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Database Programming with SQL

13-2
Using Data Types

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Objectives

In this lesson, you will learn to:

- Create a table using TIMESTAMP and TIMESTAMP WITH TIME ZONE column data types
- Create a table using INTERVAL YEAR TO MONTH and INTERVAL DAY TO SECOND column data types
- Give examples of organizations and personal situations where it is important to know to which time zone a date-time value refers
- List and provide an example of each of the number, date, and character data types

Purpose

- If you ever travel to another country, you'll quickly find out that the money in your pocket may not be that of the local currency.
- If you want to buy something, it will be necessary to convert your money into the currency of the local country.
- This conversion process is a lot like dealing with data types in SQL.
- Different types of data have different types of characteristics, the purpose of which is to efficiently store data.
- In this lesson, you will learn more about data types and their uses.

Data Type Overview

- Each value manipulated by Oracle has a data type.
- A value's data type associates a fixed set of properties with the value.
- These properties cause the database to treat values of one data type differently from values of another data type.

Data Type Overview

- Different data types offer several advantages:
  - Columns of a single type produce consistent results.
  - For example, DATE data type columns always produce date values.
  - You cannot insert the wrong type of data into a column. For example, columns of data type DATE will prevent NUMBER type data from being inserted.
- For these reasons, each column in a relational database can hold only one type of data.
- You cannot mix data types within a column.

Common Data Types

- The most commonly used column data types for character and number values are below.
- For character values:
  - CHAR (fixed size, maximum 2000 characters)
  - VARCHAR2 (variable size, maximum 4000 characters)
  - CLOB (variable size, maximum 128 terabytes)
- For number values:
  - NUMBER (variable size, maximum precision 38 digits)

Common Data Types

- The most commonly used column data types for date, time, and binary values are below.
- For date and time values:
  - DATE
  - TIMESTAMP ….
  - INTERVAL
- For binary values (eg. multimedia: JPG, WAV, MP3, and so on):
  - RAW (variable size, maximum 2000 bytes)
  - BLOB (variable size, maximum 128 terabytes)

Common Data Types

- For character values, it is usually better to use VARCHAR2 or CLOB than CHAR, because it saves space.
- For example, an employee's last name is 'Chang'.
- In a VARCHAR2(30) column, only the 5 significant characters are stored: C h a n g.
- But in a CHAR(30) column, 25 trailing spaces would be stored as well, to make a fixed size of 30 characters.
- Number values can be negative as well as positive. For example, NUMBER(6,2) can store any value from +9999.99 down to –9999.99.

DATE-TIME Data Types

- The DATE data type stores a value of centuries down to whole seconds, but cannot store fractions of a second.
- '21/Aug/2003 17:25:30' is a valid value, but '21/Aug/2003 17:25:30.255' is not.
- The TIMESTAMP data type is an extension of the DATE data type which allows fractions of a second.
- For example, TIMESTAMP(3) allows 3 digits after the whole seconds, allowing values down to milliseconds to be stored.

DATE-TIME Data Types

- TIMESTAMP example:

```
CREATE TABLE time_ex1
( exact_time TIMESTAMP);
```

```
INSERT INTO time_ex1
VALUES ('10/Jun/2015 10:52:29.123456');
```

```
INSERT INTO time_ex1
VALUES (SYSDATE);
```

```
INSERT INTO time_ex1
VALUES (SYSTIMESTAMP);
```

```
SELECT *
FROM time_ex1;
```

EXACT_TIME
10-JUN-15 10.52.29.123456 AM
16-JUL-15 08.17.08.000000 AM
16-JUL-15 08.17.16.610293 AM

TIMESTAMP…With [LOCAL] Time Zone

- Think about the time value '17:30'. Of course it means "half past five in the afternoon".
- But in which time zone?
- Is it half past five New York City time or Beijing time or Istanbul time or …. ?
- In today's globalized organizations which operate in many different countries, it is important to know to which time zone a date-time value refers.

TIMESTAMP…With [LOCAL] Time Zone

- TIMESTAMP WITH TIME ZONE stores a time zone value as a displacement from Universal Coordinated Time or UCT (previously known as Greenwich Mean Time or GMT).
- A value of '21/Aug/2003 08:00:00 –5:00' means 8:00 am 5 hours behind UTC.
- This is US Eastern Standard Time (EST).

TIMESTAMP…With [LOCAL] Time Zone

- TIMESTAMP WITH TIME ZONE example:

```
CREATE TABLE time_ex2
( time_with_offset TIMESTAMP WITH TIME ZONE);
```

```
INSERT INTO time_ex2
VALUES (SYSTIMESTAMP);
```

```
INSERT INTO time_ex2
VALUES ('10/Jun/2015 10:52:29.123456 AM +2:00');
```

```
SELECT *
FROM time_ex2;
```

TIME_WITH_OFFSET
16-JUL-15 08.49.47.126056 AM -07:00
10-JUN-15 10.52.29.123456 AM +02:00

TIMESTAMP…With [LOCAL] Time Zone

- TIMESTAMP WITH LOCAL TIME ZONE is similar, but with one difference: when this column is SELECTed in a SQL statement, the time is automatically converted to the selecting user's time zone.
- TIMESTAMP With…Time Zone Example:

```
CREATE TABLE time_ex3
( first_column TIMESTAMP WITH TIME ZONE,
  second_column TIMESTAMP WITH LOCAL TIME ZONE);
```

```
INSERT INTO time_ex3
  (first_column, second_column)
VALUES
  ('15/Jul/2015 08:00:00 AM -07:00', '15/Nov/2007 08:00:00');
```

TIMESTAMP…With Time Zone Example

- Both values are stored with a time displacement of –07:00 hours (PST).
- But now a user in Istanbul executes:

```
SELECT *
FROM time_ex3;
```

FIRST_COLUMN	SECOND_COLUMN
15-JUL-15 08.00.00.000000 AM -07:00	15-NOV-07 05.00.00.000000 PM

- Istanbul time is 9 hours ahead of PST; when it's 8am in Los Angeles, it's 5pm in Istanbul.

INTERVAL Data Types

- These store the elapsed time, or interval of time, between two date-time values.
- INTERVAL YEAR TO MONTH stores a period of time measured in years and months.
- INTERVAL DAY TO SECOND stores a period of time measured in days, hours, minutes, and seconds.

INTERVAL YEAR…TO MONTH

- Syntax:

```
INTERVAL YEAR [(year_precision)] TO MONTH
```

- year_precision is the maximum number of digits in the YEAR element.
- The default value of year_precision is 2.

INTERVAL YEAR…TO MONTH

- This example shows INTERVAL YEAR TO MONTH:

```
CREATE TABLE time_ex4
(loan_duration1 INTERVAL YEAR(3) TO MONTH,
 loan_duration2 INTERVAL YEAR(2) TO MONTH);
```

```
INSERT INTO time_ex4 (loan_duration1, loan_duration2)
VALUES (INTERVAL '120' MONTH(3),
         INTERVAL '3-6' YEAR TO MONTH);
```

Assume today's date is: 17/Jul/2015

```
SELECT SYSDATE + loan_duration1 AS "120 months from now",
       SYSDATE + loan_duration2 AS "3 years 6 months from now"
FROM time_ex4;
```

120 months from now	3 years 6 months from now
17/Jul/2025	17/Jan/2019

INTERVAL DAY…TO SECOND

- Use this when you need a more precise difference between two date-time values.
- Syntax:

```
INTERVAL DAY [day_precision)] TO SECOND [(fractional_seconds_precision)]
```

- day_precision is the maximum number of digits in the DAY element.
- The default value of day_precision is 2.
- fractional_seconds_precision is the number of digits in the fractional part of the SECOND date-time field.
- The default is 6.

INTERVAL DAY…TO SECOND

- This example shows interval DAY TO SECOND:

```
CREATE TABLE time_ex5
(day_duration1 INTERVAL DAY(3) TO SECOND,
 day_duration2 INTERVAL DAY(3) TO SECOND);
```

```
INSERT INTO time_ex5 (day_duration1, day_duration2)
VALUES (INTERVAL '25' DAY(2), INTERVAL '4 10:30:10' DAY TO SECOND);
```

```
SELECT SYSDATE + day_duration1 AS  "25 Days from now",
   TO_CHAR(SYSDATE + day_duration2, 'dd/Mon/yyyy hh:mi:ss')
   AS  "precise days and time from now"
FROM time_ex5;
```

25 Days from now	precise days and time from now
11/Aug/2015	21/Jul/2015 01:13:17

Terminology

Key terms used in this lesson included:

- CLOB
- BLOB
- TIMESTAMP
- TIMESTAMP WITH TIMEZONE
- TIMESTAMP WITH LOCAL TIMEZONE
- INTERVAL DAY TO SECOND
- INTERVAL DAY TO MONTH

Summary

In this lesson you have learned to:

- Create a table using TIMESTAMP and TIMESTAMP WITH TIME ZONE column data types
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- Give examples of organizations and personal situations where it is important to know to which time zone a date-time value refers
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