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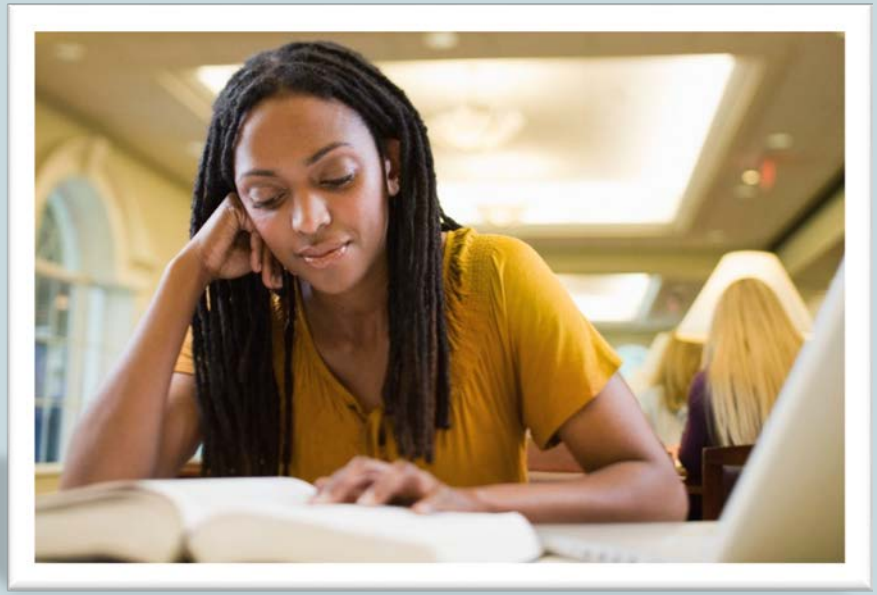
Database Programming with PL/SQL

3-3
Manipulating Data in PL/SQL



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Objectives

This lesson covers the following objectives:

- Construct and execute PL/SQL statements that manipulate data with DML statements
- Describe when to use implicit or explicit cursors in PL/SQL
- Create PL/SQL code to use SQL implicit cursor attributes to evaluate cursor activity

Purpose

- You have learned that you can include SELECT statements that return a single row in a PL/SQL block.
- The data retrieved by the SELECT statement must be held in variables using the INTO clause.
- In this lesson, you learn how to include data manipulation language (DML) statements, such as INSERT, UPDATE, DELETE, and MERGE in PL/SQL blocks.
- DML statements will help you perform a task on more than a single row.

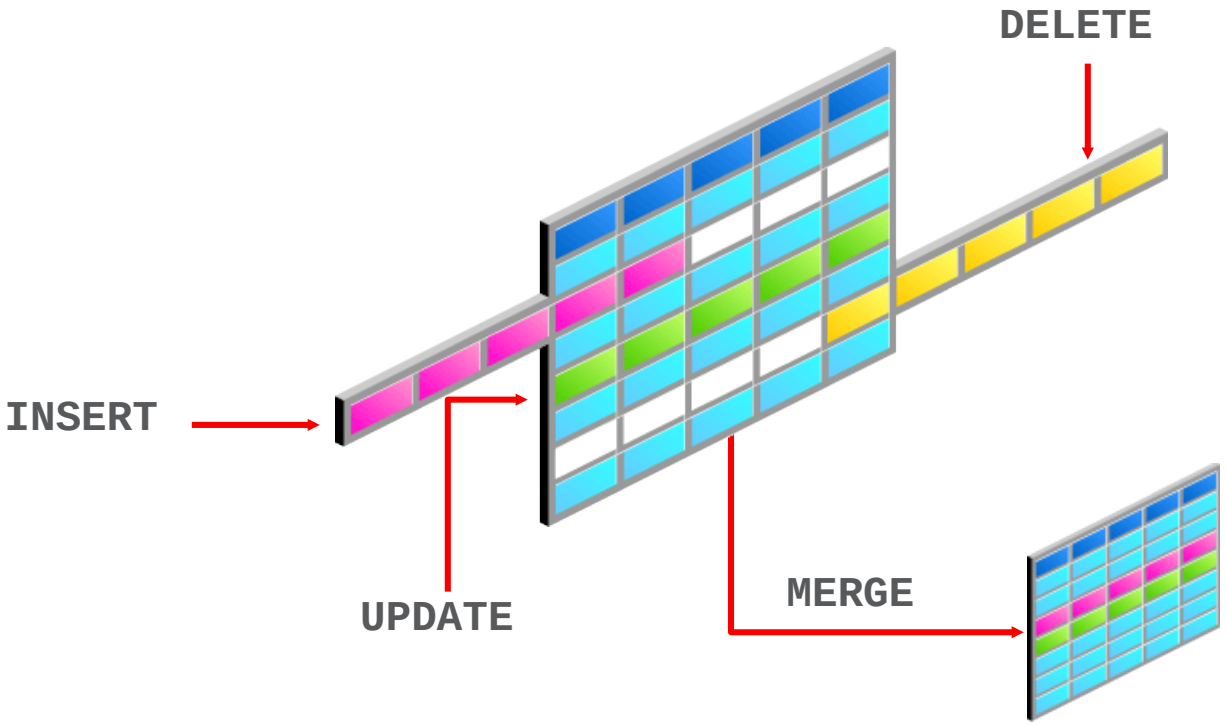
Create Copy of Original Table

- It is very important that you do NOT modify the existing tables (such as EMPLOYEES and DEPARTMENTS), because they will be needed later in the course.
- The examples in this lesson use the COPY_EMP table.
- If you haven't already created the COPY_EMP table, do so now by executing this SQL statement:

```
CREATE TABLE copy_emp
    AS SELECT *
    FROM employees;
```

Manipulating Data Using PL/SQL

- Make changes to data by using DML commands within your PLSQL block:
- INSERT
- UPDATE
- DELETE
- MERGE



Manipulating Data Using PL/SQL

- You manipulate data in the database by using the DML commands.
- You can issue the DML commands— INSERT, UPDATE, DELETE, and MERGE —without restriction in PL/SQL.
  - The INSERT statement adds new rows to the table.
  - The UPDATE statement modifies existing rows in the table.
  - The DELETE statement removes rows from the table.

Manipulating Data Using PL/SQL

- The MERGE statement selects rows from one table to update and/or insert into another table.
- The decision whether to update or insert into the target table is based on a condition in the ON clause.
  - Note: MERGE is a deterministic statement—that is, you cannot update the same row of the target table multiple times in the same MERGE statement.
  - You must have INSERT and UPDATE object privileges in the target table and the SELECT privilege in the source table.

Inserting Data

- The INSERT statement adds new row(s) to a table.
- Example: Add new employee information to the COPY_EMP table.

```
BEGIN
  INSERT INTO copy_emp
     (employee_id, first_name, last_name, email,
      hire_date, job_id, salary)
   VALUES (99, 'Ruth', 'Cores','RCORES', SYSDATE, 'AD_ASST', 4000);
END;
```

- One new row is added to the COPY_EMP table.

Updating Data

- The UPDATE statement modifies existing row(s) in a table.
- Example: Increase the salary of all employees who are stock clerks.

```
DECLARE
  v_sal_increase employees.salary%TYPE := 800;
BEGIN
  UPDATE copy_emp
    SET salary = salary + v_sal_increase
    WHERE job_id = 'ST_CLERK';
END;
```

It is recommended that the UPDATE statement be on a line of its own.

Deleting Data

- The DELETE statement removes row(s) from a table.
- Example: Delete rows that belong to department 10 from the COPY_EMP table.

```
DECLARE
  v_deptno   employees.department_id%TYPE := 10;
BEGIN
  DELETE FROM copy_emp
    WHERE  department_id = v_deptno;
END;
```

Merging Rows

- The MERGE statement selects rows from one table to update and/or insert into another table.
- Insert or update rows in the COPY_EMP table to match the employees table.

```
BEGIN
  MERGE INTO copy_emp c USING employees e
     ON (e.employee_id = c.employee_id)
   WHEN MATCHED THEN
     UPDATE SET
       c.first_name     = e.first_name,
       c.last_name      = e.last_name,
       c.email          = e.email,
       . . .
   WHEN NOT MATCHED THEN
     INSERT VALUES(e.employee_id, e.first_name,...e.department_id);
END;
```

Getting Information From a Cursor

- Look again at the DELETE statement in this PL/SQL block.

```
DECLARE
  v_deptno   employees.department_id%TYPE := 10;
BEGIN
  DELETE FROM copy_emp
    WHERE department_id = v_deptno;
END;
```

- It would be useful to know how many COPY_EMP rows were deleted by this statement.
- To obtain this information, we need to understand cursors.

What is a Cursor?

- Every time an SQL statement is about to be executed, the Oracle server allocates a private memory area to store the SQL statement and the data that it uses.
- This memory area is called an implicit cursor.
- Because this memory area is automatically managed by the Oracle server, you have no direct control over it.
- However, you can use predefined PL/SQL variables, called implicit cursor attributes, to find out how many rows were processed by the SQL statement.

Implicit and Explicit Cursors

- There are two types of cursors:
- Implicit cursors: Defined automatically by Oracle for all SQL data manipulation statements, and for queries that return only one row.
  - An implicit cursor is always automatically named “SQL.”
- Explicit cursors: Defined by the PL/SQL programmer for queries that return more than one row.

Cursor Attributes for Implicit Cursors

- Cursor attributes are automatically declared variables that allow you to evaluate what happened when a cursor was last used.
- Attributes for implicit cursors are prefaced with “SQL.”
- Use these attributes in PL/SQL statements, but not in SQL statements.
- Using cursor attributes, you can test the outcome of your SQL statements.

Cursor Attributes for Implicit Cursors

Attribute	Description
SQL%FOUND	Boolean attribute that evaluates to TRUE if the most recent SQL statement returned at least one row.
SQL%NOTFOUND	Boolean attribute that evaluates to TRUE if the most recent SQL statement did not return even one row.
SQL%ROWCOUNT	An integer value that represents the number of rows affected by the most recent SQL statement.

Using Implicit Cursor Attributes: Example 1

- Delete rows that have the specified employee ID from the COPY_EMP table.
- Print the number of rows deleted.

```
DECLARE
  v_deptno copy_emp.department_id%TYPE := 50;
BEGIN
  DELETE FROM copy_emp
    WHERE department_id = v_deptno;
  DBMS_OUTPUT.PUT_LINE(SQL%ROWCOUNT || ' rows deleted.');
END;
```

Using Implicit Cursor Attributes: Example 2

- Update several rows in the COPY_EMP table.
- Print the number of rows updated.

```
DECLARE
  v_sal_increase   employees.salary%TYPE := 800;
BEGIN
  UPDATE copy_emp
    SET salary = salary + v_sal_increase
    WHERE job_id = 'ST_CLERK';
  DBMS_OUTPUT.PUT_LINE(SQL%ROWCOUNT || ' rows updated.');
END;
```

Using Implicit Cursor Attributes: Good Practice Guideline

- Look at this code which creates a table and then executes a PL/SQL block.
- Determine what value is inserted into RESULTS.

```
CREATE TABLE results (num_rows NUMBER(4));

BEGIN
  UPDATE copy_emp
    SET salary = salary + 100
    WHERE job_id = 'ST_CLERK';
  INSERT INTO results (num_rows)
    VALUES (SQL%ROWCOUNT);
END;
```

Using Implicit Cursor Attributes: Good Practice Guideline

- To INSERT the value in the RESULTS table - we must save the SQL%ROWCOUNT value in a declared variable.
- The value is displayed using PUT_LINE.

```
DECLARE
 v_rowcount    INTEGER;
BEGIN
UPDATE  copy_emp
 SET  salary = salary + 100
 WHERE  job_id = 'ST_CLERK';
 DBMS_OUTPUT.PUT_LINE(SQL%ROWCOUNT || ' rows in COPY_EMPupdated.');
 v_rowcount := SQL%ROWCOUNT;
 INSERT INTO results (num_rows)
 VALUES (v_rowcount);
 DBMS_OUTPUT.PUT_LINE(SQL%ROWCOUNT || ' rows in RESULTS updated.');
END;
```

Terminology

Key terms used in this lesson included:

- INSERT
- UPDATE
- DELETE
- MERGE
- Explicit cursors
- Implicit cursors

Summary

In this lesson, you should have learned how to:

- Construct and execute PL/SQL statements that manipulate data with DML statements
- Describe when to use implicit or explicit cursors in PL/SQL
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