Views

DSCI 551

Wensheng Wu

Example (ETL)

- insert into W(time, tweet, stock)
- select T.time, tweet_content, stock * 200
- from ds1.T join ds2.S on T.time = S.timestamp

- Create materialized view W(time, tweet, stock)
- As select T.time, tweet_content, stock * 200
- from ds1.T join ds2.S on T.time = S.timestamp
- <refreshing policy>

Views

- A view is a “virtual table,” a relation that is defined in terms of the contents of other tables and views.
- Declare by:

  CREATE VIEW <name> AS <query>;
- In contrast, a relation whose value is really stored in the database is called a *base table*.

Example: View Definition

- CanDrink(drinker, beer) is a view "containing" the drinker-beer pairs such that the drinker frequents at least one bar that serves the beer.
- Recall Frequents(drinker, bar), Sells(bar, beer, price)

```
CREATE VIEW CanDrink AS
SELECT distinct drinker, beer
FROM Frequents, Sells
WHERE Frequents.bar = Sells.bar;
```

Example: Accessing a View

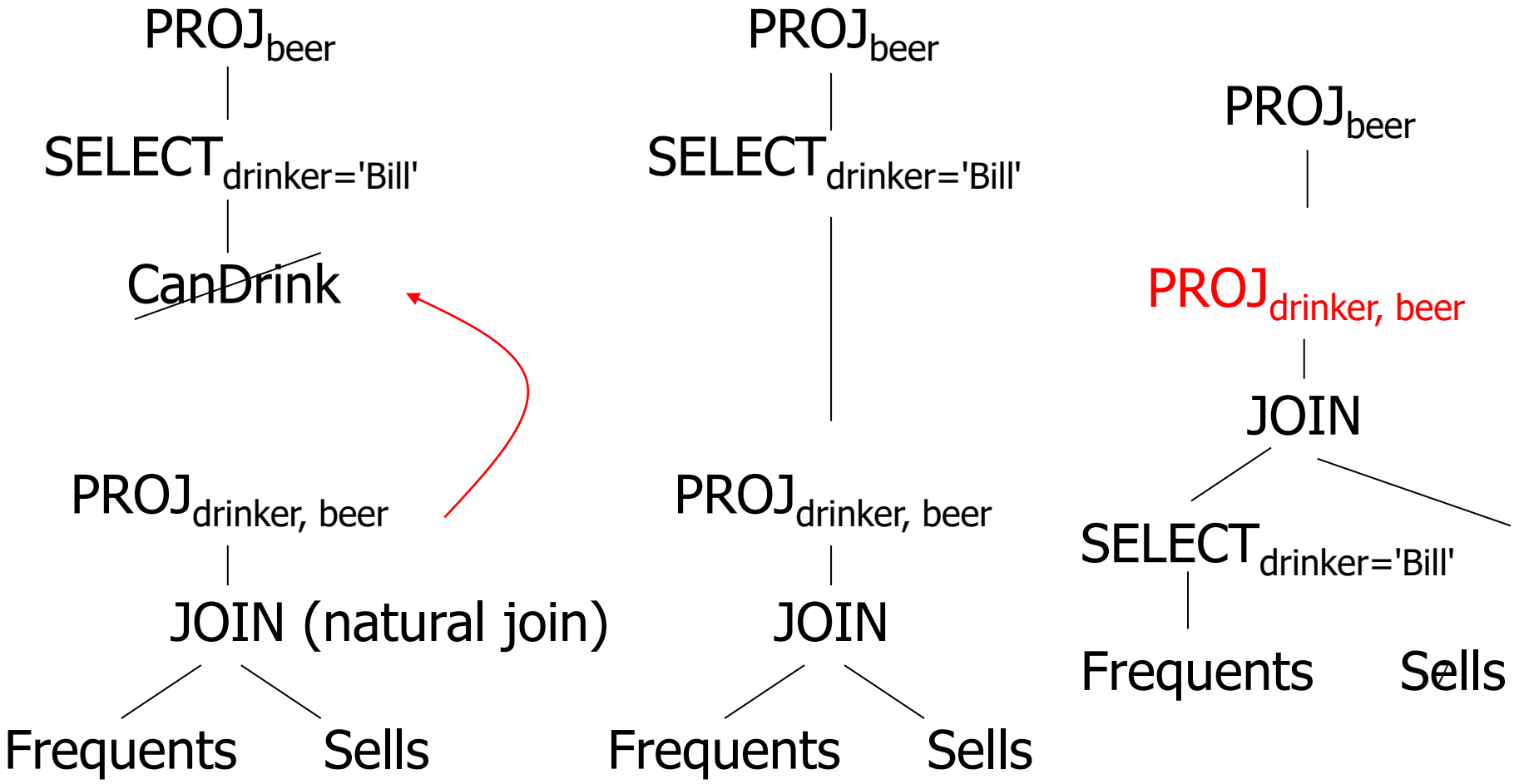
- You may query a view as if it were a base table.
  - There is a limited ability to modify views if the modification makes sense as a modification of the underlying base table.
- Example:

```
select beer from CanDrink
where drinker = 'Bill';
```

What Happens When a View Is Used?

- The DBMS starts by interpreting the query as if the view were a base table.
  - Typical DBMS turns the query into something like relational algebra.
- The queries defining any views used by the query are also replaced by their algebraic equivalents, and “spliced into” the expression tree for the query.

Example: View Expansion

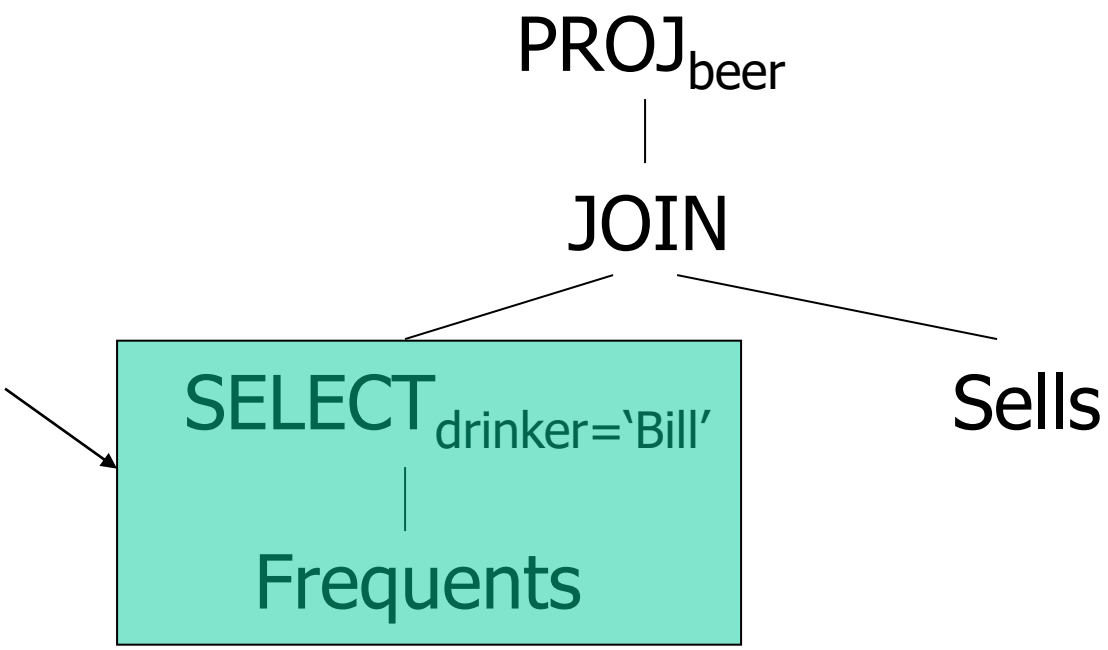


DMBS Optimization

- It is interesting to observe that the typical DBMS will then “optimize” the query by transforming the algebraic expression to one that can be executed faster.
- Key optimizations:
  1. Push selections down the tree.
  2. Eliminate unnecessary projections.

Example: Optimization

Notice how most tuples are eliminated from Frequents before the expensive join.



More Examples: Defining Views

Views are relations, except that they are not physically stored.

Can be used for presenting different information to different users

Employee(ssn, name, department, project, salary)

```
CREATE VIEW  Developers AS
   SELECT name, project
   FROM  Employee
   WHERE department = 'Development'
```

Payroll has access to all Employees, others only to Developers

A Different View

Purchase(buyer, seller, product, store, price) 1000 rows
Product(name, maker, category) 100 rows
Person(name, city, phone)

|Purchase Join Product| = 900?

```
CREATE VIEW  LA-view  AS

        SELECT  buyer, seller, product, store
        FROM    Person, Purchase
        WHERE   Person.city = 'LA'    AND
                Person.name = Purchase.buyer
```

We have a new virtual table:
LA-view(buyer, seller, product, store)

A Different View

LA-view(buyer, seller, product, store)

We can later use the view:

```
SELECT   name, store
FROM     LA-view, Product
WHERE    LA-view.product = Product.name  AND
         Product.category = 'shoes'
```

What Happens When We Query a View ?

Recall: LA-view(buyer, seller, product, store)

```
SELECT   name, LA-view.store
FROM     LA-view, Product
WHERE    LA-view.product = Product.name  AND
         Product.category = 'shoes'
```

View expansion

```
SELECT  name, Purchase.store
FROM    Person, Purchase, Product
WHERE   Person.city = 'LA'    AND
        Person.name = Purchase.buyer   AND
        Purchase.product = Product.name  AND
        Product.category = 'shoes'
```

Types of Views

- Virtual views:
  - Computed only on-demand – slow at runtime
  - Always up to date
- Materialized views
  - Precomputed offline – fast at runtime
  - Common in data warehouses (data cube)
    - Fact table + dimension tables
  - May have stale data

Reusing a Materialized View

- Suppose I have **only** the result of LAView:

```
SELECT  buyer, seller, product, store
FROM    Person, Purchase
WHERE   Person.city = 'LA'    AND
        Person.name = Purchase.buyer
```

- and I want to answer the query

```
SELECT  buyer, seller
FROM    Person, Purchase
WHERE   Person.city = 'LA'    AND
        Person.name = Purchase.buyer AND
        Purchase.product='gizmo'
```

Can I answer the query using only the view?

Query Rewriting Using Views

Rewritten query:

```
SELECT  buyer, seller
FROM    LAView
WHERE   product= ‘gizmo’
```

Original query:

```
SELECT  buyer, seller
FROM    Person, Purchase
WHERE   Person.city = ‘LA’    AND
        Person.name = Purchase.buyer AND
        Purchase.product=‘gizmo’.
```

Another Example

- I still have **only** the result of LAView:

```
SELECT  buyer, seller, product, store
FROM    Person, Purchase
WHERE   Person.city = 'LA'    AND
                Person.name = Purchase.buyer
```

- but I want to answer the query

```
SELECT  buyer, seller
FROM    Person, Purchase
WHERE   Person.city = 'LA'    AND
                Person.name = Purchase.buyer AND
                Person.phone  LIKE '206 543 %'
```

And Now?

- I still have **only** the result of (slightly different) LAView:

```
SELECT  buyer, seller, product, store
FROM    Person, Purchase, Product
WHERE   Person.city = 'LA'    AND
        Person.name = Purchase.buyer AND
        Purchase.product = Product.name
```

- but I want to answer the query

```
SELECT  buyer, seller
FROM    Person, Purchase
WHERE   Person.city = 'LA' AND
        Person.name = Purchase.buyer
```

And Now?

- I still have **only** the result of view SBS:

```
SELECT  seller, buyer, Sum(Price) sp
FROM    Purchase
WHERE   Purchase.store = 'The Bon'
Group By seller, buyer
```

- but I want to answer the query

```
SELECT  seller, Sum(Price)
FROM    Purchase
WHERE   Purchase.store = 'The Bon'
Group By seller
```

```
Select seller, sum(sp)
From SBS
Group by seller
```

And what if it's the other way around?

Example (OLAP)

Materialized view SBS(seller, buyer, sp)

Seller	Buyer	Sum(price) sp
David	Bill	10
David	Jennifer	20
David	Steve	10
Bill	David	20
Bill	Mary	10

Roll-up

Query:

Seller	Sum(price)
David	?
Bill	?

Finally…

- I still have **only** the result of:

```
SELECT  seller, buyer, Count(*) cnt
FROM    Purchase
WHERE   Purchase.store = 'The Bon'
Group By seller, buyer
```

- but I want to answer the query

```
SELECT  seller, Count(*)
FROM    Purchase
WHERE   Purchase.store = 'The Bon'
Group By seller
```

Example

View SBC(seller, buyer, cnt)

Seller	Buyer	count(*) cnt
David	Bill	2
David	Jennifer	4
David	Steve	2
Bill	David	5
Bill	Mary	2

Query:

Seller	count(*)
David	??
Bill	?

Select se
From SB
Group by