6

Handling Exceptions

Objectives

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

- Define PL/SQL exceptions
- Recognize unhandled exceptions
- List and use different types of PL/SQL exception handlers
- Trap unanticipated errors
- Describe the effect of exception propagation in nested blocks
- Customize PL/SQL exception messages

Example of an Exception

```
SET SERVEROUTPUT ON
DECLARE
  lname VARCHAR2(15);
BEGIN
  SELECT last_name INTO lname FROM employees WHERE
  first_name='John';
  DBMS_OUTPUT.PUT_LINE ('John''s last name is : '
  ||lname);
END;
/
```

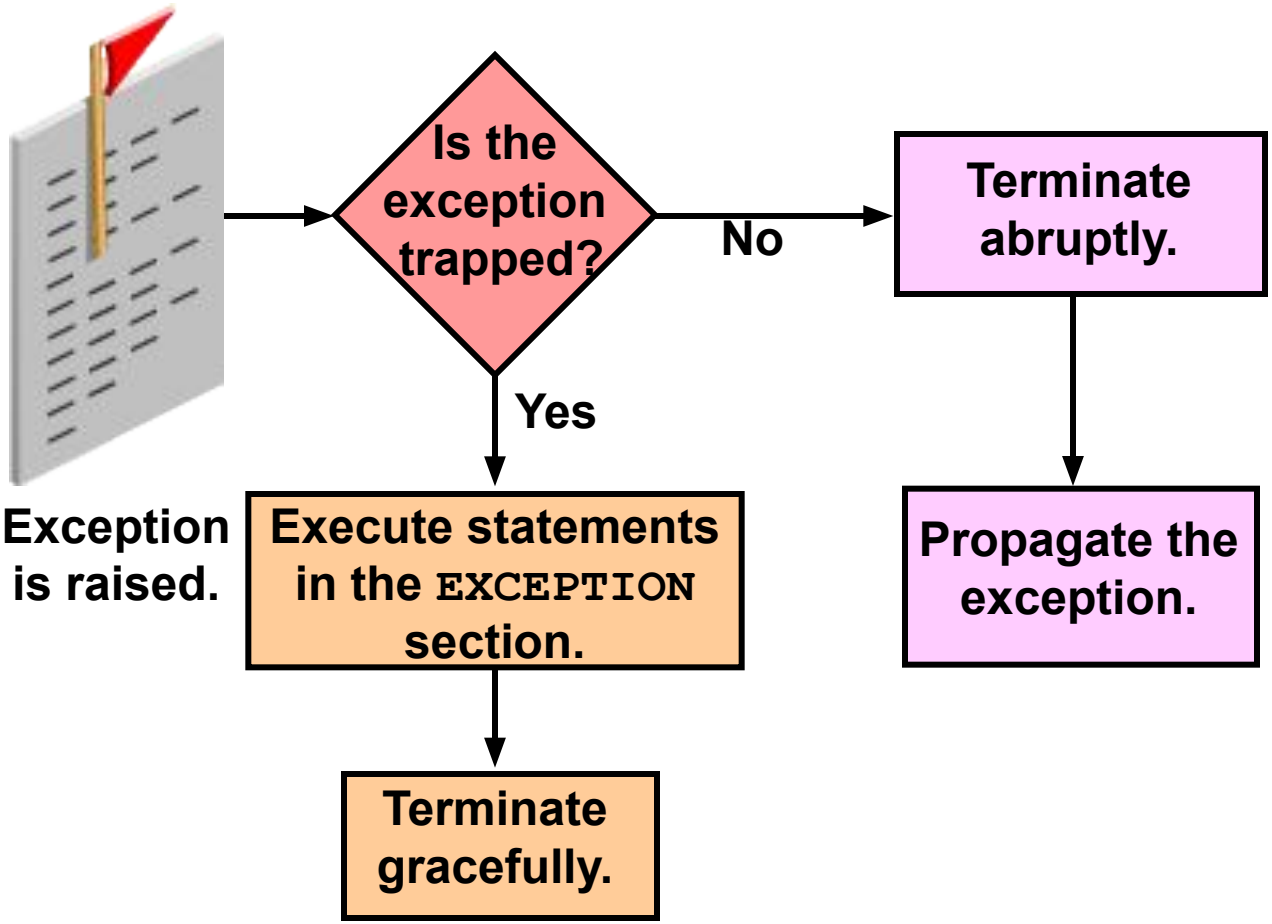
Example of an Exception

```
SET SERVEROUTPUT ON
DECLARE
  lname VARCHAR2(15);
BEGIN
  SELECT last_name INTO lname FROM employees WHERE
  first_name='John';
  DBMS_OUTPUT.PUT_LINE ('John''s last name is : '
  ||lname);
EXCEPTION
  WHEN TOO_MANY_ROWS THEN
  DBMS_OUTPUT.PUT_LINE (' Your select statement
  retrieved multiple rows. Consider using a
  cursor.');
END;
/
```

Handling Exceptions with PL/SQL

- An exception is a PL/SQL error that is raised during program execution.
- An exception can be raised:
  - Implicitly by the Oracle server
  - Explicitly by the program
- An exception can be handled:
  - By trapping it with a handler
  - By propagating it to the calling environment

Handling Exceptions



Exception Types

- Predefined Oracle server
- Non-predefined Oracle server

} Implicitly raised

- User-defined

Explicitly raised

Trapping Exceptions

Syntax:

```
EXCEPTION
  WHEN exception1 [OR exception2 . . .] THEN
    statement1;
    statement2;
    . . .
  [WHEN exception3 [OR exception4 . . .] THEN
    statement1;
    statement2;
    . . .]
  [WHEN OTHERS THEN
    statement1;
    statement2;
    . . .]
```

Guidelines for Trapping Exceptions

- The `EXCEPTION` keyword starts the exception handling section.
- Several exception handlers are allowed.
- Only one handler is processed before leaving the block.
- `WHEN OTHERS` is the last clause.

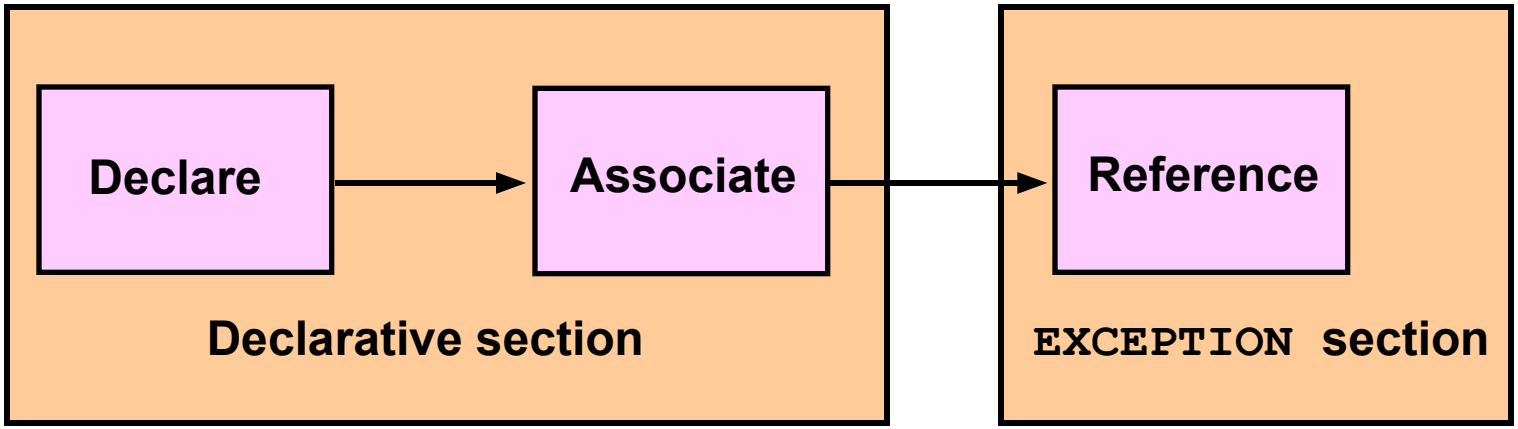
Trapping Predefined Oracle Server Errors

- Reference the predefined name in the exception-handling routine.
- Sample predefined exceptions:
  - `NO_DATA_FOUND`
  - `TOO_MANY_ROWS`
  - `INVALID_CURSOR`
  - `ZERO_DIVIDE`
  - `DUP_VAL_ON_INDEX`

Trapping Predefined Oracle Server Errors

```
SET SERVEROUTPUT ON
DECLARE
  lname VARCHAR2(15);
BEGIN
  SELECT last_name INTO lname FROM employees WHERE
  first_name='John';
  DBMS_OUTPUT.PUT_LINE ('John''s last name is : '
  ||lname);
EXCEPTION
  WHEN TOO_MANY_ROWS THEN
  DBMS_OUTPUT.PUT_LINE (' Your select statement
  retrieved multiple rows. Consider using a
  cursor.');
END;
/
```

Trapping Non-Predefined Oracle Server Errors



Name the exception.

Use `PRAGMA EXCEPTION_INIT`.

Handle the raised exception.

Non-Predefined Error

To trap Oracle server error number –01400 ("cannot insert NULL"):

```
SET SERVEROUTPUT ON
DECLARE
 insert_excep EXCEPTION;
 PRAGMA EXCEPTION_INIT
 (insert_excep, -01400);
BEGIN
 INSERT INTO departments
 (department_id, department_name) VALUES (280, NULL);
EXCEPTION
 WHEN insert_excep THEN
 DBMS_OUTPUT.PUT_LINE('INSERT OPERATION FAILED');
 DBMS_OUTPUT.PUT_LINE(SQLERRM);
END;
/
```

Functions for Trapping Exceptions

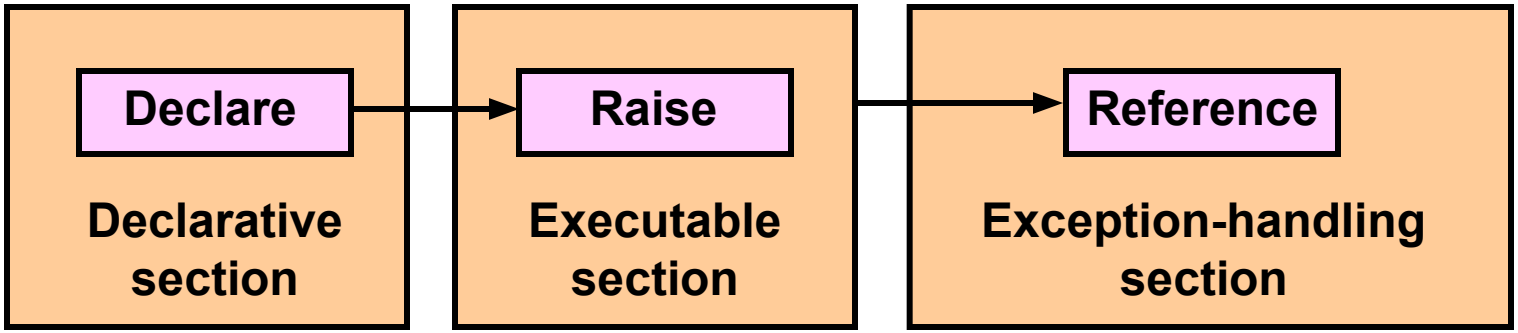
- `SQLCODE`: Returns the numeric value for the error code
- `SQLERRM`: Returns the message associated with the error number

Functions for Trapping Exceptions

Example

```
DECLARE
  error_code      NUMBER;
  error_message   VARCHAR2(255);
BEGIN
...
EXCEPTION
...
  WHEN OTHERS THEN
    ROLLBACK;
    error_code := SQLCODE ;
    error_message := SQLERRM ;
   INSERT INTO errors (e_user, e_date, error_code,
   error_message) VALUES(USER,SYSDATE,error_code,
   error_message);
END;
/
```

Trapping User-Defined Exceptions



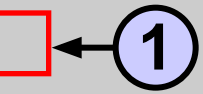
Name the exception.

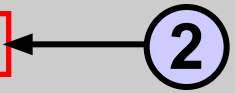
Explicitly raise the exception by using the `RAISE` statement.

Handle the raised exception.

Trapping User-Defined Exceptions

```
...
ACCEPT deptno PROMPT 'Please enter the department number:'
ACCEPT name   PROMPT 'Please enter the department name:'
DECLARE
  invalid_department EXCEPTION;
  name VARCHAR2(20):='&name';
  deptno NUMBER :=&deptno;
BEGIN
  UPDATE  departments
  SET     department_name = name
  WHERE   department_id = deptno;
  IF SQL%NOTFOUND THEN
    RAISE invalid_department;
  END IF;
  COMMIT;
EXCEPTION
  WHEN invalid_department  THEN
    DBMS_OUTPUT.PUT_LINE('No such department id.');
END;
/
```





Calling Environments

SQL Developer	Displays error number and message to screen
Procedure Builder	Displays error number and message to screen
Oracle Developer Forms	Accesses error number and message in an `ON-ERROR` trigger by means of the `ERROR_CODE` and `ERROR_TEXT` packaged functions
Precompiler application	Accesses exception number through the `SQLCA` data structure
An enclosing PL/SQL block	Traps exception in exception-handling routine of enclosing block

Propagating Exceptions in a Subblock

Subblocks can handle an exception or pass the exception to the enclosing block.

```
DECLARE
  . . .
  no_rows    exception;
  integrity  exception;
  PRAGMA EXCEPTION_INIT (integrity, -2292);
BEGIN
  FOR c_record IN emp_cursor LOOP
    BEGIN
     SELECT ...
     UPDATE ...
     IF SQL%NOTFOUND THEN
       RAISE no_rows;
     END IF;
    END;
  END LOOP;
EXCEPTION
  WHEN integrity THEN ...
  WHEN no_rows THEN ...
END;
/
```

Summary

In this lesson, you should have learned how to:

- Define PL/SQL exceptions
- Add an `EXCEPTION` section to the PL/SQL block to deal with exceptions at run time
- Handle different types of exceptions:
  - Predefined exceptions
  - Non-predefined exceptions
  - User-defined exceptions
- Propagate exceptions in nested blocks and call applications