10

Other Schema Objects

Objectives

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

- Create simple and complex views
- Retrieve data from views
- Create, maintain, and use sequences
- Create and maintain indexes
- Create private and public synonyms

Course Roadmap

Lesson 1: Introduction

Unit 1: Retrieving, Restricting, and Sorting Data

Unit 2: Joins, Subqueries, and Set Operators

Unit 3: DML and DDL

- Lesson 10: Managing Tables Using DML Statements
- Lesson 11: Introduction to Data Definition Language
- **Lesson 12: Other Schema Objects** — You are here!

Database Objects

Object	Description
Table	Basic unit of storage; composed of rows
View	Logically represents subsets of data from one or more tables
Sequence	Generates numeric values
Index	Improves the performance of some queries
Synonym	Gives alternative names to objects

What Is a View?

EMPLOYEES table

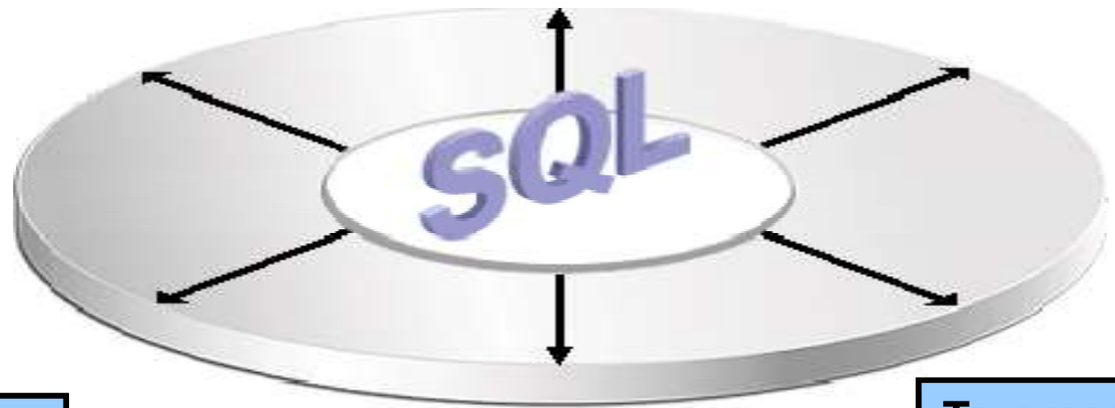
	EMPLOYEE_ID	FIRST_NAME	LAST_NAME	EMAIL	PHONE_NUMBER	HIRE_DATE	JOB_ID	SALARY
1	100	Steven	King	SKING	515.123.4567	17-JUN-87	AD_PRES	24000
2	101	Neena	Kochhar	NKOCHHAR	515.123.4568	21-SEP-89	AD_VP	17000
3	102	Lex	De Haan	LDEHAAN	515.123.4569	13-JAN-93	AD_VP	17000
4	103	Alexander	Hunold	AHUNOLD	590.423.4567	03-JAN-90	IT_PROG	9000
5	104	Bruce	Ernst	BERNST	590.423.4568	21-MAY-91	IT_PROG	6000
6	107	Diana	Lorentz	DLORENTZ	590.423.5567	07-FEB-99	IT_PROG	4200
7	124	Kevin			4	16-NOV-99	ST_MAN	5800
8	141	Trenna			9	17-OCT-95	ST_CLERK	3500
9	142	Curtis			4	29-JAN-97	ST_CLERK	3100
10	143	Randall			4	15-MAR-98	ST_CLERK	2600
11	144	Peter	Vargas	PVARGAS	650.121.2004	09-JUL-98	ST_CLERK	2500
12	149	Eleni	Zlotkey	EZLOTKEY	011.44.1344.429018	29-JAN-00	SA_MAN	10500
13	174	Ellen	Abel	EABEL	011.44.1644.429267	11-MAY-96	SA_REP	11000
14	176	Jonathon	Taylor	JTAYLOR	011.44.1644.429265	24-MAR-98	SA_REP	8600
15	178	Kimberely	Grant	KGRANT	011.44.1644.429263	24-MAY-99	SA_REP	7000
16	200	Jennifer	Whalen	JWHALEN	515.123.4444	17-SEP-87	AD_ASST	4400
17	201	Michael	Hartstein	MHARTSTE	515.123.5555	17-FEB-96	MK_MAN	13000
18	202	Pat	Fay	PFAY	603.123.6666	17-AUG-97	MK_REP	6000
19	205	Shelley	Higgins	SHIGGINS	515.123.8080	07-JUN-94	AC_MGR	12000
20	206	William	Gietz	WGIETZ	515.123.8181	07-JUN-94	AC_ACCOUNT	8300

EMPLOYEE_ID	LAST_NAME	SALARY
104	Ernst	6000
107	Lorentz	4200
124	Mourgos	5800

Advantages of Views

To restrict data access

To make complex queries easy



To provide data independence

To present different views of the same data

Simple Views and Complex Views

Feature	Simple Views	Complex Views
Number of tables	One	One or more
Contain functions	No	Yes
Contain groups of data	No	Yes
DML operations through a view	Yes	Not always

Creating a View

- You embed a subquery in the `CREATE VIEW` statement:

```
CREATE [OR REPLACE] [FORCE|NOFORCE] VIEW view
  [(alias[, alias]...)]
 AS subquery
[WITH CHECK OPTION [CONSTRAINT constraint]]
[WITH READ ONLY [CONSTRAINT constraint]];
```

- The subquery can contain complex `SELECT` syntax.

Creating a View

- Create the EMPVU80 view, which contains details of employees in department 80:

```
CREATE VIEW   empvu80
 AS SELECT   employee_id, last_name, salary
    FROM     employees
    WHERE    department_id = 80;
CREATE VIEW succeeded.
```

- Describe the structure of the view by using the DESCRIBE command:

```
DESCRIBE empvu80
```

Creating a View

- Create a view by using column aliases in the subquery:

```
CREATE VIEW  salvu50
 AS SELECT  employee_id ID_NUMBER, last_name NAME,
            salary*12 ANN_SALARY
    FROM    employees
    WHERE   department_id = 50;
CREATE VIEW succeeded.
```

- Select the columns from this view by the given alias names:

Retrieving Data from a View

```
SELECT *
FROM   salvu50;
```

	ID_NUMBER	NAME	ANN_SALARY
1	124	Mourgos	69600
2	141	Rajs	42000
3	142	Davies	37200
4	143	Matos	31200
5	144	Vargas	30000

Modifying a View

- Modify the `EMPVU80` view by using a `CREATE OR REPLACE VIEW` clause. Add an alias for each column name:

```
CREATE OR REPLACE VIEW empvu80
  (id_number, name, sal, department_id)
AS SELECT  employee_id, first_name || ' '
           || last_name, salary, department_id
   FROM    employees
   WHERE   department_id = 80;
CREATE VIEW succeeded.
```

- Column aliases in the `CREATE OR REPLACE VIEW` clause are listed in the same order as the columns in the subquery.

Creating a Complex View

- Create a complex view that contains group functions to display values from two tables:

```
CREATE OR REPLACE VIEW dept_sum_vu
  (name, minsal, maxsal, avgsal)
AS SELECT   d.department_name, MIN(e.salary),
           MAX(e.salary),AVG(e.salary)
   FROM     employees e JOIN departments d
   ON       (e.department_id = d.department_id)
   GROUP BY d.department_name;
CREATE VIEW succeeded.
```

Rules for Performing

- You can usually perform DML operations on simple views.

- You cannot remove a row if the view contains the following:
  - Group functions
  - A `GROUP BY` clause
  - The `DISTINCT` keyword
  - The pseudocolumn `ROWNUM` keyword

Rules for Performing

- You cannot modify data in a view if it contains:
  - Group functions
  - A `GROUP BY` clause
  - The `DISTINCT` keyword
  - The pseudocolumn `ROWNUM` keyword
  - Columns defined by expressions

Rules for Performing

- You cannot add data through a view if the view includes:
  - Group functions
  - A `GROUP BY` clause
  - The `DISTINCT` keyword
  - The pseudocolumn `ROWNUM` keyword
  - Columns defined by expressions
  - `NOT NULL` columns in the base tables that are not selected by the view

Using the WITH CHECK OPTION Clause

- You can ensure that DML operations performed on the view stay in the domain of the view by using the WITH CHECK OPTION clause:

```
CREATE OR REPLACE VIEW empvu20
AS SELECT     *
   FROM       employees
   WHERE      department_id = 20
   WITH CHECK OPTION CONSTRAINT empvu20_ck ;
CREATE VIEW succeeded.
```

- Any attempt to change the department number for any row in the view fails because it violates the WITH CHECK OPTION constraint.

Denying DML Operations

- You can ensure that no DML operations occur by adding the `WITH READ ONLY` option to your view definition.
- Any attempt to perform a DML operation on any row in the view results in an Oracle server error.

Denying DML Operations

```
CREATE OR REPLACE VIEW empvu10
    (employee_number, employee_name, job_title)
AS SELECT    employee_id, last_name, job_id
   FROM      employees
   WHERE     department_id = 10
   WITH READ ONLY ;
CREATE VIEW succeeded.
```

Removing a View

- You can remove a view without losing data because a view is based on underlying tables in the database.

```
DROP VIEW view;
```

```
DROP VIEW empvu80;
DROP VIEW empvu80 succeeded.
```

Practice 10: Overview of Part 1

This practice covers the following topics:

- Creating a simple view
- Creating a complex view
- Creating a view with a check constraint
- Attempting to modify data in the view
- Removing views

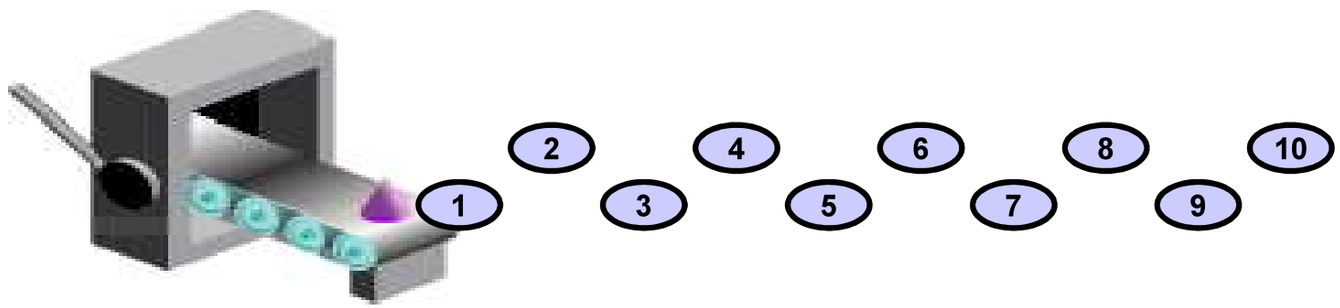
Sequences

Object	Description
Table	Basic unit of storage; composed of rows
View	Logically represents subsets of data from one or more tables
Sequence	Generates numeric values
Index	Improves the performance of some queries
Synonym	Gives alternative names to objects

Sequences

A sequence:

- Can automatically generate unique numbers
- Is a sharable object
- Can be used to create a primary key value
- Replaces application code
- Speeds up the efficiency of accessing sequence values when cached in memory



CREATE SEQUENCE Statement:

Define a sequence to generate sequential numbers automatically:

```
CREATE SEQUENCE sequence
       [INCREMENT BY n]
       [START WITH n]
       [{MAXVALUE n | NOMAXVALUE}]
       [{MINVALUE n | NOMINVALUE}]
       [{CYCLE | NOCYCLE}]
       [{CACHE n | NOCACHE}];
```

Creating a Sequence

- Create a sequence named `DEPT_DEPTID_SEQ` to be used for the primary key of the `DEPARTMENTS` table.
- Do not use the `CYCLE` option.

```
CREATE SEQUENCE dept_deptid_seq
                INCREMENT BY 10
                START WITH 120
                MAXVALUE 9999
                NOCACHE
                NOCYCLE;
CREATE SEQUENCE succeeded.
```

NEXTVAL and CURRVAL Pseudocolumns

- NEXTVAL returns the next available sequence value. It returns a unique value every time it is referenced, even for different users.
- CURRVAL obtains the current sequence value.
- NEXTVAL must be issued for that sequence before CURRVAL contains a value.

Using a Sequence

- Insert a new department named “Support” in location ID 2500:

```
INSERT INTO departments(department_id,
            department_name, location_id)
VALUES      (dept_deptid_seq.NEXTVAL,
            'Support', 2500);
1 row created.
```

- View the current value for the `DEPT_DEPTID_SEQ` sequence:

```
SELECT   dept_deptid_seq.CURRVAL
FROM     dual;
```

Caching Sequence Values

- Caching sequence values in memory gives faster access to those values.
- Gaps in sequence values can occur when:
  - A rollback occurs
  - The system crashes
  - A sequence is used in another table

Modifying a Sequence

- Change the increment value, maximum value, minimum value, cycle option, or cache option:

```
ALTER SEQUENCE dept_deptid_seq
               INCREMENT BY 20
               MAXVALUE 999999
               NOCACHE
               NOCYCLE;
ALTER SEQUENCE dept_deptid_seq succeeded.
```

Guidelines for Modifying

- You must be the owner or have the `ALTER` privilege for the sequence.
- Only future sequence numbers are affected.
- The sequence must be dropped and re-created to restart the sequence at a different number.
- Some validation is performed.
- To remove a sequence, use the `DROP` statement:

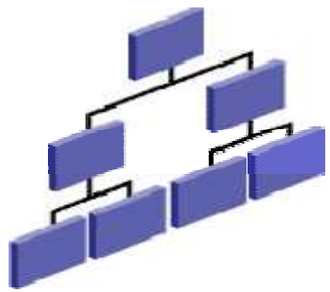
```
DROP SEQUENCE dept_deptid_seq;
DROP SEQUENCE dept_deptid_seq succeeded.
```

Indexes

Object	Description
Table	Basic unit of storage; composed of rows
View	Logically represents subsets of data from one or more tables
Sequence	Generates numeric values
Index	Improves the performance of some queries
Synonym	Gives alternative names to objects

Indexes

- An index:
  - Is a schema object
  - Can be used by the Oracle server to speed up the retrieval of rows by using a pointer
  - Can reduce disk I/O by using a rapid path access method to locate data quickly
  - Is independent of the table that it indexes
  - Is used and maintained automatically by the Oracle server



How Are Indexes Created?

- Automatically: A unique index is created automatically when you define a `PRIMARY KEY` or `UNIQUE` constraint in a table definition.

- Manually: Users can create nonunique indexes on columns to speed up access to the rows.

Creating an Index

- Create an index on one or more columns:

```
CREATE INDEX index
ON table (column[, column]...);
```

- Improve the speed of query access to the `LAST_NAME` column in the `EMPLOYEES` table:

```
CREATE INDEX  emp_last_name_idx
ON            employees(last_name);
CREATE INDEX succeeded.
```

Index Creation Guidelines

Create an index when:	
✓	A column contains a wide range of values
✓	A column contains a large number of null values
✓	One or more columns are frequently used together in a `WHERE` clause or a join condition
✓	The table is large and most queries are expected to retrieve less than 2% to 4% of the rows in the table
Do not create an index when:	
✗	The columns are not often used as a condition in the query
✗	The table is small or most queries are expected to retrieve more than 2% to 4% of the rows in the table
✗	The table is updated frequently
✗	The indexed columns are referenced as part of an expression

Removing an Index

- Remove an index from the data dictionary by using the `DROP INDEX` command:

```
DROP INDEX index;
```

- Remove the `UPPER_LAST_NAME_IDX` index from the data dictionary:

```
DROP INDEX emp_last_name_idx;
DROP INDEX emp_last_name_idx succeeded.
```

- To drop an index, you must be the owner of the index or have the `DROP ANY INDEX` privilege.

Synonyms

Object	Description
Table	Basic unit of storage; composed of rows
View	Logically represents subsets of data from one or more tables
Sequence	Generates numeric values
Index	Improves the performance of some queries
Synonym	Gives alternative names to objects

Synonyms

- Simplify access to objects by creating a synonym (another name for an object). With synonyms, you can:
  - Create an easier reference to a table that is owned by another user
  - Shorten lengthy object names

```
CREATE [PUBLIC] SYNONYM synonym
FOR    object;
```

Creating and Removing Synonyms

- Create a shortened name for the `DEPT_SUM_VU` view:

```
CREATE SYNONYM  d_sum
FOR  dept_sum_vu;
CREATE SYNONYM succeeded.
```

- Drop a synonym:

```
DROP SYNONYM d_sum;
DROP SYNONYM succeeded.
```

Summary

In this lesson, you should have learned how to:

- Create, use, and remove views
- Automatically generate sequence numbers by using a sequence generator
- Create indexes to improve query retrieval speed
- Use synonyms to provide alternative names for objects

Practice 10 : Part II

This practice covers the following topics:

- Creating sequences
- Using sequences
- Creating nonunique indexes
- Creating synonyms