Session 5
The Database Constraints

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Objectives

- **Describe constraints**
- **Create and maintain constraints**

What are Constraints?

- **Constraints enforce rules at the table level.**
- **Constraints prevent the deletion of a table if there are dependencies.**
- **The following constraint types are valid:**
  - `NOT NULL`
  - `UNIQUE`
  - `PRIMARY KEY`
  - `FOREIGN KEY`
  - `CHECK`

Constraint Guidelines

- Name a constraint or the Oracle server generates a name by using the `SYS_C`*n* format.
- Create a constraint either:
  - At the same time as the table is created, or
  - After the table has been created
- Define a constraint at the column or table level.
- View a constraint in the data dictionary.

Defining Constraints

Syntax

```
CREATE TABLE [schema.]table
           (column datatype [DEFAULT expr]
           [column_constraint],
           ...
           [table_constraint][,...]);
```

Defining Constraints

Example

```
CREATE TABLE employees(
            employee_id   NUMBER(6),
            first_name    VARCHAR2(20),
            ...
            job_id        VARCHAR2(10) NOT NULL,
            CONSTRAINT emp_emp_id_pk
           PRIMARY KEY (EMPLOYEE_ID));
```

Defining Constraints

- **Column constraint level**

```
column [CONSTRAINT constraint_name]
constraint_type,
```

- **Table constraint level**

```
column,...
  [CONSTRAINT constraint_name]
   constraint_type
  (column, ...),
```

The NOT NULL Constraint

Ensures that null values are not permitted for the

EMPLOYEE_ID	LAST_NAME	EMAIL	PHONE_NUMBER	HIRE_DATE	JOB_ID	SALARY	DEPARTMENT_ID
100	King	SKING	515.123.4567	17-JUN-87	AD_PRES	24000	90
101	Kochhar	NKOCHHAR	515.123.4568	21-SEP-89	AD_VP	17000	90
102	De Haan	LDEHAAN	515.123.4569	13-JAN-93	AD_VP	17000	90
103	Hunold	AHUNOLD	590.423.4567	03-JAN-90	IT_PROG	9000	60
104	Ernst	BERNST	590.423.4568	21-MAY-91	IT_PROG	6000	60
178	Grant	KGRANT	011.44.1644.429263	24-MAY-99	SA_REP	7000	
200	Whalen	JWHALEN	515.123.4444	17-SEP-87	AD_ASST	4400	10

...

20 rows selected.

NOT NULL constraint (No row can contain a null value for this column.)

NOT NULL constraint

Absence of NOT NULL constraint (Any row can contain null for this column.)

The NOT NULL Constraint

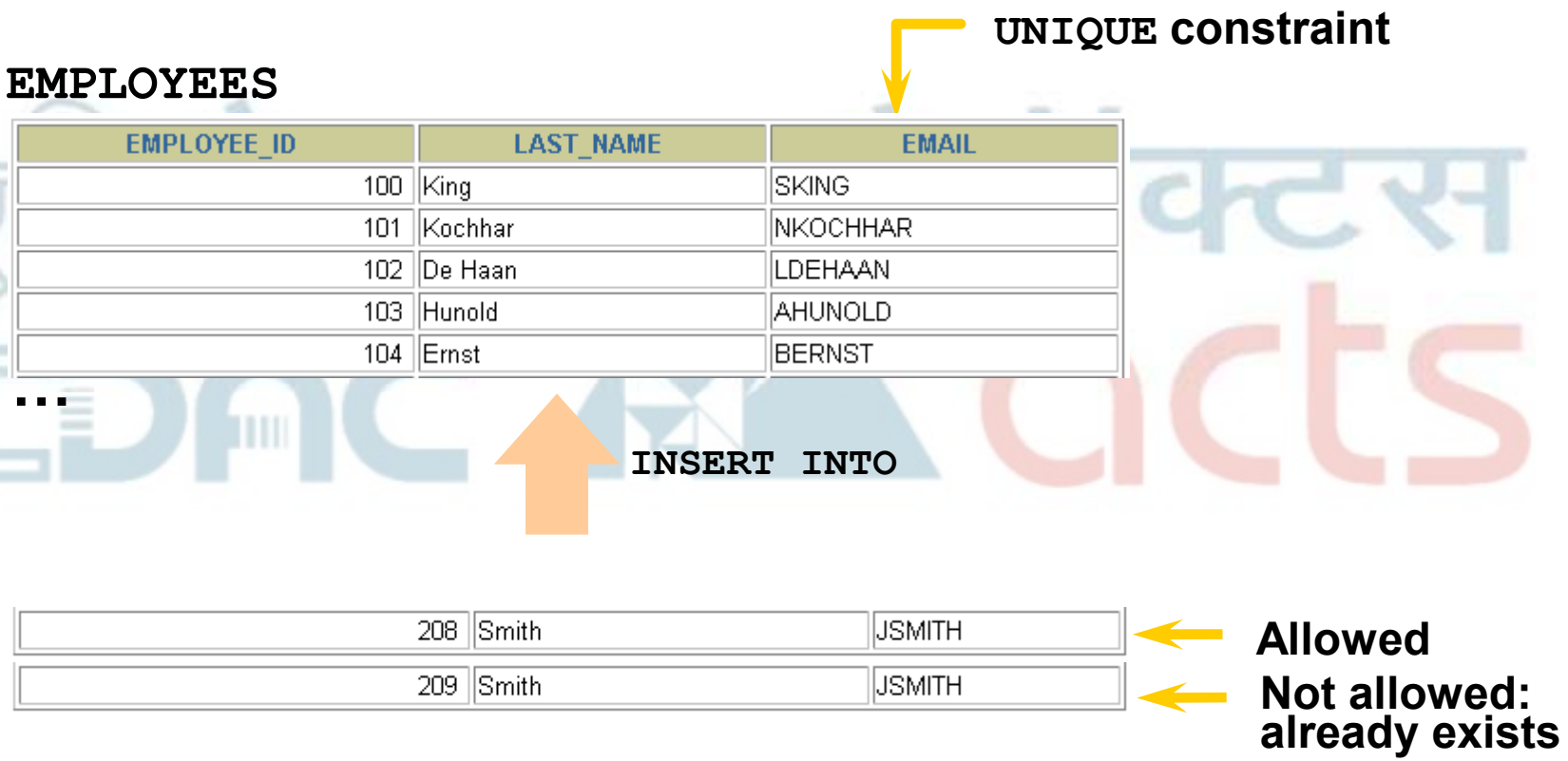
Is defined at the column level:

```
CREATE TABLE employees(
    employee_id     NUMBER(6),
    last_name       VARCHAR2(25) NOT NULL,
    salary          NUMBER(8,2),
    commission_pct  NUMBER(2,2),
    hire_date       DATE
                    CONSTRAINT emp_hire_date_nn
                    NOT NULL,
...
```

System named

User named

The UNIQUE Constraint

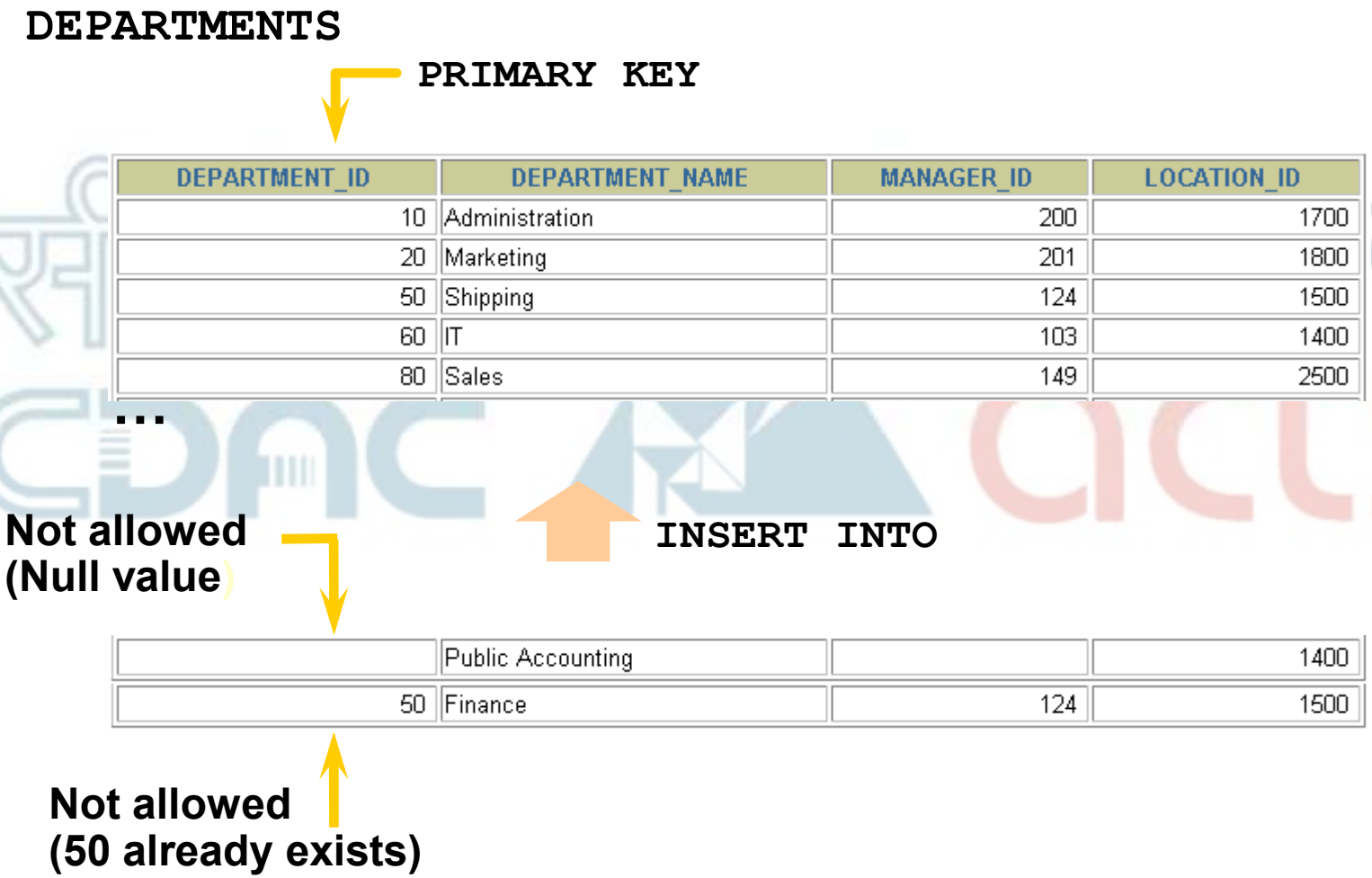


The UNIQUE Constraint

Defined at either the table level or the column level:

```
CREATE TABLE employees(
    employee_id       NUMBER(6),
    last_name         VARCHAR2(25) NOT NULL,
    email             VARCHAR2(25),
    salary            NUMBER(8,2),
    commission_pct    NUMBER(2,2),
    hire_date         DATE NOT NULL,
...
    CONSTRAINT emp_email_uk UNIQUE(email));
```

The PRIMARY KEY Constraint



The PRIMARY KEY Constraint

Defined at either the table level or the column level:

```
CREATE TABLE   departments(
    department_id         NUMBER(4),
    department_name       VARCHAR2(30)
      CONSTRAINT dept_name_nn NOT NULL,
    manager_id            NUMBER(6),
    location_id           NUMBER(4),
     CONSTRAINT dept_id_pk PRIMARY KEY(department_id));
```

The FOREIGN KEY Constraint

DEPARTMENTS

DEPARTMENT_ID	DEPARTMENT_NAME	MANAGER_ID	LOCATION_ID
10	Administration	200	1700
20	Marketing	201	1800
50	Shipping	124	1500
60	IT	103	1400
80	Sales	149	2500

...

PRIMARY KEY

EMPLOYEES

EMPLOYEE_ID	LAST_NAME	DEPARTMENT_ID
100	King	90
101	Kochhar	90
102	De Haan	90
103	Hunold	60
104	Ernst	60
107	Lorentz	60

...

FOREIGN KEY

INSERT INTO

200	Ford	9
201	Ford	60

Not allowed (9 does not exist)

Allowed

The FOREIGN KEY Constraint

Defined at either the table level or the column level:

```
CREATE TABLE employees(
    employee_id      NUMBER(6),
    last_name        VARCHAR2(25) NOT NULL,
    email            VARCHAR2(25),
    salary           NUMBER(8,2),
    commission_pct   NUMBER(2,2),
    hire_date        DATE NOT NULL,
...
    department_id    NUMBER(4),
    CONSTRAINT emp_dept_fk FOREIGN KEY (department_id)
      REFERENCES departments(department_id),
    CONSTRAINT emp_email_uk UNIQUE(email));
```

FOREIGN KEY Constraint Keywords

- **FOREIGN KEY: Defines the column in the child table at the table constraint level**
- **REFERENCES: Identifies the table and column in the parent table**
- **ON DELETE CASCADE: Deletes the dependent rows in the child table when a row in the parent table is deleted.**
- **ON DELETE SET NULL: Converts dependent foreign key values to null**

The CHECK Constraint

- Defines a condition that each row must satisfy
- The following expressions are not allowed:
  - References to CURRVAL, NEXTVAL, LEVEL, and ROWNUM pseudocolumns
  - Calls to SYSDATE, UID, USER, and USERENV functions
  - Queries that refer to other values in other rows

```
..., salary   NUMBER(2)
     CONSTRAINT emp_salary_min
                CHECK (salary > 0),...
```

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
ADD [CONSTRAINT constraint] type (column);
```

Adding a Constraint

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

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

Dropping a Constraint

- **Remove the manager constraint from the EMPLOYEES table.**

```
ALTER TABLE       employees
DROP CONSTRAINT   emp_manager_fk;
Table altered.
```

- **Remove the PRIMARY KEY constraint on the DEPARTMENTS table and drop the associated FOREIGN KEY constraint on the EMPLOYEES.DEPARTMENT_ID column.**

```
ALTER TABLE       departments
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          employees
DISABLE CONSTRAINT   emp_emp_id_pk CASCADE;
Table altered.
```

Enabling Constraints

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

```
ALTER TABLE          employees
ENABLE CONSTRAINT    emp_emp_id_pk;
Table altered.
```

- **A UNIQUE or PRIMARY KEY 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 test1
DROP (pk) CASCADE CONSTRAINTS;
Table altered.
```

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

Viewing Constraints

Query the `USER_CONSTRAINTS` table to view all constraint definitions and names.

```
SELECT constraint_name, constraint_type,
       search_condition
FROM   user_constraints
WHERE  table_name = 'EMPLOYEES';
```

CONSTRAINT_NAME	C	SEARCH_CONDITION
EMP_LAST_NAME_NN	C	"LAST_NAME" IS NOT NULL
EMP_EMAIL_NN	C	"EMAIL" IS NOT NULL
EMP_HIRE_DATE_NN	C	"HIRE_DATE" IS NOT NULL
EMP_JOB_NN	C	"JOB_ID" IS NOT NULL
EMP_SALARY_MIN	C	salary > 0
EMP_EMAIL_UK	U	

...

Viewing the Columns Associated with Constraints

View the columns associated with the constraint names in the `USER_CONS_COLUMNS` view.

```
SELECT constraint_name, column_name
FROM   user_cons_columns
WHERE  table_name = 'EMPLOYEES';
```

CONSTRAINT_NAME	COLUMN_NAME
EMP_DEPT_FK	DEPARTMENT_ID
EMP_EMAIL_NN	EMAIL
EMP_EMAIL_UK	EMAIL
EMP_EMP_ID_PK	EMPLOYEE_ID
EMP_HIRE_DATE_NN	HIRE_DATE
EMP_JOB_FK	JOB_ID
EMP_JOB_NN	JOB_ID

...

Summary

In this lesson, you should have learned how to create constraints.

- **Types of constraints:**
  - `NOT NULL`
  - `UNIQUE`
  - `PRIMARY KEY`
  - `FOREIGN KEY`
  - `CHECK`
- **You can query the `USER_CONSTRAINTS` table to view all constraint definitions and names.**


Thank You !