14

Creating Other Schema Objects

Objectives

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

- Create, maintain, and use sequences
- Create and maintain indexes
- Create private and public synonyms

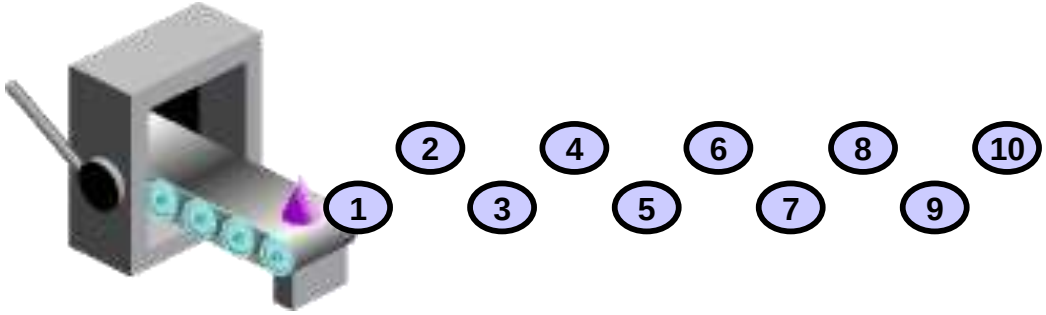
Database Objects

Object	Description
Sequence	Generates numeric values
Index	Improves the performance of some queries
Synonym	Gives alternative names to objects

Sequences

A sequence:

- **A sequence is a database object that generates a sequence of integers.**
- **Can automatically generate unique numbers**
- **Is a sharable object**
- **Can be used to create a primary key value**
- **Speeds up the efficiency of accessing sequence values when cached in memory**



CREATE SEQUENCE Statement: Syntax

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;
Sequence created.
```

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.

Rules for Using NEXTVAL and CURRVAL

- You can use NEXTVAL and CURRVAL in the following contexts:
  - The SELECT list of a SELECT statement that is not part of a subquery
  - The SELECT list of a subquery in an INSERT statement
  - The VALUES clause of an INSERT statement
  - The SET clause of an UPDATE statement

- You cannot use `NEXTVAL` and `CURRVAL` in the following contexts:
  - The `SELECT` list of a view
  - A `SELECT` statement with the `DISTINCT` keyword
  - A `SELECT` statement with `GROUP BY`, `HAVING`, or `ORDER BY` clauses
  - A subquery in a `SELECT`, `DELETE`, or `UPDATE` statement
  - The `DEFAULT` expression in a `CREATE TABLE` or `ALTER TABLE` statement

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;
Sequence altered.
```

Guidelines for Modifying a Sequence

- 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;
Sequence dropped.
```

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
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Indexes

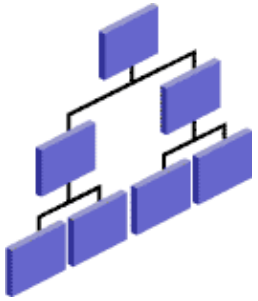
- When looking for a particular topic in a book, you can either scan the whole book looking for your topic, or you can use the book's index to find the exact location of the topic directly.

- An index for a database table is similar in concept to a book index, except that database indexes are used to find specific rows in a table.

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);
Index created.
```

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

CREATE INDEX with CREATE TABLE Statement

```
CREATE TABLE NEW_EMP
(employee_id NUMBER(6)
              PRIMARY KEY USING INDEX
             (CREATE INDEX emp_id_idx ON
             NEW_EMP(employee_id)),
first_name   VARCHAR2(20),
last_name    VARCHAR2(25));
Table created.
```

```
SELECT INDEX_NAME, TABLE_NAME
FROM   USER_INDEXES
WHERE  TABLE_NAME = 'NEW_EMP';
```

INDEX_NAME	TABLE_NAME
EMP_ID_IDX	NEW_EMP

Types of Indexes

- B-tree indexes (Balanced Trees)
- Function-based indexes
- Bitmap and bitmap join indexes
- Application domain indexes

B-tree indexes (Balanced Trees)

- The most common type of database index.
- A B-tree index is an ordered list of values divided into ranges.
- By associating a key with a row or range of rows, B-trees provide excellent retrieval performance for a wide range of queries, including exact match and range searches.
- A B-tree index has two types of blocks: branch blocks for searching and leaf blocks that store values.
- The upper-level branch blocks of a B-tree index contain index data that points to lower-level index blocks.

Function-Based Indexes

- A function-based index is based on expressions.
- The index expression is built from table columns, constants, SQL functions, and user-defined functions.

```
CREATE INDEX upper_dept_name_idx
ON dept2(UPPER(department_name));

Index created.

SELECT *
FROM   dept2
WHERE  UPPER(department_name) = 'SALES';
```

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;
Index dropped.
```

- 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
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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;
Synonym Created.
```

- Drop a synonym:

```
DROP SYNONYM d_sum;
Synonym dropped.
```

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