Interacting with the Oracle Server

Objectives

- After completing this lesson, you should be able to do the following:
  - Determine which SQL statements can be directly included in a PL/SQL executable block
  - Manipulate data with DML statements in PL/SQL
  - Use transaction control statements in PL/SQL
  - Make use of the `INTO` clause to hold the values returned by a SQL statement
  - Differentiate between implicit cursors and explicit cursors
  - Use SQL cursor attributes

SQL Statements in PL/SQL

- Retrieve a row from the database by using the `SELECT` command.
- Make changes to rows in the database by using DML commands.
- Control a transaction with the `COMMIT`, `ROLLBACK`, or `SAVEPOINT` command.

SELECT Statements in PL/SQL

- Retrieve data from the database with a SELECT statement.
- Syntax:

```
SELECT   select_list
INTO     {variable_name[, variable_name]...
         | record_name}
FROM     table
[WHERE   condition];
```

SELECT STATEMENTS IN PL/SQL

- The `INTO` clause is required.
- Queries must return only one row.

- Example

```
SET SERVEROUTPUT ON
DECLARE
 fname VARCHAR2(25);
BEGIN
 SELECT first_name INTO fname
 FROM employees WHERE employee_id=200;
 DBMS_OUTPUT.PUT_LINE(' First Name is : '||fname);
END;
/
```

Retrieving Data in PL/SQL

- Retrieve the `hire_date` and the `salary` for the specified employee.
- Example

```
DECLARE
 emp_hiredate   employees.hire_date%TYPE;
 emp_salary     employees.salary%TYPE;
BEGIN
  SELECT   hire_date, salary
  INTO     emp_hiredate, emp_salary
  FROM     employees
  WHERE    employee_id = 100;
END;
/
```

Retrieving Data in PL/SQL

- Return the sum of the salaries for all the employees in the specified department.
- Example

```
SET SERVEROUTPUT ON
DECLARE
   sum_sal   NUMBER(10,2);
   deptno    NUMBER NOT NULL := 60;
BEGIN
   SELECT  SUM(salary)  -- group function
   INTO sum_sal FROM employees
   WHERE  department_id = deptno;
   DBMS_OUTPUT.PUT_LINE ('The sum of salary is '
   || sum_sal);
END;
/
```

Naming Conventions

```
DECLARE
  hire_date        employees.hire_date%TYPE;
  sysdate          hire_date%TYPE;
  employee_id      employees.employee_id%TYPE := 176;
BEGIN
  SELECT   hire_date, sysdate
  INTO     hire_date, sysdate
  FROM     employees
  WHERE    employee_id = employee_id;
END;
/
```

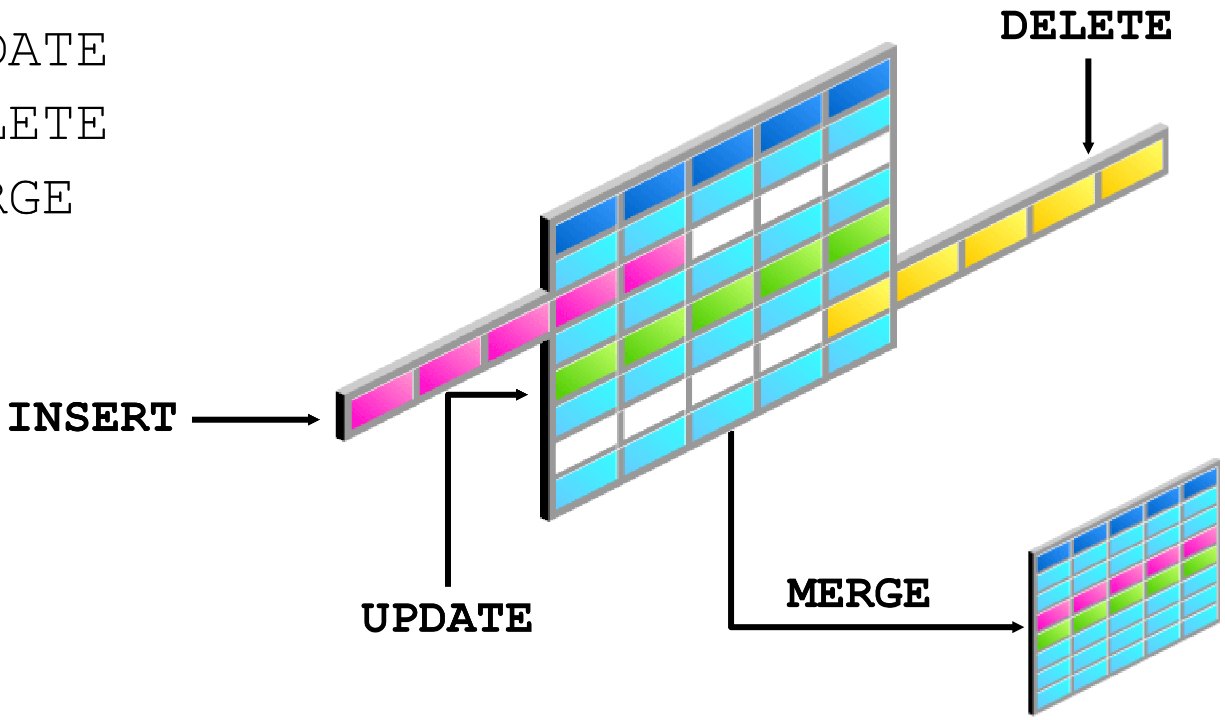
```
DECLARE
*
ERROR at line 1:
ORA-01422: exact fetch returns more than requested number of rows
ORA-06512: at line 6
```

Naming Conventions

- Use a naming convention to avoid ambiguity in the `WHERE` clause.
- Avoid using database column names as identifiers.
- Syntax errors can arise because PL/SQL checks the database first for a column in the table.
- The names of local variables and formal parameters take precedence over the names of database *tables*.
- The names of database table *columns* take precedence over the names of local variables.

MANIPULATING DATA USING PL/SQL

- Make changes to database tables by using DML commands:
  - `INSERT`
  - `UPDATE`
  - `DELETE`
  - `MERGE`



INSERTING DATA

- Add new employee information to the EMPLOYEES table.
- Example

```
BEGIN
 INSERT INTO employees
  (employee_id, first_name, last_name, email,
   hire_date, job_id, salary)
   VALUES(employees_seq.NEXTVAL, 'Ruth', 'Cores',
   'RCORES',sysdate, 'AD_ASST', 4000);
END;
/
```

UPDATING DATA

- Increase the salary of all employees who are stock clerks.
- Example

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

Deleting Data

- Delete rows that belong to department 10 from the `employees` table.
- Example

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

Merging Rows

- Insert or update rows in the `copy_emp` table to match the `employees` table.

```
DECLARE
      empno employees.employee_id%TYPE := 100;
BEGIN
MERGE INTO copy_emp c
     USING employees e
     ON (e.employee_id = c.empno)
   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.last_name,
          . . .,e.department_id);
END;
/
```

SQL Cursor

- A cursor is a pointer to the private memory area allocated by the Oracle server.
- There are two types of cursors:
  - Implicit: Created and managed internally by the Oracle server to process SQL statements
  - Explicit: Explicitly declared by the programmer

SQL Cursor Attributes for Implicit Cursors

- Using SQL cursor attributes, you can test the outcome of your SQL statements.

`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**

SQL Cursor Attributes for Implicit Cursors

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

```
VARIABLE rows_deleted VARCHAR2(30)
DECLARE
  empno employees.employee_id%TYPE := 176;
BEGIN
  DELETE FROM  employees
  WHERE employee_id = empno;
  :rows_deleted := (SQL%ROWCOUNT ||
                             ' row deleted.');
END;
/
PRINT rows_deleted
```

SUMMARY

- In this lesson, you should have learned how to:
  - Embed DML statements, transaction control statements, and DDL statements in PL/SQL
  - Use the `INTO` clause, which is mandatory for all `SELECT` statements in PL/SQL
  - Differentiate between implicit cursors and explicit cursors
  - Use SQL cursor attributes to determine the outcome of SQL statements

Practice 4: Overview

- This practice covers the following topics:
  - Selecting data from a table
  - Inserting data into a table
  - Updating data in a table
  - Deleting a record from a table