

SQL – Views

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Bases de Dados

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Based on Jennifer Widom slides

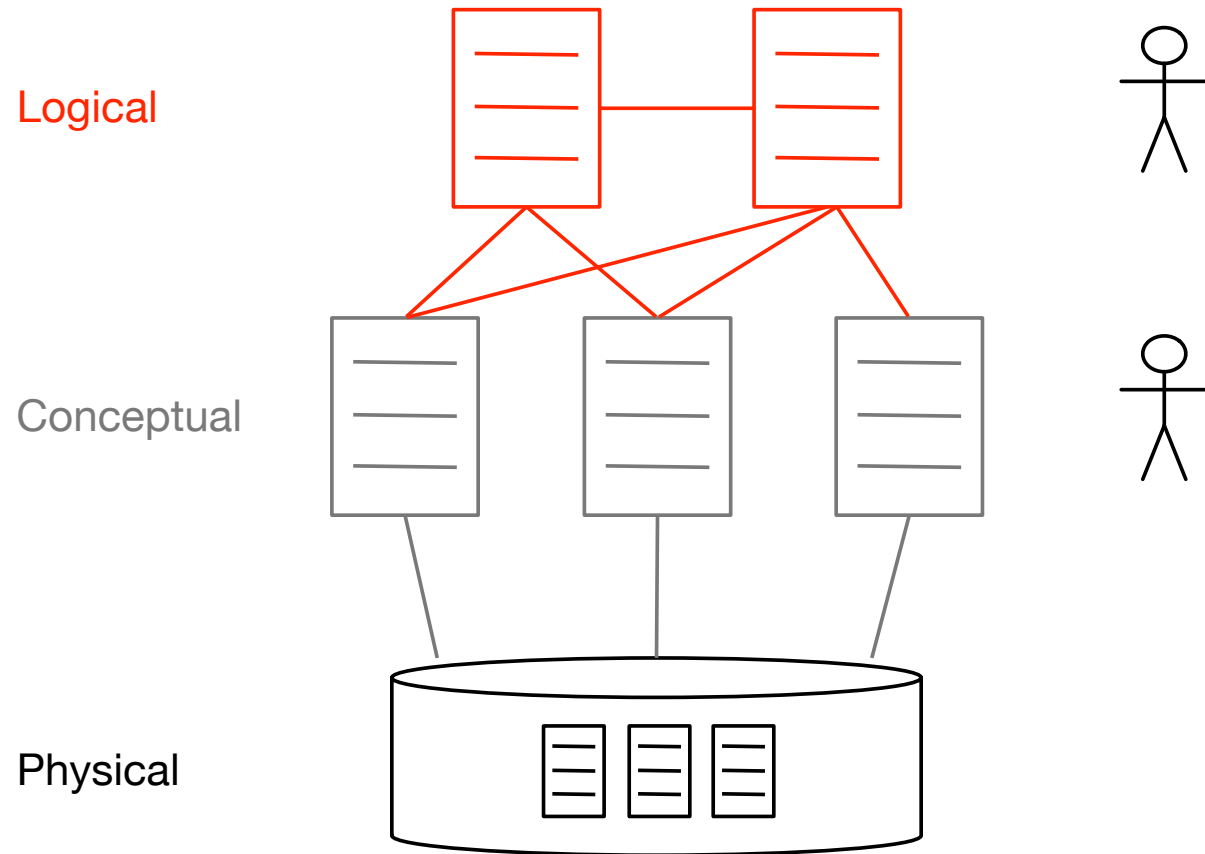
Agenda

Defining and Using Views

Views Modifications Introduction

Views Modification Using Triggers

Three-level vision of database



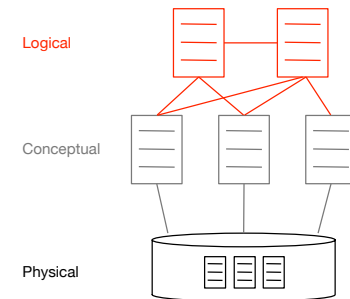
Why use views?

Hide some data from some users

Make some queries easier / more natural

Modularity of database access

Real applications tend to use lots and lots of views



Defining and using views

View $V = \text{ViewQuery}(R_1, R_2, \dots, R_n)$

Schema of V is schema of query result

Query Q involving V , conceptually:

$V := \text{ViewQuery}(R_1, R_2, \dots, R_n)$

Evaluate Q

In reality, Q rewritten to use R_1, \dots, R_n instead of V



Performed
automatically
by the DBMS

R_i could itself be a view

SQL Syntax

Create View **Vname** As

<Query>

Create View **Vname(A₁,A₂,...,A_n)** As

<Query>

Once the view is created, it can be used as if it is a regular table

College Admission Database

Apply

<u>sID</u>	<u>cName</u>	<u>major</u>	<u>dec</u>
123	Stanford	CS	Y
123	Stanford	EE	N
123	Berkeley	CS	Y
123	Cornell	EE	Y
234	Berkeley	biology	N
345	MIT	bioengineering	Y
345	Cornell	bioengineering	N
345	Cornell	CS	Y
345	Cornell	EE	N
678	Stanford	history	Y
987	Stanford	CS	Y
987	Berkeley	CS	Y
876	Stanford	CS	Y
876	MIT	biology	Y
876	MIT	marine biology	N
765	Stanford	history	Y
765	Cornell	history	N
765	Cornell	psychology	Y
543	MIT	CS	N

College

<u>cName</u>	<u>state</u>	<u>enr</u>
Stanford	CA	15000
Berkeley	CA	36000
MIT	MA	10000
Cornell	NY	21000

Student

<u>sID</u>	<u>sName</u>	<u>GPA</u>	<u>HS</u>
123	Amy	3.9	1000
234	Bob	3.6	1500
345	Craig	3.5	500
456	Doris	3.9	1000
567	Edward	2.9	2000
678	Fay	3.8	200
789	Gary	3.4	800
987	Helen	3.7	800
876	Irene	3.9	400
765	Jay	2.9	1500
654	Amy	3.9	1000
543	Craig	3.4	2000

View 1

Create View CSaccept As

Select sID, cName

From Apply

Where major = 'CS' and dec = 'Y';

Select *
From CSaccept



sID	cName
123	Stanford
123	Berkeley
345	Cornell
987	Stanford
987	Berkeley



View is actually not stored, query is rewritten based on the view definition

A query using View 1

Select Student.sID, sName, GPA

From Student, CSaccept

Where Student.sID = Csaccept.sID and cName = 'Stanford' and
GPA < 3.8;

sID	sName	gpa
987	Helen	3.7

What happens when we
run a query that refers to
a view?

A query using View 1 – conceptual analysis

Create temporary table T as

Select sID, cName

From Apply

Where major = 'CS' and dec= 'Y';

sID	sName	gpa
987	Helen	3.7

Select Student.sID, sName, GPA

From Student, T

Where Student.sID = T.sID and cName = 'Stanford' and GPA < 3.8;

Drop table T;

A query using View 1 – practical analysis

Select Student.sID, sName, GPA

From Student,

(**Select** sID, cName

From Apply

Where major = 'CS' and dec= 'Y') as CSaccept

Where Student.sID = CSaccept.sID and cName = 'Stanford' and
GPA < 3.8;



Not how the systems
tend to do it either

sID	sName	gpa
987	Helen	3.7

A query using View 1 – practical analysis

Select Student.sID, sName, GPA

From Student, Apply

Where major = 'CS' and dec= 'Y' and Student.sID = Apply.sID and
cName = 'Stanford' and GPA < 3.8;

sID	sName	gpa
987	Helen	3.7

View 2 – a view using other view

Create View CSberk As

Select Student.sID, sName, GPA

From Student, CSaccept

Where Student.sID = Csaccept.sID and cName = 'Berkeley' and HS > 500;

Select *

From CSberk



sID	sName	gpa
123	Amy	3.9
987	Helen	3.7

A query using View 2

Select *

From CSberk

Where GPA > 3.8;

sID	sName	gpa
123	Amy	3.9

What happens when we run a query that refers to a view?

A query using View 2 – rewrite process

select * **from**

(**select** Student.sID, sName, GPA

from Student, (**select** sID, cName **from** Apply

where major = 'CS' and dec = 'Y') **as** CSaccept

where Student.sID = CSaccept.sID and cName = 'Berkeley' and HS
> 500) CSberk

where GPA > 3.8;



What would be the
flattened rewrite of this
query?

sID	sName	gpa
123	Amy	3.9

View 2 – dropping View 1

drop view CSaccept;

What happens?

Postgres: Error - other objects depend on it

SQLite/MySQL: no error on drop; error when we refer to CSberk

View 3

Create View Mega As

```
Select College.cName, state, enr, Student.sID, sName, GPA, HS,  
major, dec
```

From College, Student, Apply

Where College.cName = Apply.cName and Student.sID = Apply.sID;

Select *

From Mega;

[illegible]

A query using View 3

Select sID, sName, GPA, cName

From Mega

Where GPA > 3.5 and major = 'CS' and enr > 15000;

sID	sName	gpa	cName
123	Amy	3.9	Berkeley
987	Helen	3.7	Berkeley

View 3 rewritten

Select Student.sID, sName, GPA, College.cName

From College, Student, Apply

Where College.cName = Apply.cName and Student.sID = Apply.sID
and GPA > 3.5 and major = 'CS' and enr > 15000;

sID	sName	gpa	cName
123	Amy	3.9	Berkeley
987	Helen	3.7	Berkeley

Agenda

~~Defining and Using Views~~

Views Modifications Introduction

Views Modification Using Triggers

Modifying views

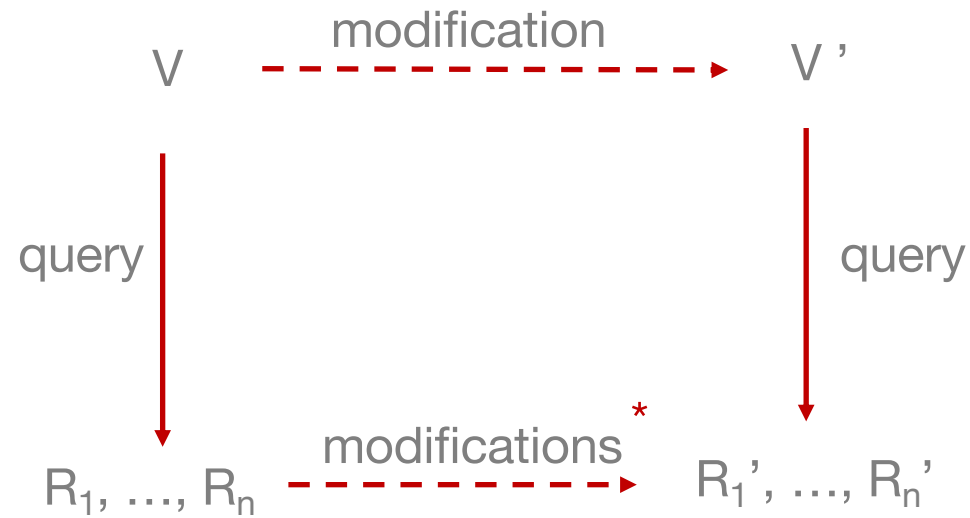
Once view V defined, can we modify V like any table ?

Doesn't make sense: V is not stored

Has to make sense: views are some users' entire "view" of the database

Solution: Modifications to V rewritten to modify base tables

Modifying base tables

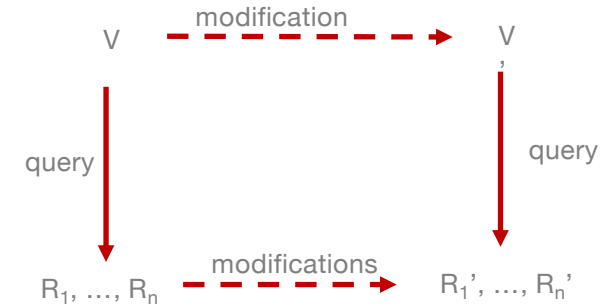


Can we always
perform the
modifications * so
the diagram holds?

Usually, yes

Problems with modifying base tables

Often, there are many possible modifications



$R(A,B)$

$V = \pi_A(R)$

(1,2)

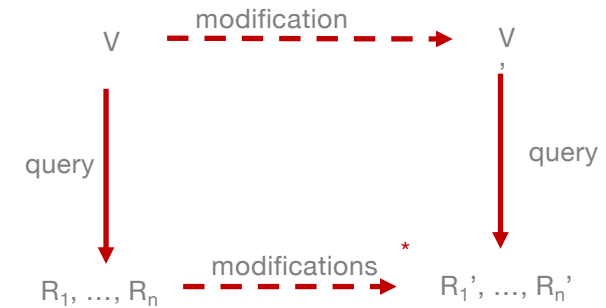
(1)

(3) ← insert

What modifications will be done on R? What do we insert on B?

Problems with modifying base tables

Often, there are many possible modifications



$R(N)$

$V = avg(N)$

(1)

(3) ← update to 7

(3)

(5)

What modifications will be done on R ? There are many options.



Unlike queries, modifications cannot be automated in general

Modifying views

Rewriting process specified explicitly by view creator

- + Can handle all modifications
 - No guarantee of correctness (or meaningful)
- Instead-of triggers

Restrict views + modifications so that translation to base table modifications is meaningful and unambiguous

- + No user intervention
 - Restrictions are significant
- SQL standard

Kahoot time!

Any doubts?

Readings

Jeffrey Ullman, Jennifer Widom, A first course in
Database Systems 3rd Edition

Section 8.1 – Virtual Views

Section 8.2 – Modifying Views