Oracle 11g - SQL

Data Manipulating

Objectives

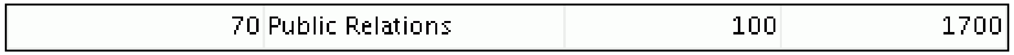
After completing this lesson, you should be able to do the following:

- Describe each data manipulation language (DML) statement
- Insert rows into a table
- Update rows in a table
- Delete rows from a table
- Control transactions
- Read Consistency

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.

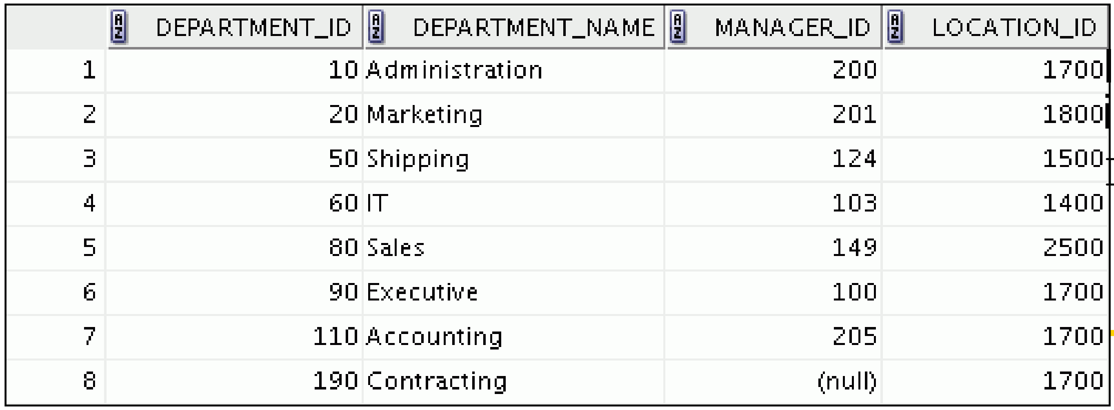
Adding a New Row to a Table



70	Public Relations	100	1700

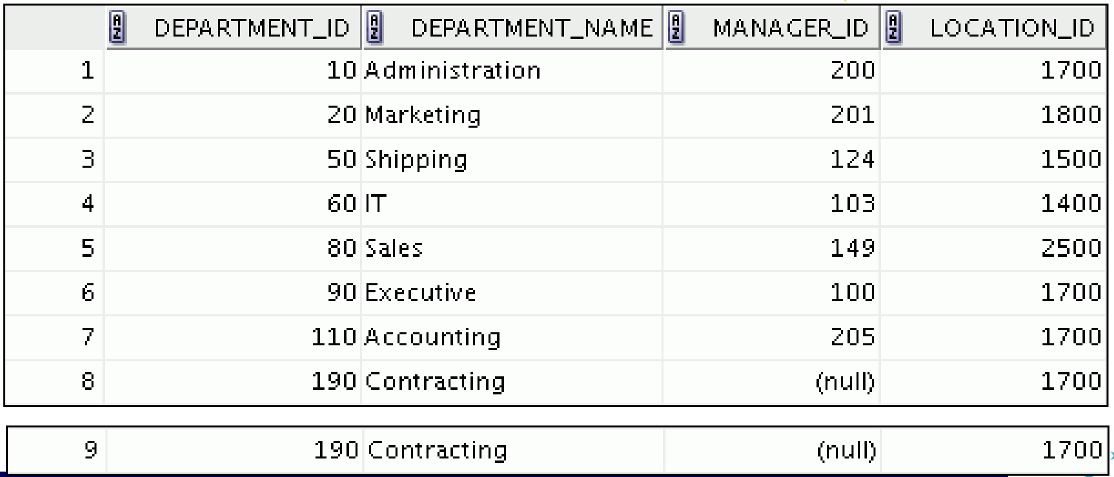
New row

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

Insert new row into 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
8	190	Contracting	(null)	1700
9	190	Contracting	(null)	1700

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.

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 in single quotation marks.

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
```

Inserting Special Values

The SYSDATE function records the current date and time.

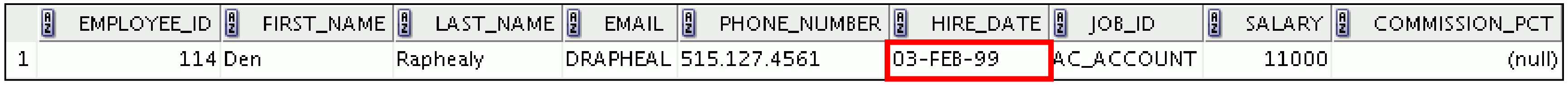
```
INSERT INTO employees (employee_id,
                 first_name, last_name,
                 email, phone_number,
                 hire_date, job_id, salary,
                 commission_pct, manager_id,
                 department_id)
VALUES           (113,
                 'Louis', 'Popp',
                 'LPOPP', '515.124.4567',
                 SYSDATE, 'AC_ACCOUNT', 6900,
                 NULL, 205, 100);
1 rows inserted
```

Inserting Specific Date Values

- Add a new employee.

```
INSERT INTO employees
VALUES      (114,
             'Den', 'Raphealy',
             'DRAPHEAL', '515.127.4561',
             TO_DATE('FEB 3, 1999', 'MON DD, YYYY'),
             'AC_ACCOUNT', 11000, NULL, 100, 30);
1 rows inserted
```

- Verify your addition.

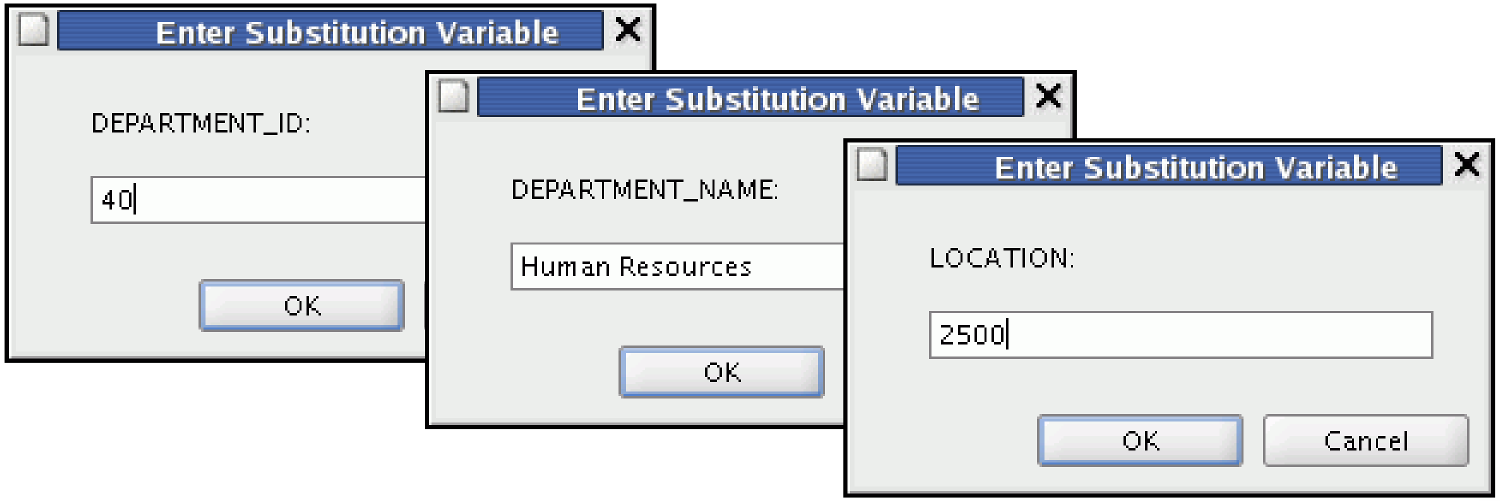


	EMPLOYEE_ID	FIRST_NAME	LAST_NAME	EMAIL	PHONE_NUMBER	HIRE_DATE	JOB_ID	SALARY	COMMISSION_PCT
1	114	Den	Raphealy	DRAPHEAL	515.127.4561	03-FEB-99	AC_ACCOUNT	11000	(null)

Creating a Script

- Use `&` 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);
```



Enter Substitution Variable

DEPARTMENT_ID: 40

OK

Enter Substitution Variable

DEPARTMENT_NAME: Human Resources

OK

Enter Substitution Variable

LOCATION: 2500

OK Cancel

Copying Rows from Another Table

- Write your INSERT statement with a subquery:

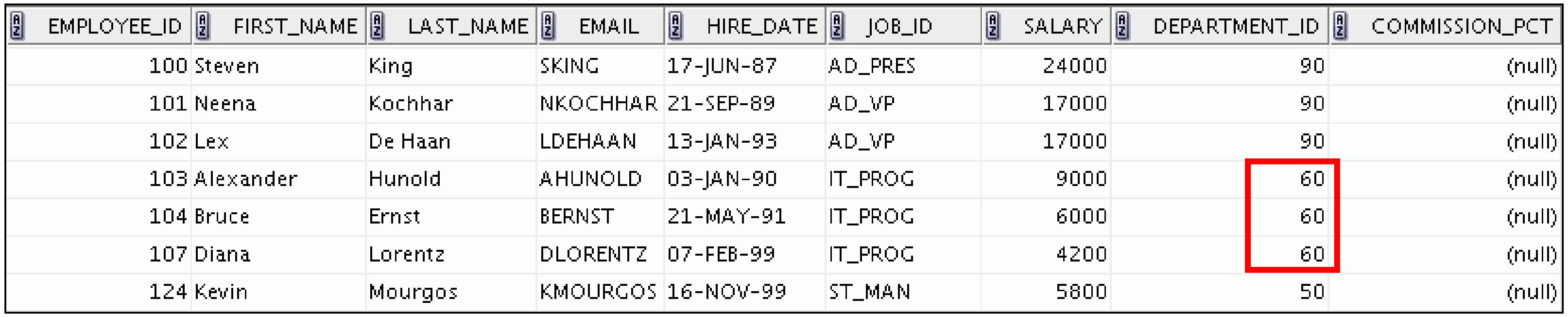
```
INSERT INTO sales_reps(id, name, salary, commission_pct)
  SELECT employee_id, last_name, salary, commission_pct
  FROM   employees
  WHERE  job_id LIKE '%REP%';

4 rows inserted
```

- Do not use the VALUES clause.
- Match the number of columns in the INSERT clause to those in the subquery.

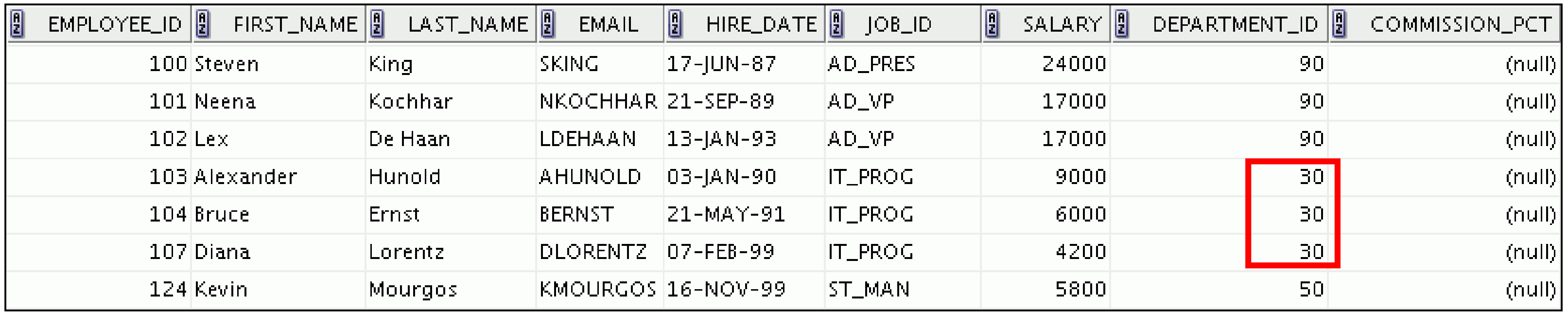
Changing Data in a Table

EMPLOYEES



EMPLOYEE_ID	FIRST_NAME	LAST_NAME	EMAIL	HIRE_DATE	JOB_ID	SALARY	DEPARTMENT_ID	COMMISSION_PCT
100	Steven	King	SKING	17-JUN-87	AD_PRES	24000	90	(null)
101	Neena	Kochhar	NKOCHHAR	21-SEP-89	AD_VP	17000	90	(null)
102	Lex	De Haan	LDEHAAN	13-JAN-93	AD_VP	17000	90	(null)
103	Alexander	Hunold	AHUNOLD	03-JAN-90	IT_PROG	9000	60	(null)
104	Bruce	Ernst	BERNST	21-MAY-91	IT_PROG	6000	60	(null)
107	Diana	Lorentz	DLORENTZ	07-FEB-99	IT_PROG	4200	60	(null)
124	Kevin	Mourgos	KMOURGOS	16-NOV-99	ST_MAN	5800	50	(null)

Update rows in the EMPLOYEES table:



EMPLOYEE_ID	FIRST_NAME	LAST_NAME	EMAIL	HIRE_DATE	JOB_ID	SALARY	DEPARTMENT_ID	COMMISSION_PCT
100	Steven	King	SKING	17-JUN-87	AD_PRES	24000	90	(null)
101	Neena	Kochhar	NKOCHHAR	21-SEP-89	AD_VP	17000	90	(null)
102	Lex	De Haan	LDEHAAN	13-JAN-93	AD_VP	17000	90	(null)
103	Alexander	Hunold	AHUNOLD	03-JAN-90	IT_PROG	9000	30	(null)
104	Bruce	Ernst	BERNST	21-MAY-91	IT_PROG	6000	30	(null)
107	Diana	Lorentz	DLORENTZ	07-FEB-99	IT_PROG	4200	30	(null)
124	Kevin	Mourgos	KMOURGOS	16-NOV-99	ST_MAN	5800	50	(null)

UPDATE Statement Syntax

- Modify existing rows with the UPDATE statement:

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

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

Updating Rows in a Table

- Specific row or rows are modified if you specify the `WHERE` clause:

```
UPDATE employees
SET    department_id = 70
WHERE  employee_id = 113;
1 rows updated
```

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

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

Updating Two Columns with a Subquery

Update employee 114’s job and salary to match that of employee 205.

```
UPDATE   employees
SET      job_id   = (SELECT  job_id
                     FROM    employees
                     WHERE   employee_id = 205),
         salary   = (SELECT  salary
                     FROM    employees
                     WHERE   employee_id = 205)
WHERE    employee_id    =  114;
1 rows updated
```

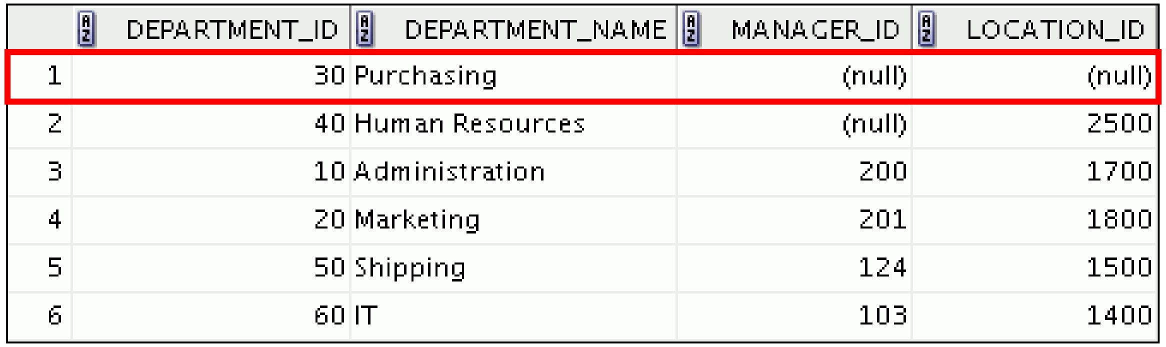
Updating Rows Based on Another Table

Use subqueries in UPDATE statements to update rows 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
```

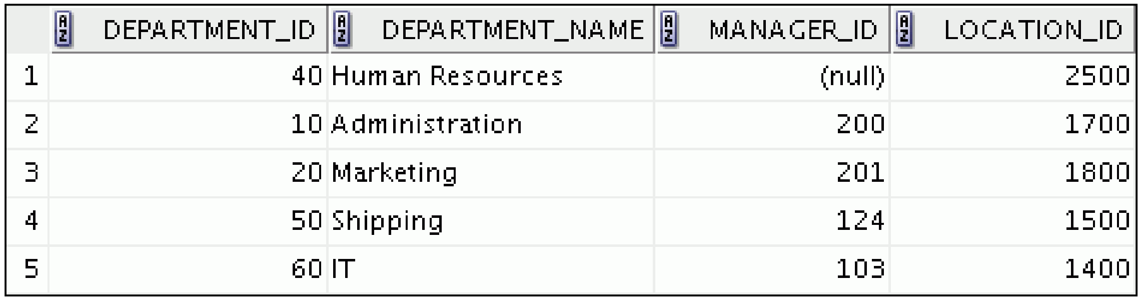
Removing a Row from a Table

DEPARTMENTS



	DEPARTMENT_ID	DEPARTMENT_NAME	MANAGER_ID	LOCATION_ID
1	30	Purchasing	(null)	(null)
2	40	Human Resources	(null)	2500
3	10	Administration	200	1700
4	20	Marketing	201	1800
5	50	Shipping	124	1500
6	60	IT	103	1400

Delete a row from the DEPARTMENTS table:



	DEPARTMENT_ID	DEPARTMENT_NAME	MANAGER_ID	LOCATION_ID
1	40	Human Resources	(null)	2500
2	10	Administration	200	1700
3	20	Marketing	201	1800
4	50	Shipping	124	1500
5	60	IT	103	1400

DELETE Statement

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

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

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
```

Deleting Rows Based on Another Table

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

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

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

```
TRUNCATE TABLE table_name;
```

```
TRUNCATE TABLE copy_emp;
```

Using a Subquery in an `INSERT` Statement

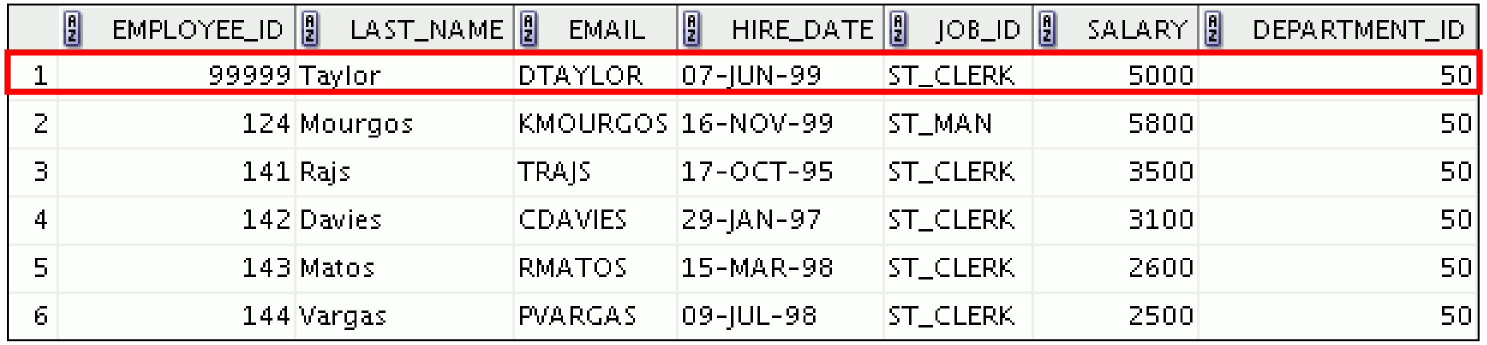
```
INSERT INTO
        (SELECT employee_id, last_name,
                email, hire_date, job_id, salary,
                department_id
         FROM   employees
         WHERE  department_id = 50)
VALUES (99999, 'Taylor', 'DTAYLOR',
        TO_DATE('07-JUN-99', 'DD-MON-RR'),
        'ST_CLERK', 5000, 50);

1 rows inserted
```

Using a Subquery in an `INSERT` Statement

Verify the results:

```
SELECT employee_id, last_name, email, hire_date,
       job_id, salary, department_id
FROM   employees
WHERE  department_id = 50;
```



	EMPLOYEE_ID	LAST_NAME	EMAIL	HIRE_DATE	JOB_ID	SALARY	DEPARTMENT_ID
1	99999	Taylor	DTAYLOR	07-JUN-99	ST_CLERK	5000	50
2	124	Mourgos	KMOURGOS	16-NOV-99	ST_MAN	5800	50
3	141	Rajs	TRAJS	17-OCT-95	ST_CLERK	3500	50
4	142	Davies	CDAVIES	29-JAN-97	ST_CLERK	3100	50
5	143	Matos	RMATOS	15-MAR-98	ST_CLERK	2600	50
6	144	Vargas	PVARGAS	09-JUL-98	ST_CLERK	2500	50

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

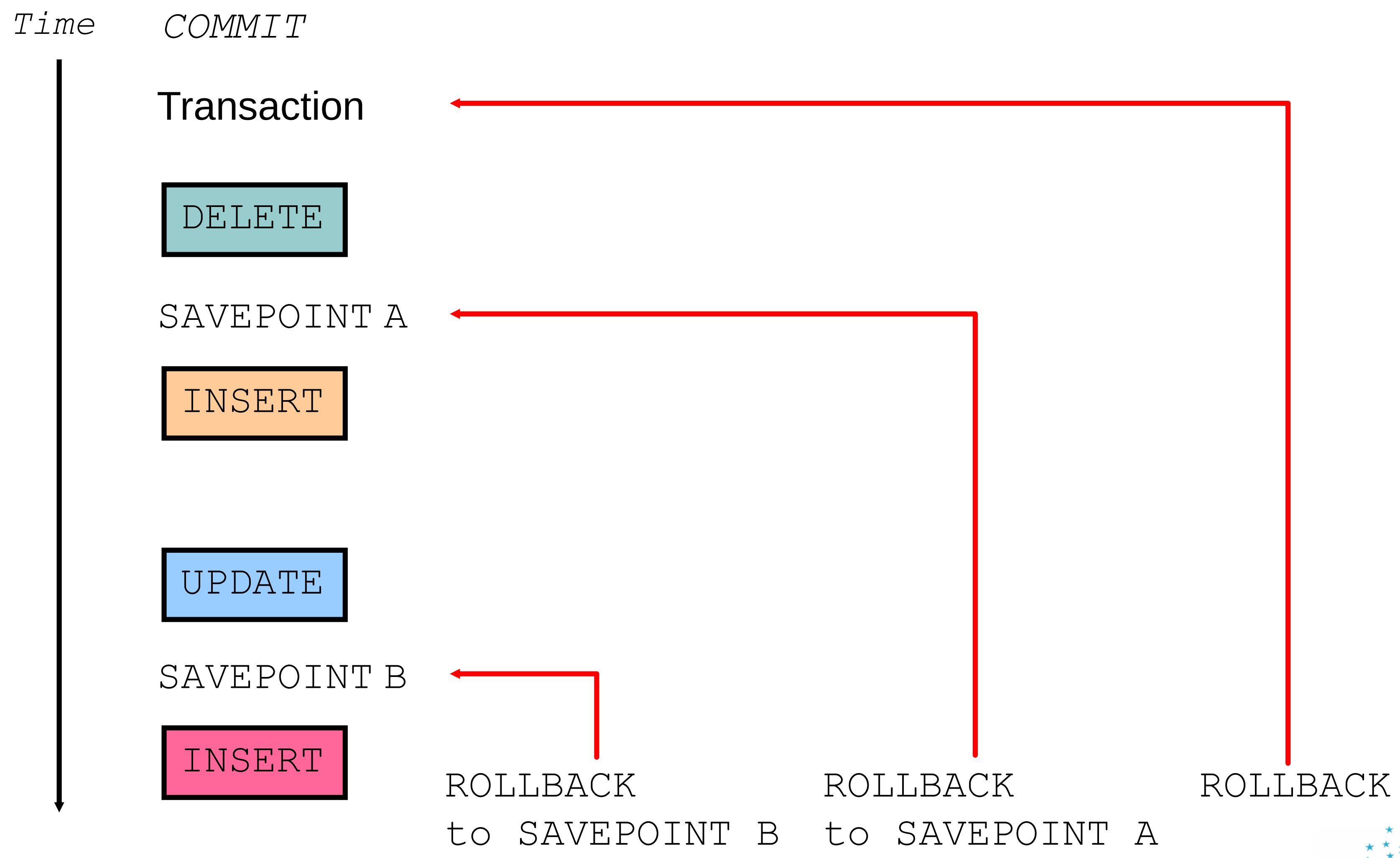
- Begin when the first DML SQL statement is executed
- End with one of the following events:
  - A `COMMIT` or `ROLLBACK` statement is issued.
  - A DDL or DCL statement executes (automatic commit).
  - The user interact with SQL Developer or SQL*Plus.

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

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

Implicit Transaction Processing

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

State of the Data Before COMMIT or ROLLBACK

- The previous state of the data can be recovered.
- 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 rows deleted

INSERT INTO departments
VALUES (290, 'Corporate Tax', NULL, 1700);
1 rows inserted
```

- 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;
20 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 rows deleted

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

COMMIT;
Commit complete
```

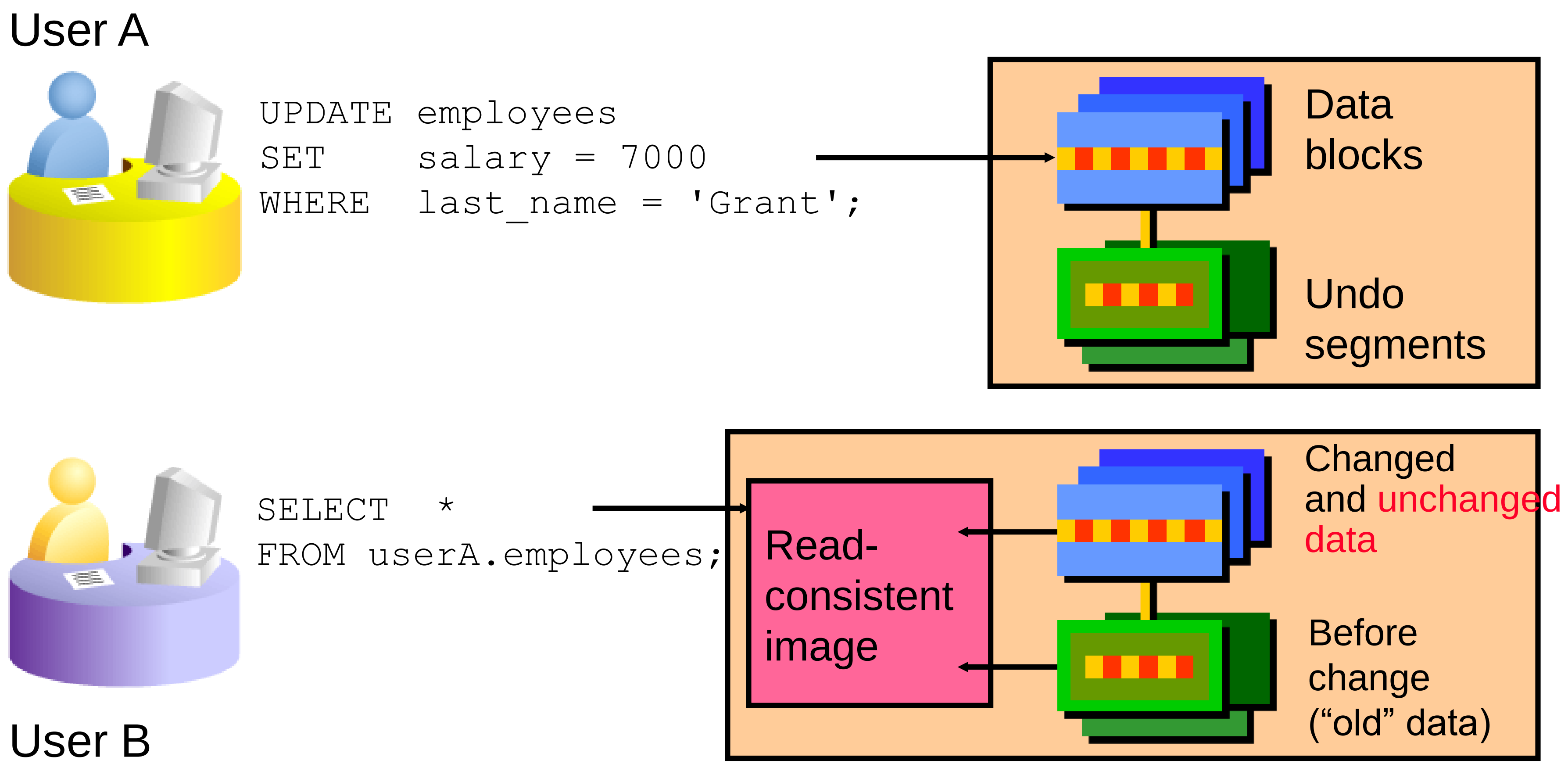
Statement-Level Rollback

- 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

Implementation of Read Consistency



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

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