Security – Views

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An introduction

Tables and views are database objects

Table – basic unit of storage; composed of rows and columns

View – logically represents subsets of data from one or more tables

What is a View?

- A view is a logical (*virtual*) table based on a table or another view.
- A view contains no data of its own.
- The tables on which a view is based are called base tables.

Why use Views?

- Views restrict access to the data because the view can display selective columns from the table – data hiding
- Used to make simple queries to retrieve the results of complicated queries – simplified query formulations
- Views can provide logical data independence

Creating a View

- Embed a subquery within the CREATE VIEW statement.

```
CREATE [OR REPLACE] VIEW view_name
[(alias[, alias]...)]
AS subquery
[WITH CHECK OPTION [CONSTRAINT constraint]]
```

- The subquery can contain complex SELECT syntax.

Creating a View

- Create a view, that contains details of employees in department 50

```
CREATE VIEW empvu
AS SELECT employee_id,last_name,salary
   FROM employees
   WHERE department_id=50;
```

- The structure of view can be viewd by DESC.

Guidelines – Creating a View

- The subquery that defines a view can contain complex SELECT syntax – Joins, Groups and subqueries.
- The subquery that defines the view cannot contain an ORDER BY clause.
- Use the OR REPLACE option to change the definition of the view.

Creating a View using column alias

- The number of aliases must match the number of expressions selected in the subquery

```
CREATE VIEW salvu (ID_NUMBER, NAME, ANN_SAL)
AS SELECT employee_id,last_name,salary*12
   FROM employees
   WHERE department_id=50;
```

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

Example Relational Scheme with RIC

- student(<u>rollNo</u>, name, degree, year, sex, deptNo, advisor)
- department(<u>deptId</u>, name, hod, phone)
- professor(<u>empId</u>, name, sex, startYear, deptNo, phone)
- course(<u>courseId</u>, cname, credits, deptNo)

Creating a View – using complex SELECT clause

- Create a view which contains name, employeeId and phone number of professors who joined before 2005, and working for CSE dept.

```
CREATE VIEW profBef05 (EMP_ID, NAME, CONTACT)
AS(SELECT empId, p.name, phone
   FROM professor p, department d
   WHERE p.deptNo = d.deptId
   AND d.name = 'CSE'
   AND p.startYear < 2005 );
```

Querying on Views

- Querying is allowed in views as like in base table.
- *Obtain names of professors in CSE dept, who joined before 2005 and whose name starts with 'Ram'*

```
SELECT name
FROM profBef05
WHERE name LIKE 'Ram%';
```

Operations on View

- View definition is stored in data dictionary table.
- Update operations are usually restricted:

because - updates on a view may modify *many base tables*.

- there may not be a *unique way of updating* the base tables to reflect the updates on view.
- view may contain some *aggregate values*.
- ambiguity where *primary key of a base table is not included* in view definition.

Restrictions on Updating Views (1/3)

- Updates on views defined on joining of more than one table are not allowed.
- *Create a view prof_Dept with professor ID, department Name and department phone*

```
CREATE VIEW prof_Dept (PROF_ID, D_NAME, D_PHONE)
AS(SELECT p.empId, d.name, d.phone
   FROM professor p, department d
   WHERE p.deptNo = d.deptId
 );
```

Restrictions on Updating Views (2/3)

- Updates on views defined with GROUP BY clause and aggregate functions is not permitted, as a tuple in view will not have a corresponsing tuple in base relation.
- *Create a view Dept_Totcredit which contains total credits offered by a dept.*

```
CREATE VIEW Dept_Totcredit (DEPTNO, TOT_CREDIT)
AS(SELECT deptNo,SUM(credits)
   FROM course
   GROUP BY deptNo
 );
```

Restrictions on Updating Views (3/3)

- Updates on views which do not include primary key of base table, are also not permitted.
- *Create a view Stud_Phone with student name and degree*

```
CREATE VIEW Stud_Phone
AS (SELECT name, degree FROM student
 );
```

View does not contains PK(rollNo)

Allowed Updates on Views

- The view-defining table expression is a simple select expression (not contains JOIN, set operators).
- The SELECT clause of select expression does not contain the DISTINCT keyword.
- The FROM clause of that select expression contains exactly <u>one table</u> reference.
- That table reference identifies either a <u>base table or a view</u> that satisfies conditions.
- The select expression does not include aggregate functions, a GROUP BY clause.

Using WITH CHECK OPTION

- The WITH CHECK OPTION specifies that INSERTs and UPDATEs on the view will be rejected if they violate any integrity constraint implied by the view-defining expression.

```
CREATE VIEW emp_20
AS(SELECT *
   FROM professor
   WHERE deptNo = 20
   WITH CHECK OPTION CONSTRAINT emp20_ck
 );
```

Removing a View

- An existing view can be dropped by means of DROP VIEW syntax:

```
DROP VIEW view_name;

DROP VIEW emp_20;
```

- Dropping view has no effect on the tables on which the view was based.
- Views or other applications based on deleted views become invalid.

References

An Introduction to Database Systems, *CJ.Date*

Fundamentals of Database Systems, *Elmasri and Navathe*