Manage Schema Objects

Objectives

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

- Add constraints
- Create indexes
- Create and manage indexes
- Creating function-based indexes
- Drop columns and set column `UNUSED`
- Perform `FLASHBACK` operations
- Create and use external tables

The `ALTER TABLE` Statement

Use the `ALTER TABLE` statement to:

- Add a new column
- Modify an existing column
- Define a default value for the new column
- Drop a column

The ALTER TABLE Statement

Use the ALTER TABLE statement to add, modify, or drop columns.

```
ALTER TABLE table
ADD         (column datatype [DEFAULT expr]
            [, column datatype]...);
```

```
ALTER TABLE table
MODIFY      (column datatype [DEFAULT expr]
            [, column datatype]...);
```

```
ALTER TABLE table
DROP        (column);
```

Adding a Column

- You use the **ADD** clause to add columns.

```
ALTER TABLE dept80
ADD         (job_id VARCHAR2(9));
Table altered.
```

- The new column becomes the last column.

EMPLOYEE_ID	LAST_NAME	ANNSAL	HIRE_DATE	JOB_ID
145	Russell	14000	01-OCT-96	
146	Partners	13500	05-JAN-97	
147	Errazuriz	12000	10-MAR-97	
148	Cambrault	11000	15-OCT-99	
149	Zlotkey	10500	29-JAN-00	

...

Modifying a Column

- You can change a column's data type, size, and default value.

```
ALTER TABLE dept80
MODIFY      (last_name VARCHAR2(30));
Table altered.
```

- A change to the default value affects only subsequent insertions to the table.

Dropping a Column

Use the `DROP COLUMN` clause to drop columns you no longer need from the table.

```
ALTER TABLE  dept80
DROP COLUMN  job_id;
Table altered.
```

EMPLOYEE_ID	LAST_NAME	ANNSAL	HIRE_DATE
145	Russell	14000	01-OCT-96
146	Partners	13500	05-JAN-97
147	Errazuriz	12000	10-MAR-97
148	Cambrault	11000	15-OCT-99
149	Zlotkey	10500	29-JAN-00

The SET UNUSED Option

- You use the SET UNUSED option to mark one or more columns as unused.
- You use the DROP UNUSED COLUMNS option to remove the columns that are marked as unused.

```
ALTER TABLE  <table_name>
SET    UNUSED(<column_name>);
OR
ALTER TABLE  <table_name>
SET    UNUSED COLUMN <column_name>;
```

```
ALTER TABLE <table_name>
DROP  UNUSED COLUMNS;
```

Adding a Constraint Syntax

Use the **ALTER TABLE** statement to:

- Add or drop a constraint, but not modify its structure
- Enable or disable constraints
- Add a **NOT NULL** constraint by using the **MODIFY** clause

```
ALTER TABLE  <table_name>
ADD [CONSTRAINT <constraint_name>]
type (<column_name>);
```

Adding a Constraint

Add a `FOREIGN KEY` constraint to the `EMP2` table indicating that a manager must already exist as a valid employee in the `EMP2` table.

```
ALTER TABLE emp2
modify employee_id Primary Key;
Table altered.
```

```
ALTER TABLE emp2
ADD CONSTRAINT emp_mgr_fk
  FOREIGN KEY(manager_id)
  REFERENCES emp2(employee_id);
Table altered.
```

ON DELETE CASCADE

Delete child rows when a parent key is deleted.

```
ALTER TABLE Emp2 ADD CONSTRAINT emp_dt_fk
FOREIGN KEY (Department_id)
REFERENCES departments ON DELETE CASCADE);
Table altered.
```

Deferring Constraints

Constraints can have the following attributes:

- **DEFERRABLE or NOT DEFERRABLE**
- **INITIALLY DEFERRED or INITIALLY IMMEDIATE**

```
ALTER TABLE dept2
ADD CONSTRAINT dept2_id_pk
PRIMARY KEY (department_id)
DEFERRABLE INITIALLY DEFERRED
```

Deferring constraint on creation

```
SET CONSTRAINTS dept2_id_pk IMMEDIATE
```

Changing a specific constraint attribute

```
ALTER SESSION
SET CONSTRAINTS= IMMEDIATE
```

Changing all constraints for a session

Dropping a Constraint

- Remove the manager constraint from the `EMP2` table.

```
ALTER TABLE emp2
DROP CONSTRAINT emp_mgr_fk;
Table altered.
```

- Remove the `PRIMARY KEY` constraint on the `DEPT2` table and drop the associated `FOREIGN KEY` constraint on the `EMP2.DEPARTMENT_ID` column.

```
ALTER TABLE dept2
DROP PRIMARY KEY CASCADE;
Table altered.
```

Disabling Constraints

- Execute the `DISABLE` clause of the `ALTER TABLE` statement to deactivate an integrity constraint.
- Apply the `CASCADE` option to disable dependent integrity constraints.

```
ALTER TABLE emp2
DISABLE CONSTRAINT emp_dt_fk;
Table altered.
```

Enabling Constraints

- Activate an integrity constraint currently disabled in the table definition by using the `ENABLE` clause.

```
ALTER TABLE       emp2
ENABLE CONSTRAINT emp_dt_fk;
Table altered.
```

- A `UNIQUE` index is automatically created if you enable a `UNIQUE` key or `PRIMARY KEY` constraint.

Cascading Constraints

- The `CASCADE CONSTRAINTS` clause is used along with the `DROP COLUMN` clause.
- The `CASCADE CONSTRAINTS` clause drops all referential integrity constraints that refer to the primary and unique keys defined on the dropped columns.
- The `CASCADE CONSTRAINTS` clause also drops all multicolumn constraints defined on the dropped columns.

Cascading Constraints

Example:

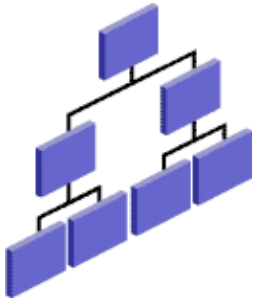
```
ALTER TABLE emp2
DROP COLUMN employee_id CASCADE CONSTRAINTS;
Table altered.
```

```
ALTER TABLE test1
DROP (pk, fk, col1) CASCADE CONSTRAINTS;
Table altered.
```

Indexes

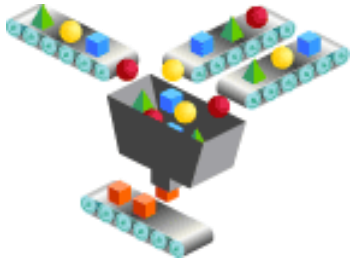
An index:

- **Is a schema object**
- **Is 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.**

Overview of Indexes

Indexes are created:

- **Automatically**
  - **`PRIMARY KEY` creation**
  - **`UNIQUE KEY` creation**
- **Manually**
  - **`CREATE INDEX` statement**
  - **`CREATE TABLE` statement**

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

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.

DROP TABLE … PURGE

```
DROP TABLE dept80 PURGE;
```

The FLASHBACK TABLE Statement

- Repair tool for accidental table modifications
  - Restores a table to an earlier point in time
  - Benefits: Ease of use, availability, fast execution
  - Performed in place
- Syntax:

```
FLASHBACK TABLE[schema.]table[,
[ schema.]table ]...
TO { TIMESTAMP | SCN } expr
[ { ENABLE | DISABLE } TRIGGERS ];
```

The FLASHBACK TABLE Statement

```
DROP TABLE emp2;
Table dropped
```

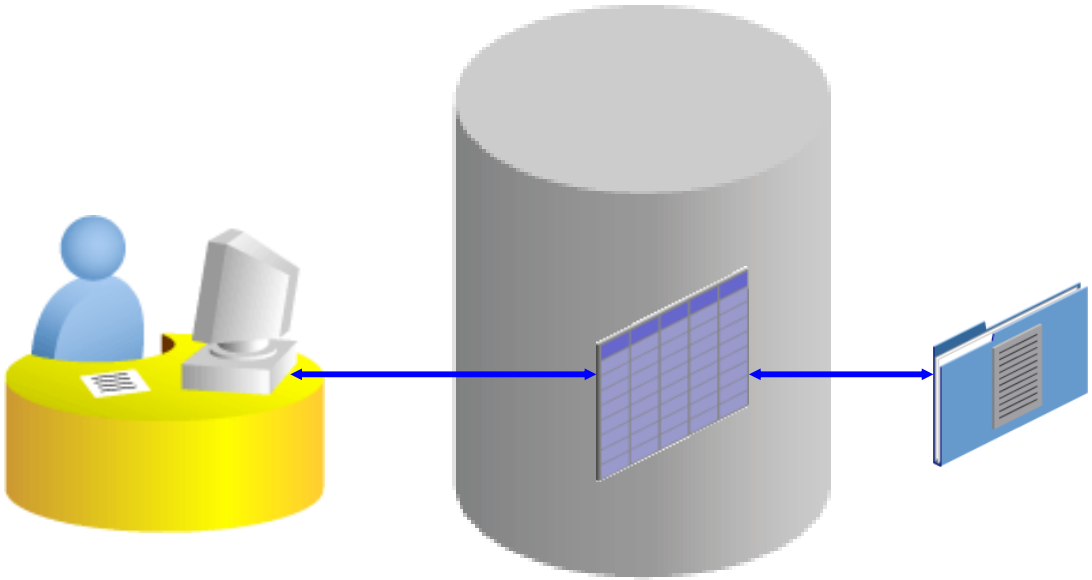
```
SELECT original_name, operation, droptime,
FROM recyclebin;
```

ORIGINAL_NAME	OPERATION	DROPTIME
EMP2	DROP	2004-03-03:07:57:11

...

```
FLASHBACK TABLE emp2 TO BEFORE DROP;
Flashback complete
```

External Tables



Creating a Directory for the External Table

Create a `DIRECTORY` object that corresponds to the directory on the file system where the external data source resides.

```
CREATE OR REPLACE DIRECTORY emp_dir
AS '/…/emp_dir';

GRANT READ ON DIRECTORY emp_dir TO hr;
```

Creating an External Table

```
CREATE TABLE <table_name>
   ( <col_name> <datatype>, … )
ORGANIZATION EXTERNAL
    (TYPE <access_driver_type>
     DEFAULT DIRECTORY <directory_name>
     ACCESS PARAMETERS
       (… ) )
      LOCATION ('<location_specifier>') )
REJECT LIMIT [0 | <number> | UNLIMITED];
```

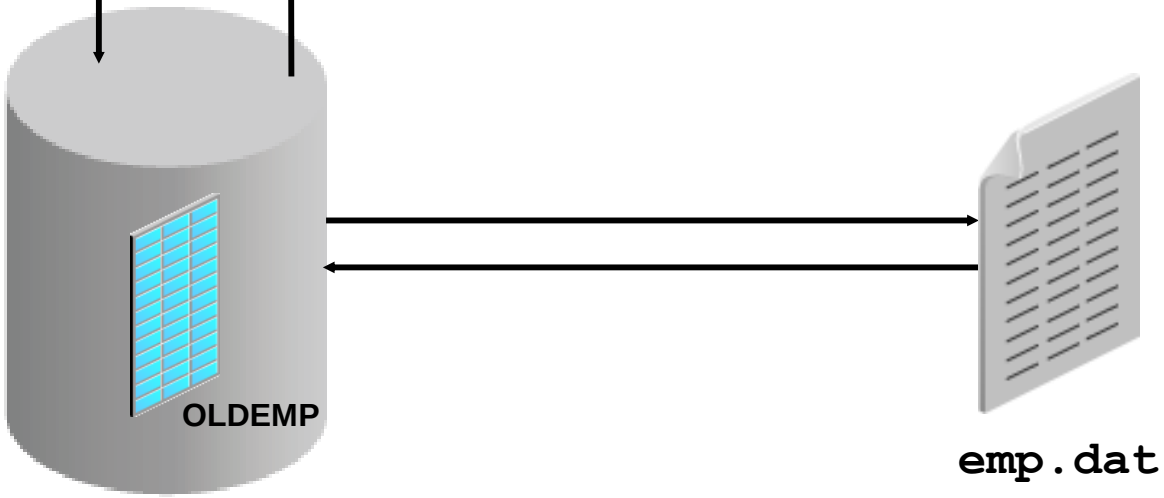
Creating an External Table Using ORACLE_LOADER

```
CREATE TABLE oldemp (
  fname char(25), lname CHAR(25))
  ORGANIZATION EXTERNAL
  (TYPE ORACLE_LOADER
   DEFAULT DIRECTORY emp_dir
   ACCESS PARAMETERS
   (RECORDS DELIMITED BY NEWLINE
    NOBADFILE
    NOLOGFILE
    FIELDS TERMINATED BY ',')
   LOCATION ('emp.dat'))
  PARALLEL 5
  REJECT LIMIT 200;
Table created.
```

Querying External Tables

```
SELECT  *
FROM oldemp
```

FNAME	LNAME
Constantin	Welles
Harry	Pacino
Manisha	Taylor
Harrison	Sutherland
Matthias	MacGraw
Mark	Hannah



Summary

In this lesson, you should have learned how to:

- Add constraints
- Create indexes
- Create a primary key constraint using an index
- Create indexes using the `CREATE TABLE` statement
- Creating function-based indexes
- Drop columns and set column `UNUSED`
- Perform `FLASHBACK` operations
- Create and use external tables

Practice 2: Overview

This practice covers the following topics:

- **Altering tables**
- **Adding columns**
- **Dropping columns**
- **Creating indexes**
- **Creating external tables**