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Database Programming with PL/SQL

1-1
Introduction to PL/SQL

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Objectives

This lesson covers the following objectives:

- Describe PL/SQL
- Differentiate between SQL and PL/SQL
- Explain the need for PL/SQL

Purpose

- PL/SQL is Oracle Corporation's procedural programming language for relational databases.
- To describe PL/SQL, you learn its characteristics and identify the differences between PL/SQL and SQL.
- Identifying limitations of SQL and how PL/SQL addresses those limitations will help you to understand why PL/SQL is needed.

PL/SQL Description

- Procedural Language extension to SQL.
- A third-generation programming language (3GL).
- An Oracle proprietary programming language.
- Combines program logic and control flow with SQL.

IF...THEN..
ELSE
...
END IF;
LOOP...
END LOOP;
SQL
PL/SQL

SQL Description

- A nonprocedural language.
  - Also known as a "declarative language," allows programmer to focus on input and output rather than the program steps.
- A fourth-generation programming language (4GL).
- Primary language used to access and modify data in relational databases.
- Standardized by the American National Standards Institute (ANSI).
- Vendors such as Oracle typically include some proprietary SQL features in their database environments.

SQL Statement

- The SQL statement shown is simple and straightforward.
- However, if you need to modify a data item in a conditional manner, you come across a limitation of SQL.

```
SELECT employee_id, job_id, hire_date
    FROM employees;
```

- For example, how would you write an SQL statement to update the job_id data with a new value determined by the current job_id and the hire_date?

Limitations of SQL

- Assume the company decides to promote all sales representatives, marketing representatives, and stock clerks employed for at least ten years to senior representatives and clerks.
- If the current date is 05-Feb-2015, sales representatives 174, 176, and 178 qualify for the promotion.

EMPLOYEE_ID	JOB_ID	HIRE_DATE	“NEW” JOB_ID
174	SA_REP	11-May-1996	SR_SA_REP
176	SA_REP	24-Mar-1998	SR_SA_REP
178	SA_REP	24-May-1999	SR_SA_REP
240	SA_REP	02-Oct-2005	
242	SA_REP	09-Dec-2007	

Limitations of SQL

If the current date is 05-FEB-2015, stock clerks 141, 142, 143, and 144 also qualify for the promotion.

EMPLOYEE_ID	JOB_ID	HIRE_DATE	“NEW” JOB_ID
141	ST_CLERK	17-Oct-1995	SR_ST_CLERK
142	ST_CLERK	29-Jan-1997	SR_ST_CLERK
143	ST_CLERK	15-Mar-1998	SR_ST_CLERK
144	ST_CLERK	09-Jul-1998	SR_ST_CLERK
244	ST_CLERK	07-Sep-2009	

Limitations of SQL

- One solution to updating the job_id data is shown.
- How many SQL statements do you need to write for sales representatives, marketing representatives, and stock clerks?
- What if there are other job_ids to update?

```
UPDATE employees
     SET job_id = 'SR_SA_REP'
     WHERE job_id = 'SA_REP' AND
          hire_date <= '05-Feb-2005'
```

```
UPDATE employees
     SET job_id = 'SR_ST_CLERK'
     WHERE job_id = 'ST_CLERK' AND
          hire_date <= '05-Feb-2005'
```

and so on…

Limitations of SQL

- You would need to write a separate SQL statement for each job_id that needs to be updated.
- Depending on the number of job_ids, this could be a tedious task.
- It would be easier to write a single statement to accomplish this task.
- The statement would require logic, otherwise known as procedural logic.
- PL/SQL extends SQL with procedural logic and makes it possible to write one statement to accomplish this task.

PL/SQL Extends SQL with Procedural Logic

Using PL/SQL, you can write one statement to promote the sales representatives, marketing representatives, and stock clerks.

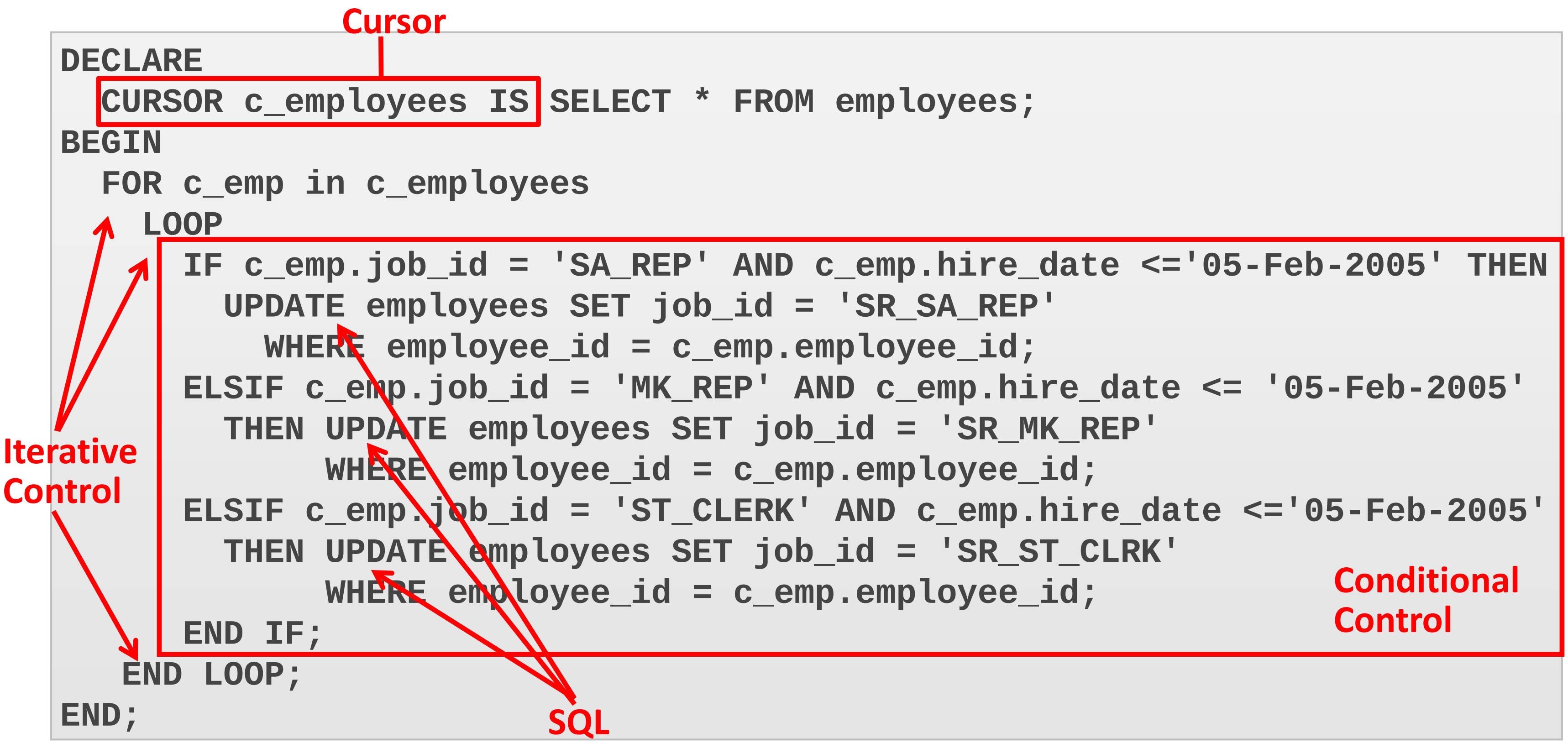
```
DECLARE
   CURSOR c_employees IS SELECT * FROM employees;
BEGIN
   FOR c_emp in c_employees
   LOOP
     IF c_emp.job_id = 'SA_REP' AND c_emp.hire_date <= '05-Feb-2005' THEN
       UPDATE employees SET job_id = 'SR_SA_REP' WHERE employee_id =
c_emp.employee_id;
       ELSIF c_emp.job_id = 'MK_REP' AND c_emp.hire_date <= '05-Feb-2005' THEN
         UPDATE employees SET job_id = 'SR_MK_REP' WHERE employee_id =
c_emp.employee_id;
       ELSIF c_emp.job_id = 'ST_CLERK' AND c_emp.hire_date <= '05-Feb-2005' THEN
         UPDATE employees SET job_id = 'SR_ST_CLRK' WHERE employee_id =
c_emp.employee_id;
     END IF;
   END LOOP;
END;
```

Procedural Constructs

- You use PL/SQL to write the procedural code and embed SQL statements within the PL/SQL code.
- The procedural code includes variables, constants, cursors, conditional logic, and iteration.
- PL/SQL code blocks can be saved and named, then executed whenever needed.

Procedural Constructs Highlighted

Several PL/SQL constructs are highlighted below.



```
DECLARE
  CURSOR c_employees IS SELECT * FROM employees;
BEGIN
  FOR c_emp in c_employees
    LOOP
      IF c_emp.job_id = 'SA_REP' AND c_emp.hire_date <='05-Feb-2005' THEN
        UPDATE employees SET job_id = 'SR_SA_REP'
          WHERE employee_id = c_emp.employee_id;
      ELSIF c_emp.job_id = 'MK_REP' AND c_emp.hire_date <= '05-Feb-2005'
        THEN UPDATE employees SET job_id = 'SR_MK_REP'
             WHERE employee_id = c_emp.employee_id;
      ELSIF c_emp.job_id = 'ST_CLERK' AND c_emp.hire_date <='05-Feb-2005'
        THEN UPDATE employees SET job_id = 'SR_ST_CLRK'
             WHERE employee_id = c_emp.employee_id;
      END IF;
   END LOOP;
END;
```

Characteristics of PL/SQL

PL/SQL:

- Is a highly structured, readable, and accessible language.
- Is a standard and portable language for Oracle development.
- Is an embedded language and it works with SQL.
- Is a high-performance, highly integrated database language.
- Is based on the Ada Programming Language and has many similarities in syntax.

Terminology

Key terms used in this lesson included:

- PL/SQL
- Procedural Constructs

Summary

In this lesson, you should have learned how to:

- Describe PL/SQL
- Differentiate between SQL and PL/SQL
- Explain the need for PL/SQL

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