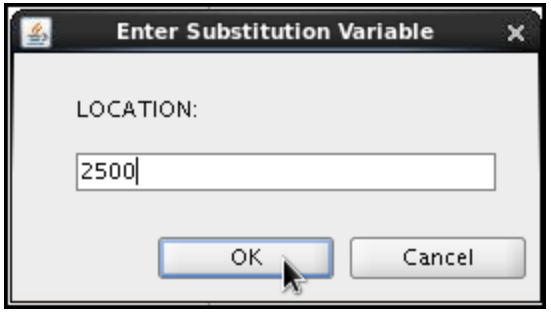
Creating a Script

- Use the & substitution in a SQL statement to prompt for values.
- & is a placeholder for the variable value.

```
INSERT INTO departments
            (department_id, department_name, location_id)
VALUES      (&department_id, '&department_name',&location);
```







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Copying Rows from Another Table

- Write your INSERT statement with a subquery:

```
INSERT INTO sales_reps(id, name, salary, commission_pct)
  SELECT employee_id, last_name, salary, commission_pct
  FROM   employees
  WHERE  job_id LIKE '%REP%';

5 rows inserted.
```

- Do not use the VALUES clause.
- Match the number of columns in the INSERT clause to those in the subquery.
- Inserts all the rows returned by the subquery in the table, sales_reps.

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  - UPDATE statement
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Changing Data in a Table

EMPLOYEES

EMPLOYEE_ID	FIRST_NAME	LAST_NAME	SALARY	MANAGER_ID	COMMISSION_PCT	DEPARTMENT_ID
100	Steven	King	24000	(null)	(null)	90
101	Neena	Kochhar	17000	100	(null)	90
102	Lex	De Haan	17000	100	(null)	90
103	Alexander	Hunold	9000	102	(null)	60
104	Bruce	Ernst	6000	103	(null)	60
107	Diana	Lorentz	4200	103	(null)	60
124	Kevin	Mourgos	5800	100	(null)	50

Update rows in the EMPLOYEES table:

EMPLOYEE_ID	FIRST_NAME	LAST_NAME	SALARY	MANAGER_ID	COMMISSION_PCT	DEPARTMENT_ID
100	Steven	King	24000	(null)	(null)	90
101	Neena	Kochhar	17000	100	(null)	90
102	Lex	De Haan	17000	100	(null)	90
103	Alexander	Hunold	9000	102	(null)	80
104	Bruce	Ernst	6000	103	(null)	80
107	Diana	Lorentz	4200	103	(null)	80
124	Kevin	Mourgos	5800	100	(null)	50

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UPDATE Statement Syntax

- Modify existing values in a table with the UPDATE statement:

```
UPDATE      table
SET         column = value [, column = value, ...]
[WHERE      condition];
```

- Update more than one row at a time (if required).

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Updating Rows in a Table

- Values for a specific row or rows are modified if you specify the WHERE clause:

```
UPDATE employees
SET    department_id = 50
WHERE  employee_id = 113;
1 rows updated
```

- Values for all the rows in the table are modified if you omit the WHERE clause:

```
UPDATE   copy_emp
SET      department_id = 110;
22 rows updated
```

- Specify SET *column_name*= NULL to update a column value to NULL.

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Updating Two Columns with a Subquery

Update employee 103's job and salary to match those of employee 205.

```
UPDATE   employees
SET      (job_id,salary)  = (SELECT  job_id,salary
                             FROM    employees
                             WHERE   employee_id = 205)
         WHERE    employee_id    =  103;
```

```
1 rows updated
```


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Updating Rows Based on Another Table

Use the subqueries in the UPDATE statements to update row values in a table based on values from another table:

```
UPDATE  copy_emp
SET     department_id  =  (SELECT department_id
                          FROM employees
                          WHERE employee_id = 100)
WHERE   job_id         =  (SELECT job_id
                          FROM employees
                          WHERE employee_id = 200);
```

```
1 rows updated
```


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Removing a Row from a Table

DEPARTMENTS

	DEPARTMENT_ID	DEPARTMENT_NAME	MANAGER_ID	LOCATION_ID
1	10	Administration	200	1700
2	20	Marketing	201	1800
3	50	Shipping	124	1500
4	60	IT	103	1400
5	80	Sales	149	2500
6	90	Executive	100	1700
7	110	Accounting	205	1700
8	190	Contracting	(null)	1700

Delete a row from the DEPARTMENTS table:

	DEPARTMENT_ID	DEPARTMENT_NAME	MANAGER_ID	LOCATION_ID
1	10	Administration	200	1700
2	20	Marketing	201	1800
3	50	Shipping	124	1500
4	60	IT	103	1400
5	80	Sales	149	2500
6	90	Executive	100	1700
7	110	Accounting	205	1700

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DELETE Statement

You can remove existing rows from a table by using the DELETE statement:

```
DELETE [FROM]   table
[WHERE          condition];
```


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Deleting Rows from a Table

- Specific rows are deleted if you specify the WHERE clause:

```
DELETE FROM departments
WHERE  department_name = 'Finance';
```

```
1 rows deleted
```

- All rows in the table are deleted if you omit the WHERE clause:

```
DELETE FROM  copy_emp;
```

```
22 rows deleted
```


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Deleting Rows Based on Another Table

Use the subqueries in the DELETE statements to remove rows from a table based on values from another table:

```
DELETE FROM employees
WHERE  department_id IN
                (SELECT department_id
                 FROM   departments
                 WHERE  department_name
                        LIKE '%Public%');
1 rows deleted
```


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TRUNCATE Statement

- Removes all rows from a table, leaving the table empty and the table structure intact
- Is a data definition language (DDL) statement rather than a DML statement; cannot easily be undone
- Syntax:

```
TRUNCATE TABLE table_name;
```

- Example:

```
TRUNCATE TABLE copy_emp;
```


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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

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Database Transactions: Start and End

- 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 Developer or SQL*Plus.
  - The system crashes.

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Advantages of COMMIT and ROLLBACK Statements

With COMMIT and ROLLBACK statements, you can:

- Ensure data consistency
- Preview data changes before making changes permanent
- Group logically related operations

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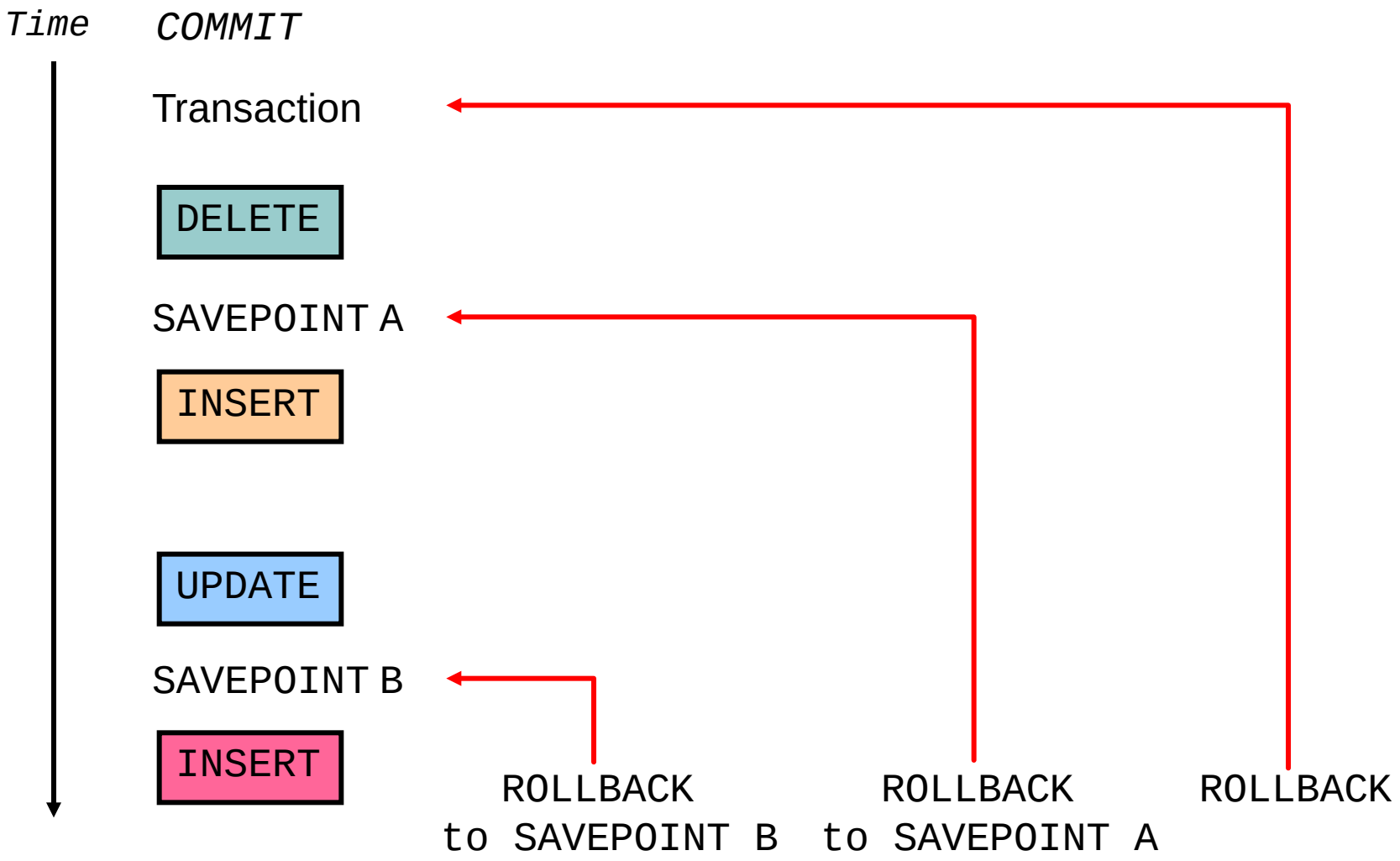
Explicit Transaction Control Statements



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Rolling Back Changes to a Marker

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

```
UPDATE...
SAVEPOINT update_done;
SAVEPOINT update_done succeeded.
INSERT...
ROLLBACK TO update_done;
ROLLBACK TO succeeded.
```


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Implicit Transaction Processing

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

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State of Data Before COMMIT or ROLLBACK

- The previous state of the data can be recovered.
- The current session can review the results of the DML operations by using the SELECT statement.
- Other sessions *cannot* view the results of the DML statements issued by the current session.
- The affected rows are *locked*; other session cannot change the data in the affected rows.

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State of Data After COMMIT

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

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Committing Data

- Make the changes:

```
DELETE FROM EMPLOYEES
WHERE employee_id=113;
1 rows deleted
INSERT INTO departments
VALUES (290, 'Corporate Tax', NULL, 1700);
1 rows inserted
```

- Commit the changes:

```
COMMIT;
commited.
```


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State of 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;
ROLLBACK ;
```


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State of Data After ROLLBACK: Example

```
DELETE FROM test;
4 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.
```


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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.

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Read Consistency

- Read consistency guarantees a consistent view of the data at all times.
- Changes made by one user do not conflict with the 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
  - Writers wait for writers

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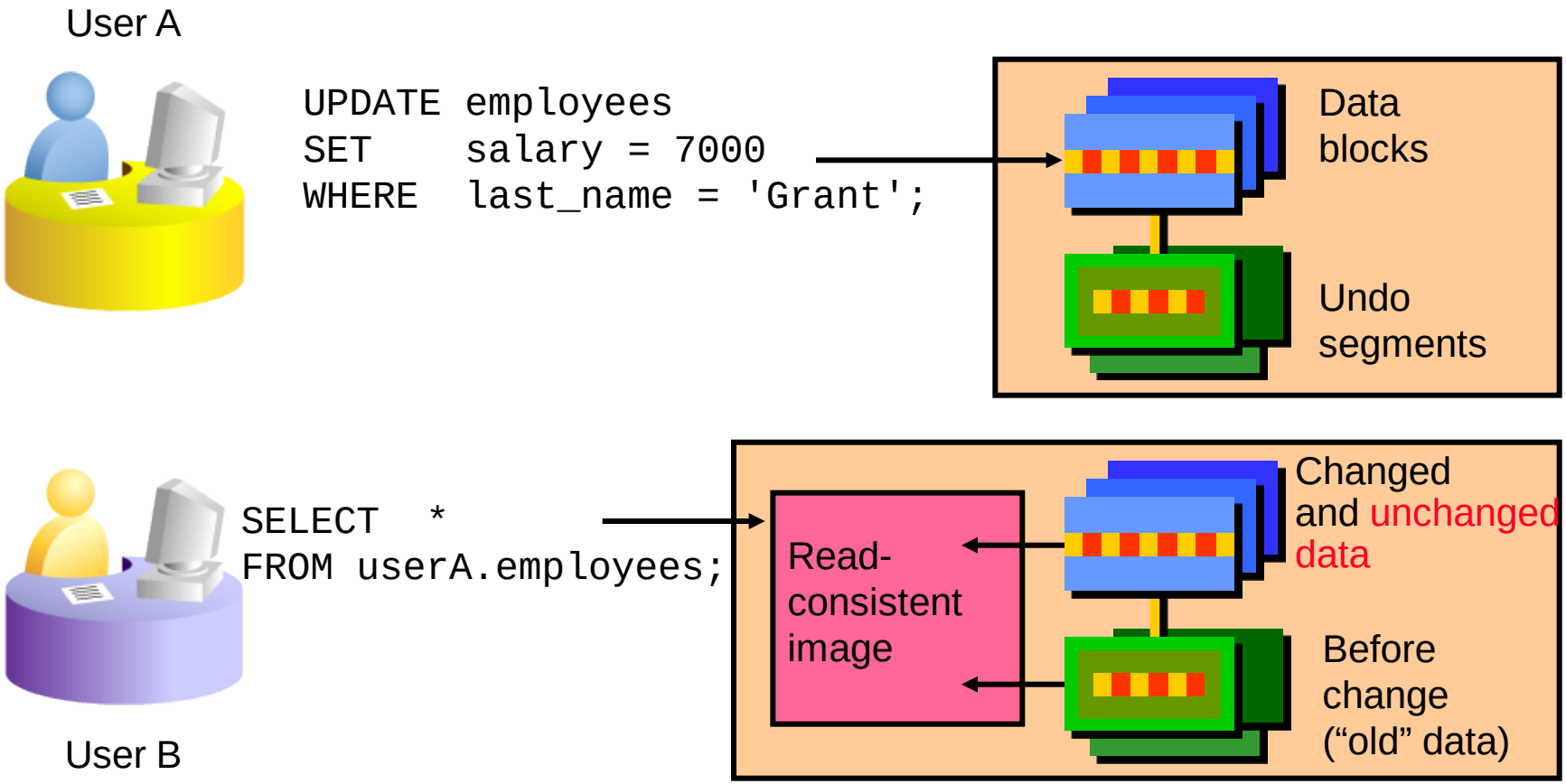
Implementing Read Consistency



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FOR UPDATE Clause in a SELECT Statement

- Locks the rows in the EMPLOYEES table where job_id is SA_REP.

```
SELECT employee_id, salary, commission_pct, job_id
FROM employees
WHERE job_id = 'SA_REP'
FOR UPDATE
ORDER BY employee_id;
```

- Lock is released only when you issue a ROLLBACK or a COMMIT.
- If the SELECT statement attempts to lock a row that is locked by another user, the database waits until the row is available, and then returns the results of the SELECT statement.

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FOR UPDATE Clause: Examples

- You can use the FOR UPDATE clause in a SELECT statement against multiple tables.

```
SELECT e.employee_id, e.salary, e.commission_pct
FROM employees e JOIN departments d
USING (department_id)
WHERE job_id = 'ST_CLERK'
AND location_id = 1500
FOR UPDATE
ORDER BY e.employee_id;
```

- Rows from both the EMPLOYEES and DEPARTMENTS tables are locked.
- Use FOR UPDATE OF *column_name* to qualify the column you intend to change, then only the rows from that specific table are locked.

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Quiz

The following statements produce the same results:

```
DELETE FROM copy_emp;
```

```
TRUNCATE TABLE copy_emp;
```

a. True
b. False

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Summary

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

Function	Description
INSERT	Adds a new row to the table
UPDATE	Modifies existing rows in the table
DELETE	Removes existing rows from the table
TRUNCATE	Removes all rows from a table
COMMIT	Makes all pending changes permanent
SAVEPOINT	Is used to roll back to the savepoint marker
ROLLBACK	Discards all pending data changes
FOR UPDATE clause in SELECT	Locks rows identified by the SELECT query

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Practice 10: Overview

This practice covers the following topics:

- Inserting rows into the tables
- Updating and deleting rows in the table
- Controlling transactions

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