6

Writing Explicit Cursors

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Objectives

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

- Distinguish between an implicit and an explicit cursor
- Discuss when and why to use an explicit cursor
- Use a PL/SQL record variable
- Write a cursor FOR loop

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About Cursors

Every SQL statement executed by the Oracle Server has an individual cursor associated with it:

- Implicit cursors: Declared for all DML and PL/SQL SELECT statements
- Explicit cursors: Declared and named by the programmer

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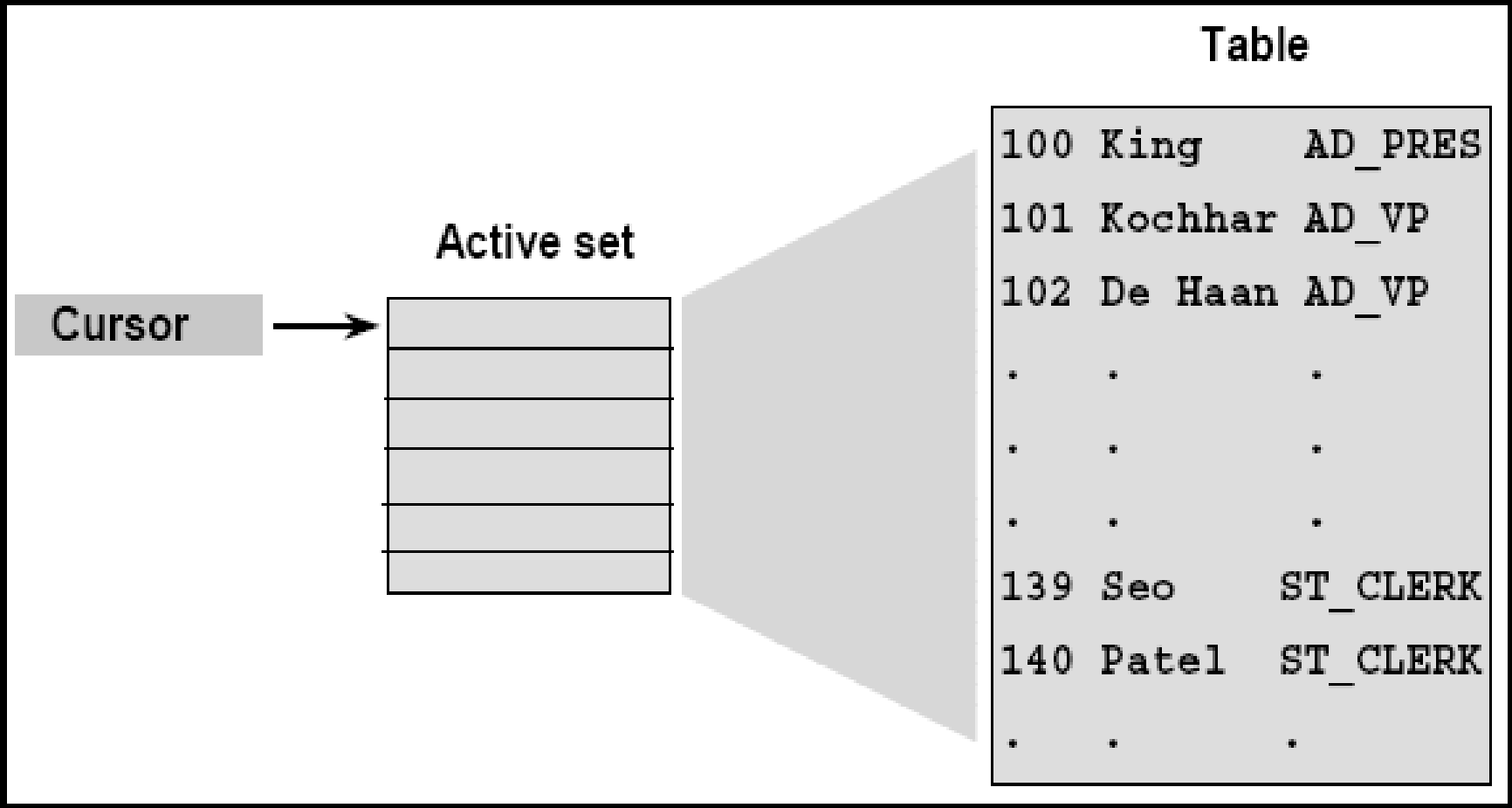
Explicit Cursor Functions



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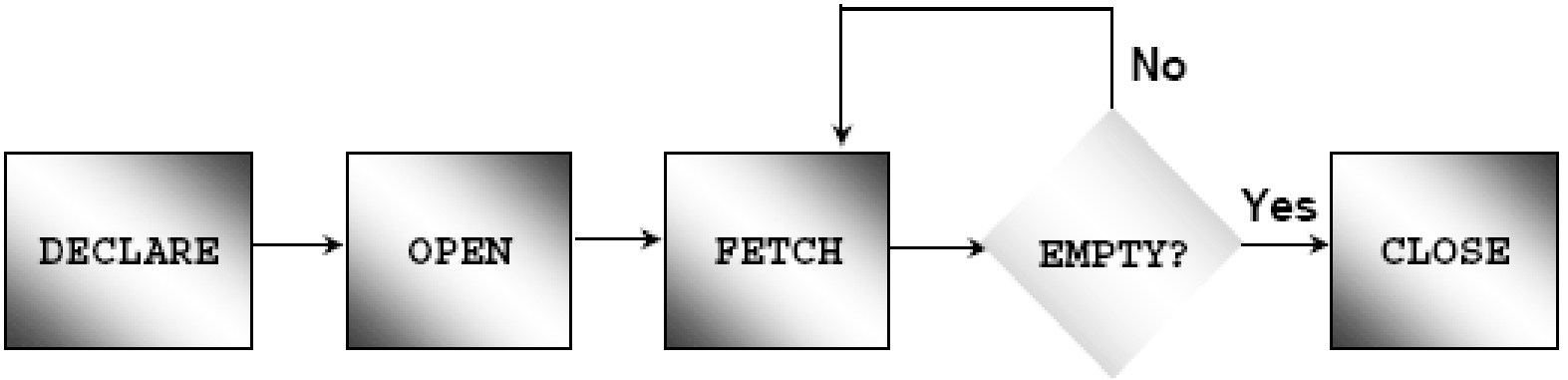
Controlling Explicit Cursors



- Create a named SQL area
- Identify the active set
- Load the current row into variables
- Test for existing rows
- Return to FETCH if rows are found
- Release the active set

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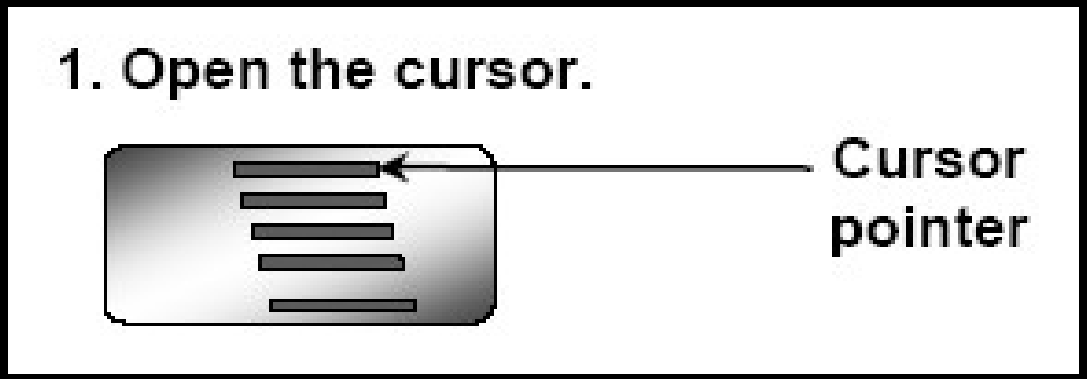
Controlling Explicit Cursors

1. Open the cursor
2. Fetch a row
3. Close the Cursor



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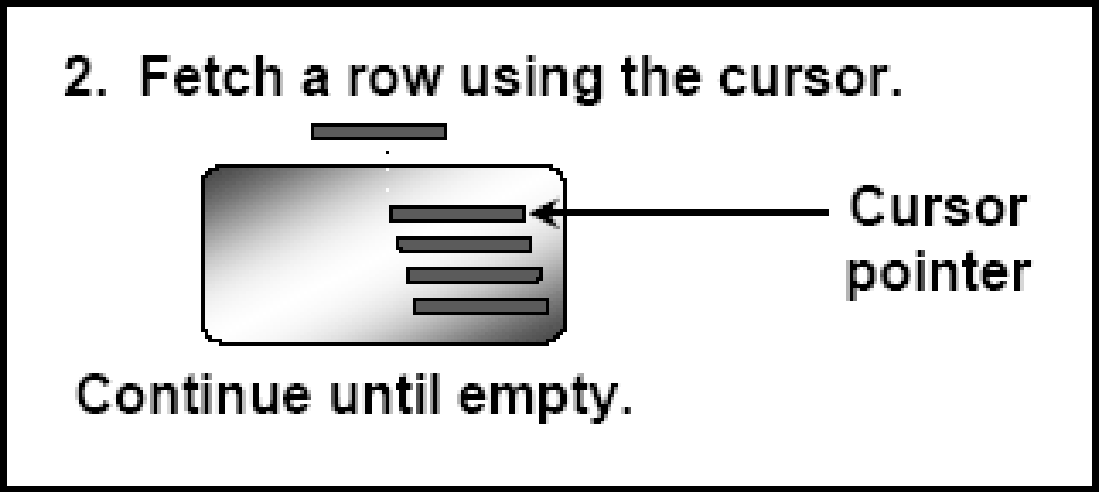

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Controlling Explicit Cursors

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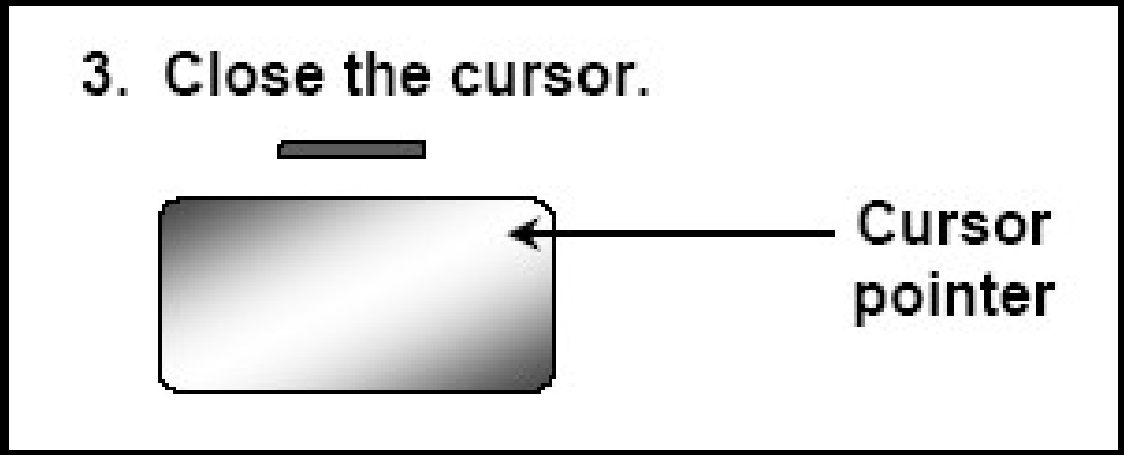

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Declaring the Cursor

Syntax:

```
CURSOR cursor_name IS
select_statement;
```

- Do not include the INTO clause in the cursor declaration.
- If processing rows in a specific sequence is required, use the ORDER BY clause in the query.

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Declaring the Cursor

Example:

```
DECLARE
    CURSOR emp_cursor IS
                        SELECT employee_id, last_name
                        FROM employees;
    CURSOR dept_cursor IS
                        SELECT *
                        FROM departments
                        WHERE location_id = 170;
BEGIN
...
```


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Opening the Cursor

Syntax:

```
OPEN cursor_name;
```

- Open the cursor to execute the query and identify the active set.
- If the query returns no rows, no exception is raised.
- Use cursor attributes to test the outcome after a fetch.

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Fetching Data from the Cursor

Syntax:

```
FETCH cursor_name INTO [variable1, variable2, ...]
                       | record_name];
```

- Retrieve the current row values into variables.
- Include the same number of variables.
- Match each variable to correspond to the columns positionally.
- Test to see whether the cursor contains rows.

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Fetching Data from the Cursor

Example:

```
LOOP
    FETCH emp_cursor INTO v_empno,v_ename;
    EXIT WHEN ...;
    ...
        -- Process the retrieved data
    ...
END LOOP;
```


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Closing the Cursor

Syntax:

```
CLOSE cursor_name;
```

- Close the cursor after completing the processing of the rows.
- Reopen the cursor, if required.
- Do not attempt to fetch data from a cursor after it has been closed.

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Explicit Cursor Attributes

Obtain status information about a cursor.

Attribute	Type	Description
%ISOPEN	Boolean	Evaluates to TRUE if the cursor is open
%NOTFOUND	Boolean	Evaluates to TRUE if the most recent fetch does not return a row
%FOUND	Boolean	Evaluates to TRUE if the most recent fetch returns a row; complement of %NOTFOUND
%ROWCOUNT	Number	Evaluates to the total number of rows returned so far

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The %ISOPEN Attribute

- Fetch rows only when the cursor is open.
- Use the %ISOPEN cursor attribute before performing a fetch to test whether the cursor is open.

Example:

```
IF  NOT  emp_cursor%ISOPEN  THEN
            OPEN emp_cursor;
END IF;
LOOP
            FETCH emp_cursor ...
```


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Controlling Multiple Fetches

- Process several rows from an explicit cursor using a loop.
- Fetch a row with each iteration.
- Use explicit cursor attributes to test the success of each fetch.

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The %NOTFOUND and %ROWCOUNT Attributes

- Use the %ROWCOUNT cursor attribute to retrieve an exact number of rows.
- Use the %NOTFOUND cursor attribute to determine when to exit the loop.

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Example

```
SET SERVEROUTPUT ON
DECLARE
   v_empno employees.employee_id%TYPE;
   v_ename employees.last_name%TYPE;
   CURSOR emp_cursor IS
            SELECT employee_id, last_name FROM employees;
    BEGIN
       OPEN emp_cursor;
       LOOP
            FETCH emp_cursor INTO v_empno, v_ename;
            EXIT WHEN emp_cursor%ROWCOUNT > 10 OR
                                  emp_cursor%NOTFOUND;
            DBMS_OUTPUT.PUT_LINE (TO_CHAR(v_empno)
                                        ||' '|| v_ename);
       END LOOP;
       CLOSE emp_cursor;
    END ;
```


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Cursors and Records

Process the rows of the active set by fetching values into a PL/SQL RECORD.

```
CREATE TABLE temp_list AS SELECT employee_id, last_name
                          FROM employees WHERE employee_id = 50;
DECLARE
  CURSOR emp_cursor IS SELECT employee_id, last_name  FROM employees;
  emp_record emp_cursor%ROWTYPE;
BEGIN
  OPEN emp_cursor;
  LOOP
     FETCH emp_cursor INTO emp_record;
     EXIT WHEN emp_cursor%NOTFOUND;
     INSERT INTO temp_list (empid, empname)
     VALUES (emp_record.employee_id, emp_record.last_name);
  END LOOP;
  COMMIT;
  CLOSE emp_cursor;
END;
```


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Cursor FOR Loops

Syntax:

```
FOR record_name IN cursor_name LOOP
        statement1;
        statement2;
        . . .
END LOOP;
```

- The cursor FOR loop is a shortcut to process explicit cursors.
- Implicit open, fetch, exit, and close occur.
- The record is implicitly declared.

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Cursor FOR Loops

Print a list of the employees who work for the sales department.

```
SET SERVEROUTPUT ON
DECLARE
    CURSOR emp_cursor IS  SELECT last_name, department_id
                          FROM employees;
BEGIN
     FOR emp_record IN emp_cursor LOOP
     --implicit open and implicit fetch occur
         IF emp_record.department_id = 80 THEN
             DBMS_OUTPUT.PUT_LINE ('Employee ' ||
                          emp_record.last_name || ' works in the Sales Dept. ');
         END IF;
      END LOOP; --implicit close and implicit loop exit
END ;
```


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Cursor FOR Loops Using Subqueries

No need to declare the cursor.
Example:

```
ET SERVEROUTPUT ON
EGIN
OR emp_record IN (SELECT last_name, department_id FROM employees) LOOP
implicit open and implicit fetch occur
  IF emp_record.department_id = 80 THEN
      DBMS_OUTPUT.PUT_LINE ('Employee ' || emp_record.last_name
                                        || ' works in the Sales Dept. ');
  END IF;
ND LOOP; --implicit close occurs
ND ;
```


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Summary

In this lesson you should have learned to:

- Distinguish cursor types:
  - Implicit cursors: used for all DML statements and single-row queries
  - Explicit cursors: used for queries of zero, one, or more rows
- Manipulate explicit cursors
- Evaluate the cursor status by using cursor attributes
- Use cursor FOR loops

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Practice 6 Overview

This practice covers the following topics:

- Declaring and using explicit cursors to query rows of a table
- Using a cursor FOR loop
- Applying cursor attributes to test the cursor status

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