Manipulating Data

Objectives

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

- Describe each DML statement
- Insert rows into a table
- Update rows in a table
- Delete rows from a table
- Control transactions

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

50	DEVELOPMENT	DETROIT

New row

DEPT

DEPTNO	DNAME	LOC
10	ACCOUNTING	NEW YORK
20	RESEARCH	DALLAS
30	SALES	CHICAGO
40	OPERATIONS	BOSTON

"…insert a new row into DEPT table…"

DEPT

DEPTNO	DNAME	LOC
10	ACCOUNTING	NEW YORK
20	RESEARCH	DALLAS
30	SALES	CHICAGO
40	OPERATIONS	BOSTON
50	DEVELOPMENT	DETROIT

The INSERT Statement

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

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

- Only one row is inserted at a time with this syntax.

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.

```
SQL> INSERT INTO     dept (deptno, dname, loc)
  2  VALUES           (50, 'DEVELOPMENT', 'DETROIT');
1 row created.
```

- Enclose character and date values within single quotation marks.

Inserting Rows with Null Values

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

```
SQL> INSERT INTO     dept (deptno, dname )
  2  VALUES          (60, 'MIS');
1 row created.
```

- Explicit method: Specify the NULL keyword.

```
SQL> INSERT INTO     dept
  2  VALUES          (70, 'FINANCE', NULL);
1 row created.
```

Inserting Special Values

The SYSDATE function records the current date and time.

```
SQL> INSERT INTO     emp (empno, ename, job,
  2                  mgr, hiredate, sal, comm,
  3                  deptno)
  4   VALUES         (7196, 'GREEN', 'SALESMAN',
  5                  7782, SYSDATE, 2000, NULL,
  6                  10);
1 row created.
```

Inserting Specific Date Values

- Add a new employee.

```
SQL> INSERT INTO emp
  2  VALUES        (2296,'AROMANO','SALESMAN',7782,
  3                 TO_DATE('FEB 3, 1997', 'MON DD, YYYY'),
  4                 1300, NULL, 10);
1 row created.
```

- Verify your addition.

```
EMPNO ENAME    JOB       MGR  HIREDATE   SAL  COMM DEPTNO
----- -------- --------- ---- --------- ---- ---- ------
 2296 AROMANO  SALESMAN  7782 03-FEB-97 1300          10
```

Inserting Values by Using Substitution Variables

Create an interactive script by using SQL*Plus substitution parameters.

```
SQL> INSERT INTO     dept (deptno, dname, loc)
  2  VALUES          (&department_id,
  3                  '&department_name', '&location');
```

```
Enter value for department_id: 80
Enter value for department_name: EDUCATION
Enter value for location: ATLANTA

1 row created.
```

Copying Rows from Another Table

- Write your INSERT statement with a subquery.

```
SQL> INSERT INTO managers(id, name, salary, hiredate)
  2                    SELECT empno, ename, sal, hiredate
  3                    FROM   emp
  4                    WHERE  job = 'MANAGER';
3 rows created.
```

- 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

EMP

EMPNO	ENAME	JOB	. . .	DEPTNO
7839	KING	PRESIDENT		10
7698	BLAKE	MANAGER		30
7782	CLARK	MANAGER		10
7566	JONES	MANAGER		20
. . .				

"…update a row in EMP table…"

EMP

EMPNO	ENAME	JOB	. . .	DEPTNO
7839	KING	PRESIDENT		10
7698	BLAKE	MANAGER		30
7782	CLARK	MANAGER		20
7566	JONES	MANAGER		20
. . .				

The UPDATE Statement

- 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.

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Updating Rows in a Table

- Specific row or rows are modified when you specify the WHERE clause.

```
SQL> UPDATE   emp
  2  SET      deptno = 20
  3  WHERE    empno = 7782;
1 row updated.
```

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

```
SQL> UPDATE   employee
  2  SET      deptno = 20;
14 rows updated.
```

Updating with Multiple-Column Subquery

Update employee 7698’s job and department to match that of employee 7499.

```
SQL> UPDATE   emp
  2  SET      (job, deptno) =
  3                            (SELECT job, deptno
  4                             FROM   emp
  5                             WHERE  empno = 7499)
  6  WHERE    empno = 7698;
1 row updated.
```

Updating Rows Based on Another Table

Use subqueries in UPDATE statements to update rows in a table based on values from another table.

```
SQL> UPDATE   employee
  2  SET      deptno =  (SELECT    deptno
  3                       FROM      emp
  4                       WHERE     empno = 7788)
  5  WHERE    job    =  (SELECT    job
  6                       FROM      emp
  7                       WHERE     empno = 7788);
2 rows updated.
```

Removing a Row from a Table

DEPT

DEPTNO	DNAME	LOC
10	ACCOUNTING	NEW YORK
20	RESEARCH	DALLAS
30	SALES	CHICAGO
40	OPERATIONS	BOSTON
50	DEVELOPMENT	DETROIT
60	MIS	
...		

"…delete a row from DEPT table…"

DEPT

DEPTNO	DNAME	LOC
10	ACCOUNTING	NEW YORK
20	RESEARCH	DALLAS
30	SALES	CHICAGO
40	OPERATIONS	BOSTON
60	MIS	
...		

The 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 when you specify the WHERE clause.

```
SQL> DELETE FROM    department
  2  WHERE          dname = 'DEVELOPMENT';
1 row deleted.
```

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

```
SQL> DELETE FROM    department;
4 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.

```
SQL> DELETE FROM     employee
  2  WHERE           deptno =
  3                         (SELECT   deptno
  4                          FROM     dept
  5                          WHERE    dname ='SALES');
6 rows deleted.
```

Database Transactions

Consist of one of the following statements:

- DML statements that make up one consistent change to the data
- One DDL statement
- One DCL statement

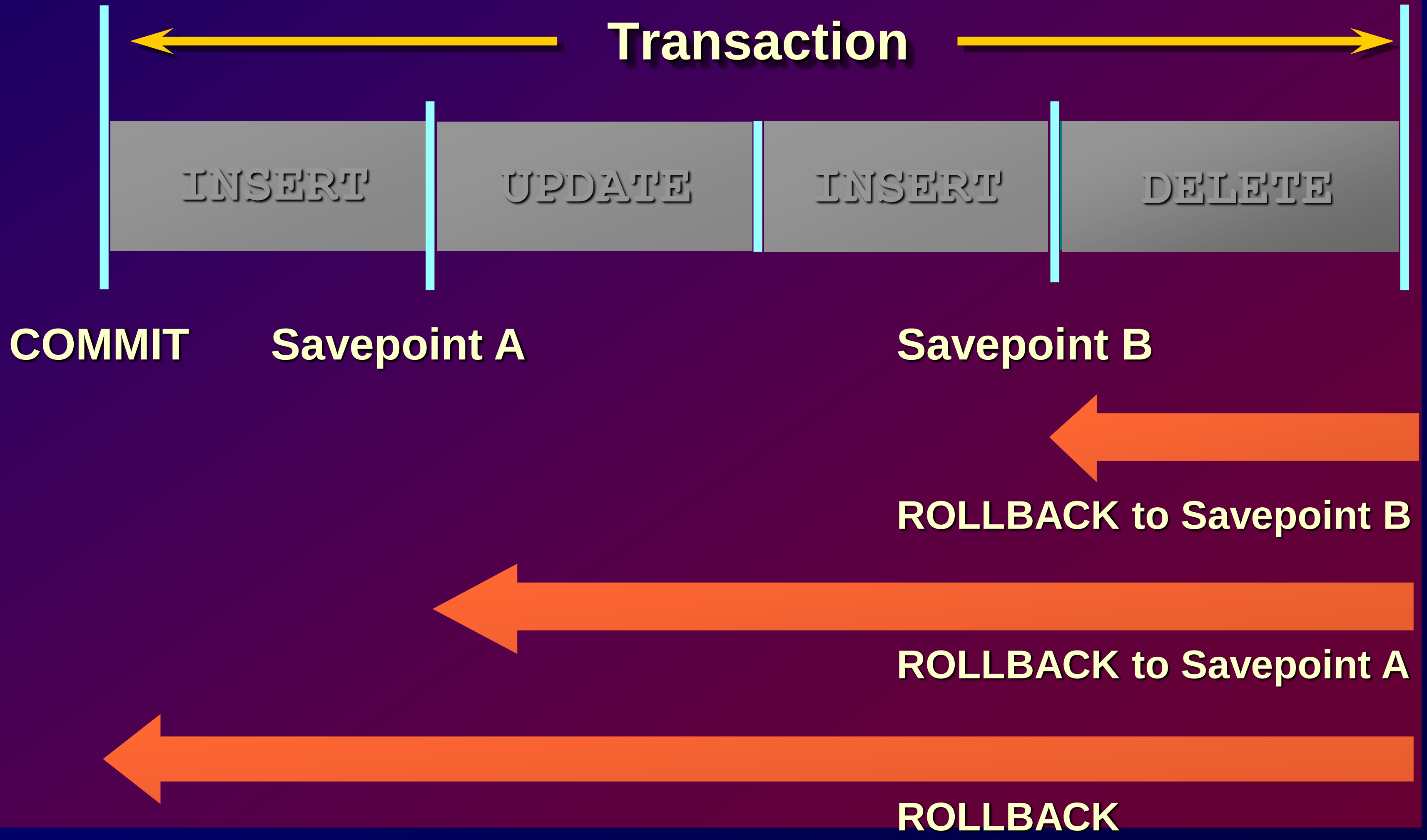
Database Transactions

- Begin when the first executable SQL statement is executed
- End with one of the following events:
  - COMMIT or ROLLBACK is issued
  - DDL or DCL statement executes (automatic commit)
  - User exits
  - System crashes

Advantages of COMMIT and ROLLBACK Statements

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

Controlling Transactions



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
- An automatic rollback occurs under an abnormal termination of 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 within 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.

```
SQL> UPDATE   emp
  2  SET      deptno = 10
  3  WHERE    empno = 7782;
1 row updated.
```

- Commit the changes.

```
SQL> 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.

```
SQL> DELETE FROM    employee;
14 rows deleted.
SQL> ROLLBACK;
Rollback complete.
```

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.

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

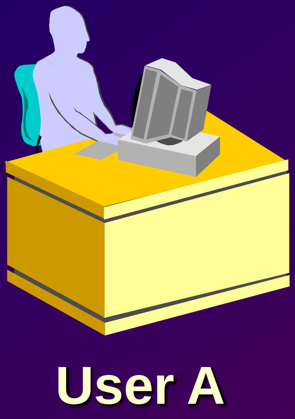
Statement-Level Rollback

- 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.

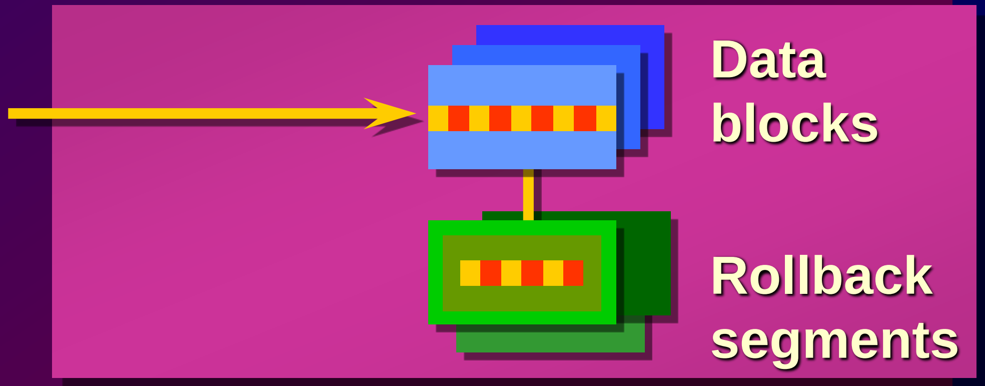
Read Consistency

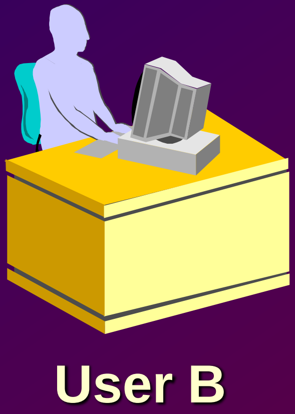
- Read consistency guarantees a consistent view of the data at all times.
- Changes made by one user do not conflict with changes made by another user.
- Read consistency ensures that on the same data:
  - Readers do not wait for writers
  - Writers do not wait for readers

Implementation of Read Consistency

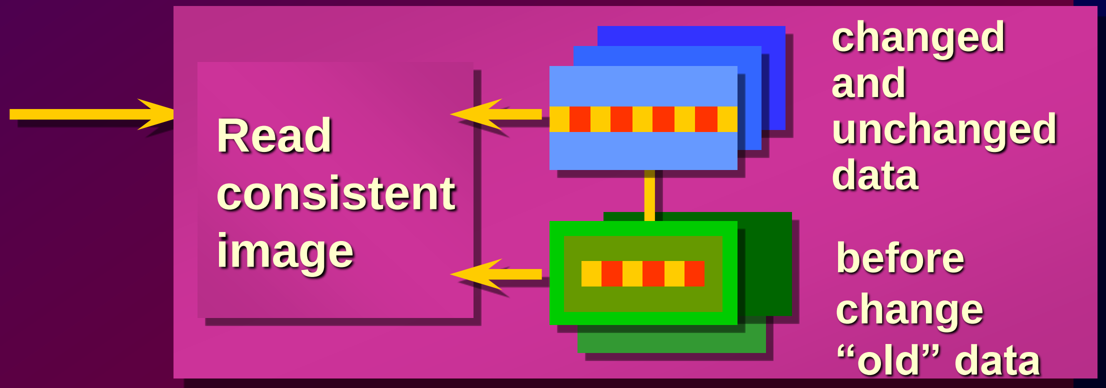


```
UPDATE  emp
SET     sal = 2000
WHERE   ename =
        'SCOTT';
```





```
SELECT   *
FROM     emp;
```



Summary

Statement	Description
INSERT	Adds a new row to the table
UPDATE	Modifies existing rows in the table
DELETE	Removes existing rows from the table
COMMIT	Makes all pending changes permanent
SAVEPOINT	Allows a rollback to the savepoint marker
ROLLBACK	Discards all pending data changes