What Is a View?

You can present logical subsets or combinations of data by creating views of tables. A view is a logical table based on a table or another view. A view contains no data of its own but is like a window through which data from tables can be viewed or changed. The tables on which a view is based are called base tables. The view is stored as a SELECT statement in the data dictionary.

Advantages of Views

- Views restrict access to the data because the view can display selective columns from the table.
- Views can be used to make simple queries to retrieve the results of complicated queries. For example, views can be used to query information from multiple tables without the user knowing how to write a join statement.
- Views provide data independence for ad hoc users and application programs. One view can be used to retrieve data from several tables.
- Views provide groups of users access to data according to their particular criteria.

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 within 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.**

In the syntax:

`OR REPLACE`	re-creates the view if it already exists
`FORCE`	creates the view regardless of whether or not the base tables exist
`NOFORCE`	creates the view only if the base tables exist (This is the default.)
`view`	is the name of the view
`alias`	specifies names for the expressions selected by the view's query (The number of aliases must match the number of expressions selected by the view.)
`subquery`	is a complete `SELECT` statement (You can use aliases for the columns in the `SELECT` list.)
`WITH CHECK OPTION`	specifies that only rows accessible to the view can be inserted or updated
`constraint`	is the name assigned to the `CHECK OPTION` constraint
`WITH READ ONLY`	ensures that no DML operations can be performed on this view

- **Create a view, `EMPVU80`, that contains details of employees in department 80.**

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

- **Describe the structure of the view by using the *i*SQL*Plus `DESCRIBE` command.**

```
DESCRIBE empvu80
```

The example in the slide creates a view that contains the employee number, last name, and salary for each employee in department 80.

You can display the structure of the view by using the *i*SQL*Plus `DESCRIBE` command.

Name	Null?	Type
EMPLOYEE_ID	NOT NULL	NUMBER(6)
LAST_NAME	NOT NULL	VARCHAR2(25)
SALARY		NUMBER(8,2)

Guidelines for creating a view:

- The subquery that defines a view can contain complex `SELECT` syntax, including joins, groups, and subqueries.
- The subquery that defines the view cannot contain an `ORDER BY` clause. The `ORDER BY` clause is specified when you retrieve data from the view.
- If you do not specify a constraint name for a view created with the `WITH CHECK OPTION`, the system assigns a default name in the format `SYS_Cn`.
- You can use the `OR REPLACE` option to change the definition of the view without dropping and re-creating it or regranting object privileges previously granted on it.

- **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;
View created.
```

- **Select the columns from this view by the given alias names.**

As an alternative, you can use an alias after the `CREATE` statement and prior to the `SELECT` subquery. The number of aliases listed must match the number of expressions selected in the subquery.

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

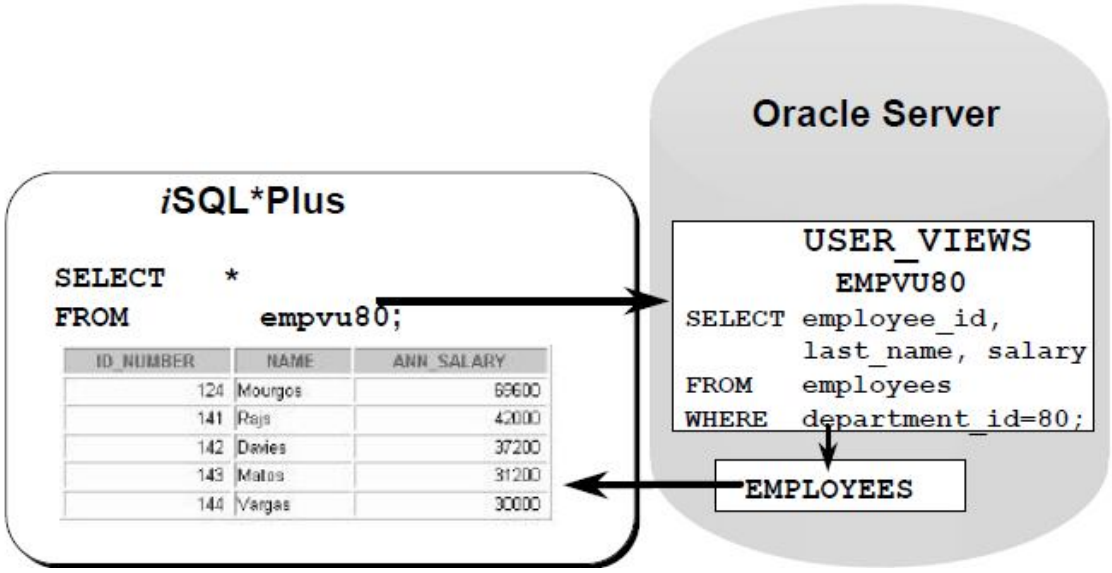
Retrieving Data from a View

```
SELECT *
FROM  salvu50;
```

ID_NUMBER	NAME	ANN_SALARY
124	Mourgos	69600
141	Rajs	42000
142	Davies	37200
143	Matos	31200
144	Vargas	30000

You can retrieve data from a view as you would from any table. You can display either the contents of the entire view or just specific rows and columns.

Querying a View



Views in the Data Dictionary

Once your view has been created, you can query the data dictionary view called `USER_VIEWS` to see the name of the view and the view definition. The text of the `SELECT` statement that constitutes your view is stored in a `LONG` column.

Data Access Using Views

When you access data using a view, the Oracle Server performs the following operations:

1. It retrieves the view definition from the data dictionary table `USER_VIEWS`.
2. It checks access privileges for the view base table.
3. It converts the view query into an equivalent operation on the underlying base table or tables. In other words, data is retrieved from, or an update is made to, the base tables.

Modifying a View

- Modify the EMPVU80 view by using 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;
View created.
```

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

With the OR REPLACE option, a view can be created even if one exists with this name already, thus replacing the old version of the view for its owner. This means that the view can be altered without dropping, re-creating, and regranting object privileges.

Note: When assigning column aliases in the CREATE VIEW clause, remember that the aliases 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 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, departments d
   WHERE     e.department_id = d.department_id
   GROUP BY  d.department_name;
View created.
```

The example in the slide creates a complex view of department names, minimum salaries, maximum salaries, and average salaries by department. Note that alternative names have been specified for the view. This is a requirement if any column of the view is derived from a function or an expression.

You can view the structure of the view by using the *i*SQL*Plus `DESCRIBE` command. Display the contents of the view by issuing a `SELECT` statement.

```
SELECT   *
FROM     dept_sum_vu;
```

NAME	MINSAL	MAXSAL	AVGSAL
Accounting	8300	12000	10150
Administration	4400	4400	4400
Executive	17000	24000	19333.3333
IT	4200	9000	6400
Marketing	6000	13000	9500
Sales	8600	11000	10033.3333
Shipping	2500	5800	3500

Rules for Performing DML Operations on a View

- You can 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 DML Operations on a View

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

You can modify data through a view unless it contains any of the conditions mentioned in the previous slide or columns defined by expressions: for example, `SALARY * 12`.

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 within 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;
View created.
```

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

It is possible to perform referential integrity checks through views. You can also enforce constraints at the database level. The view can be used to protect data integrity, but the use is very limited.

The WITH CHECK OPTION clause specifies that INSERTs and UPDATEs performed through the view cannot create rows which the view cannot select, and therefore it allows integrity constraints and data validation checks to be enforced on data being inserted or updated.

If there is an attempt to perform DML operations on rows that the view has not selected, an error is displayed, with the constraint name if that has been specified.

```
UPDATE empvu20
  SET    department_id = 10
  WHERE employee_id = 201;
UPDATE empvu20
       *
ERROR at line 1:
ORA-01402: view WITH CHECK OPTION where-clause violation
```

Note: No rows are updated because if the department number were to change to 10, the view would no longer be able to see that employee. Therefore, with the WITH CHECK OPTION clause, the view can see only employees in department 20 and does not allow the department number for those employees to be changed through the view.

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 on any row in the view results in an Oracle server error.

```
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;
View created.
```

Any attempts to remove a row from a view with a read-only constraint results in an error.

```
DELETE FROM empvu10
  WHERE employee_number = 200;
DELETE FROM empvu10
          *
ERROR at line 1:
ORA-01752: cannot delete from view without exactly one key-
preserved table
```

Any attempts to insert a row or modify a row using the view with a read-only constraint results in the following Oracle Server error:

```
01733: virtual column not allowed here.
```

Removing a View

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

In the syntax:

view is the name of the view

```
DROP VIEW view;
```

```
DROP VIEW empvu80;
View dropped.
```

You use the DROP VIEW statement to remove a view. The statement removes the view definition from the database. Dropping views has no effect on the tables on which the view was based. Views or other applications based on deleted views become invalid. Only the creator or a user with the DROP ANY VIEW privilege can remove a view.

Inline Views

- **An inline view is a subquery with an alias (or correlation name) that you can use within a SQL statement.**
- **A named subquery in the FROM clause of the main query is an example of an inline view.**
- **An inline view is not a schema object.**

An inline view is created by placing a subquery in the FROM clause and giving that subquery an alias. The subquery defines a data source that can be referenced in the main query. In the following example, the inline view b returns the details of all department numbers and the maximum salary for each department from the EMPLOYEES table. The WHERE a.department_id = b.department_id AND a.salary < b.maxsal clause of the main query displays employee names, salaries, department numbers, and maximum salaries for all the employees who earn less than the maximum salary in their department.

```
SELECT  a.last_name, a.salary, a.department_id, b.maxsal
FROM    employees a, (SELECT   department_id, max(salary) maxsal
                      FROM     employees
                      GROUP BY department_id) b
WHERE   a.department_id = b.department_id
AND     a.salary < b.maxsal;
```

LAST_NAME	SALARY	DEPARTMENT_ID	MAXSAL
Fay	6000	20	13000
Rajs	3500	50	5800
Davies	3100	50	5800
Gietz	[illegible]	[illegible]	[illegible]00

12 rows selected.

Top-*n* Analysis

- **Top-*n* queries ask for the *n* largest or smallest values of a column. For example:**
  - **What are the ten best selling products?**
  - **What are the ten worst selling products ?**
- **Both largest values and smallest values sets are considered top-*n* queries.**

Top-*n* queries are useful in scenarios where the need is to display only the *n* top-most or the *n* bottommost records from a table based on a condition. This result set can be used for further analysis. For example using top-*n* analysis you can perform the following types of queries:

- The top three earners in the company
- The four most recent recruits in the company
- The top two sales representatives who have sold the maximum number of products
- The top three products that have had the maximum sales in the last six months

Performing Top-*n* Analysis

The high-level structure of a top-*n* analysis query is:

```
SELECT [column_list], ROWNUM
FROM   (SELECT [column_list]
        FROM table
        ORDER  BY Top-N_column)
WHERE  ROWNUM <=  N;
```

Top-*n* queries use a consistent nested query structure with the elements described below:

- A subquery or an inline view to generate the sorted list of data. The subquery or the inline view includes the `ORDER BY` clause to ensure that the ranking is in the desired order. For results retrieving the largest values, a `DESC` parameter is needed.
- An outer query to limit the number of rows in the final result set. The outer query includes the following components:
  - The `ROWNUM` pseudocolumn, which assigns a sequential value starting with 1 to each of the rows returned from the subquery.
  - A `WHERE` clause, which specifies the *n* rows to be returned. The outer `WHERE` clause must use a < or <= operator.

Example of Top-*n* Analysis

To display the top three earner names and salaries from the EMPLOYEES table.

```
SELECT ROWNUM as RANK, last_name, salary
FROM  (SELECT last_name,salary FROM employees
       ORDER BY salary DESC)
WHERE ROWNUM <= 3;
```

RANK	LAST_NAME	SALARY
1	King	24000
2	Kochhar	17000
3	De Haan	17000

Here is another example of top-*n* analysis that uses an inline view. The example below uses the inline view `E` to display the four most senior employees in the company.

```
SELECT ROWNUM as SENIOR,E.last_name, E.hire_date
FROM  (SELECT last_name,hire_date FROM employees
       ORDER BY hire_date)E
WHERE rownum <= 4;
```

SENIOR	LAST_NAME	HIRE_DATE
1	King	17-JUN-87
2	Whalen	17-SEP-87
3	Kochhar	21-SEP-89
4	Hunold	03-JAN-90

ASSIGNMENTS

1. Create a view called `EMPLOYEES_VU` based on the employee numbers, employee names, and department numbers from the `EMPLOYEES` table. Change the heading for the employee name to `EMPLOYEE`.
2. Display the contents of the `EMPLOYEES_VU` view.

EMPLOYEE_ID	EMPLOYEE	DEPARTMENT_ID
100	King	90
101	Kochhar	90
102	De Haan	90
103	Hunold	60
104	Ernst	60
107	Lorentz	60
206	Gietz	110

20 rows selected.

3. Select the view name and text from the `USER_VIEWS` data dictionary view.

   Note: Another view already exists. The `EMP_DETAILS_VIEW` was created as part of your schema.

   Note: To see more contents of a `LONG` column, use the *i*SQL*Plus command `SET LONG n`, where *n* is the value of the number of characters of the `LONG` column that you want to see.

VIEW_NAME	TEXT
EMPLOYEES_VU	SELECT employee_id, last_name employee, department_id FROM employees
EMP_DETAILS_VIEW	SELECT e.employee_id, e.job_id, e.manager_id, e.department_id, d.location_id, l.country_id, e.first_name, e.last_name, e.salary, e.commission_pct, d.department_name, j.job_title, l.city, l.state_province, c.country_name, r.region_name FROM employees e, departments d, jobs j, locations l, countries c, regions r WHERE e.department_id = d.department_id AND d.location_id = l.location_id AND l.country_id = c.country_id AND c.region_id = r.region_id AND j.job_id = e.job_id WITH READ ONLY

4. Using your `EMPLOYEES_VU` view, enter a query to display all employee names and department numbers.

EMPLOYEE	DEPARTMENT_ID
King	90
Kochhar	90
De Haan	90
Gietz	110

20 rows selected.

5. Create a view named `DEPT50` that contains the employee numbers, employee last names, and department numbers for all employees in department 50. Label the view columns `EMPNO`, `EMPLOYEE`, and `DEPTNO`. Do not allow an employee to be reassigned to another department through the view.
6. Display the structure and contents of the `DEPT50` view.

Name	Null?	Type
EMPNO	NOT NULL	NUMBER(6)
EMPLOYEE	NOT NULL	VARCHAR2(25)
DEPTNO		NUMBER(4)

EMPNO	EMPLOYEE	DEPTNO
124	Mourgos	50
141	Rajs	50
142	Davies	50
143	Matos	50
144	Vargas	50

7. Attempt to reassign Matos to department 80.

If you have time, complete the following exercise:

8. Create a view called `SALARY_VU` based on the employee last names, department names, salaries, and salary grades for all employees. Use the `EMPLOYEES`, `DEPARTMENTS`, and `JOB_GRADES` tables. Label the columns `Employee`, `Department`, `Salary`, and `Grade`, respectively.