Chapter 8: SQL – Data Managemet

Content:

- Using the data manipulation language in SQL to change data in a database system

Next:

- Physical data organization: indexing

Changes in the database: Insert

Insert of tuples by explicitly giving values:

insert into Students (StudNr, Name)

values (28121, 'Archimedes'), (4711, 'Pythagoras');

Changes in the database: Insert

Insert of tuples via a query

```
insert into attend
    (select StudNr, LectureNr
    from Students, Lectures
    where Title= `Logik´);
```

(Mandatory registration of all students for ‚Logik')

Changes in the database : Insert

Insert of tuples from a file

Database system specific programs, e.g. DB2:

- **Import:**

```
IMPORT FROM studis.tbl OF DEL
INSERT INTO Students;
```

```
Analogously: EXPORT TO studis.tbl OF DEL
             SELECT * FROM Students;
```

- **Load:**

High-Performance alternative to import

Oracle: Load, Datapump, ...

Changes in the Database: delete, update

delete from Students

where Semester > 13;

Note: **delete from** Students;

deletes all tuples from the relation

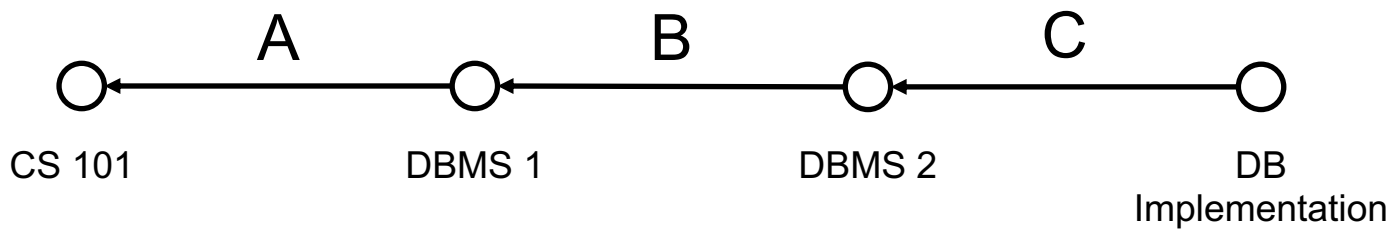
update Students

set Semester= Semester + 1;

Example

```
delete
from Require
where predecessor in
            (select successor
             from Require);
```

	Require	
	predecessor	**successor**
A	CS 101	DBMS 1
B	DBMS 1	DBMS 2
C	DBMS 2	DB Implementation



Changes in two phase

1. Candidates for changes are determined and marked
2. Changes are performed at the marked tuples

Otherwise changes can depend on the order of the tuples.

delete from Require
  where predecessor **in** (**select** successor
    from Require);

Data Definition Language DDL

Changes to the schema

- **drop table** <Table name>
- **alter table** <Table name>
  drop| **add column** <Attribute name> <Data type>
  alter column <Attribute name> **set default** <default>
  …

Further commands vendor specific, e.g. Oracle:

- **alter table** <Table name>
  - **modify** | **add column** <Attribute name> <Data type>
  - **drop column** <Attribute name>
  - **add** | **drop** | **enable** | **disable** <constraint clause>

Views ...

- Belong to DDL:

```
create view <view name> as <select-statement>
create view StudentsSem1 as (select *
                             from Students
                             where semester = 1);
```

- Often used to design queries more clear
- Can be seen as a "virtual relation" or "variable"
- Show an excerpt of the database

Advantages

- Simplify the access for certain user groups
- Can be used to restrict the access to the data

Disadvantages

- Not all (mostly none) views can be modified

Remember this query ??

```
select tmp.StudNr, tmp.Name, tmp.Number_of_Lectures
from (select s.StudNr, s.Name, count(*) as Number_of_Lectures
        from Students s, attend a
        where s.StudNr = a.StudNr
        group by s.StudNr, s.Name)  tmp
where tmp.Number_of_Lectures > 2
```

… alternatively with view

```
create view tmp (StudNr, Name, Number_of_Lectures) as
(select s.StudNr, s.Name, count(*)
        from Students s, attend a
        where s.StudNr=a.StudNr
        group by s.StudNr, s.Name)

select * from tmp where Number_of_Lectures > 2;

drop view tmp;
```

… alternatively with with

```
with tmp (StudNr, Name, Number_of_Lectures) as
(select s.StudNr, s.Name, count(*)
        from Students s, attend a
        where s.StudNr=a.StudNr
        group by s.StudNr, s.Name)

select * from tmp where Number_of_Lectures > 2;
```

→ With creates a temporary table, only valid within the query

Simplifying Queries with Views

Complex query: Names of all professors who give a lecture with more weekly hours than the average weekly hours per lecture and with more than three assistants.

- Not all at once → divide into smaller more concise parts

- These parts can be realized by using views or or named intermediate results (‘with’)

Simplification

1. All professors ids with weekly hours more than the average of weekly hours:

```
create view AboveAverageWeeklyHours as (
        select givenby
        from Lectures
        where WeeklyHours
        > (select avg(WeeklyHours) from Lectures)
);
```

Simplification

2. All professors ids with more than three assistants:

```
create view ManyAssistants as (
        select Boss
        from Assistants
        group by Boss
        having count(*) > 3
);
```

Simplification

- Combine
- Views can be used like common relations

```
select Name
from Professors
where PersNr in (select given_by
                 from AboveAverageWeeklyHours)
  and PersNr in (select Boss
                 from ManyAssistants);
```

Expanding when executed

```
select Name
from Professors
where PersNr in
   (select  Given_by
   from (select Given_by                    AboveAverageWeeklyHours
   from Lectures
   where WeeklyHours >
      (select avg (WeeklyHours)
       from Lectures))) and
          PersNr in
   (select Boss
   from (select Boss
   from Assistants                          ManyAssistants
   group by Boss
   having count(*) > 3));
```

Views ...

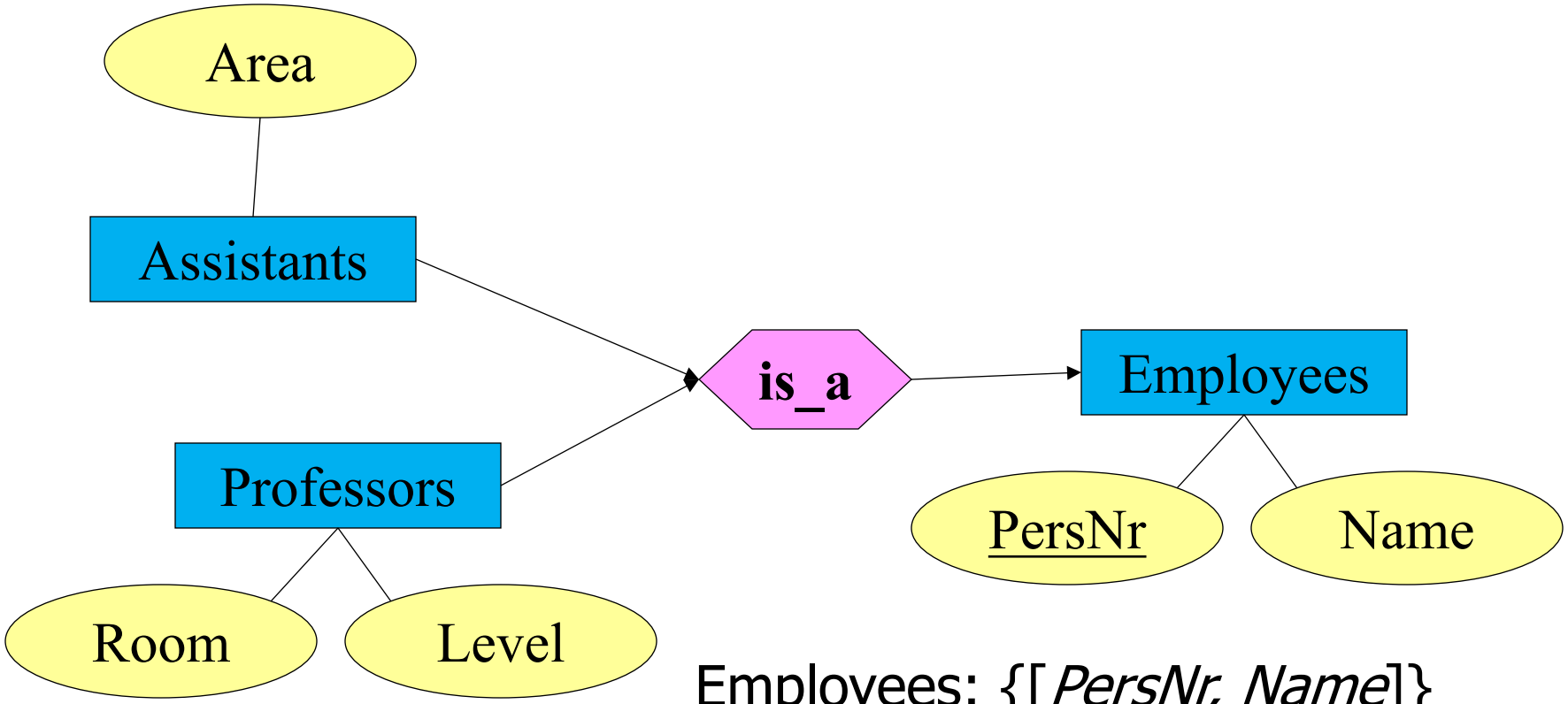
For data privacy

```
create view testView as
    select StudNr, LectureNr, PersNr
    from test
```

For statistics

```
create view TestQual(Name, QualLevel) as
      (select p.Name, avg(t.Grade)
       from Professors p join test t on
                    p.PersNr = t.PersNr
       group by p.Name, p.PersNr
       having count(*) > 50)
```

Relational Modelling of the Generalization



Employees: {[*PersNr, Name*]}

Professors: {[*PersNr, Level, Room*]}

Assistants: {[*PersNr, Area*]}

Table Definition

```
create table Employees
        (PersNr    integer not null,
         Name      varchar (30) not null);
create table ProfData
        (PersNr    integer not null,
         Level     character(2),
         Room      integer);
create table AssData
        (PersNr    integer not null,
         Area      varchar(30) );
```

Views to model generalization

```
create view Professors as
        select *
        from employees e, ProfData p
        where e.PersNr=p.PersNr;

create view Assistants as
        select *
        from Employees e, AssData d
        where e.PersNr=a.PersNr;
```

➔ subtypes as view

Table Definition

```
create table Professors
        (PersNr         integer not null,
        Name            varchar (30) not null,
        Level           character (2),
        Room            integer);

create table Assistants
        (PersNr         integer not null,
         Name           varchar (30) not null,
         Area           varchar (30) );

create table OtherEmployees
        (PersNr         integer not null,
         Name           varchar (30) not null);
```

Views to Model Generalization

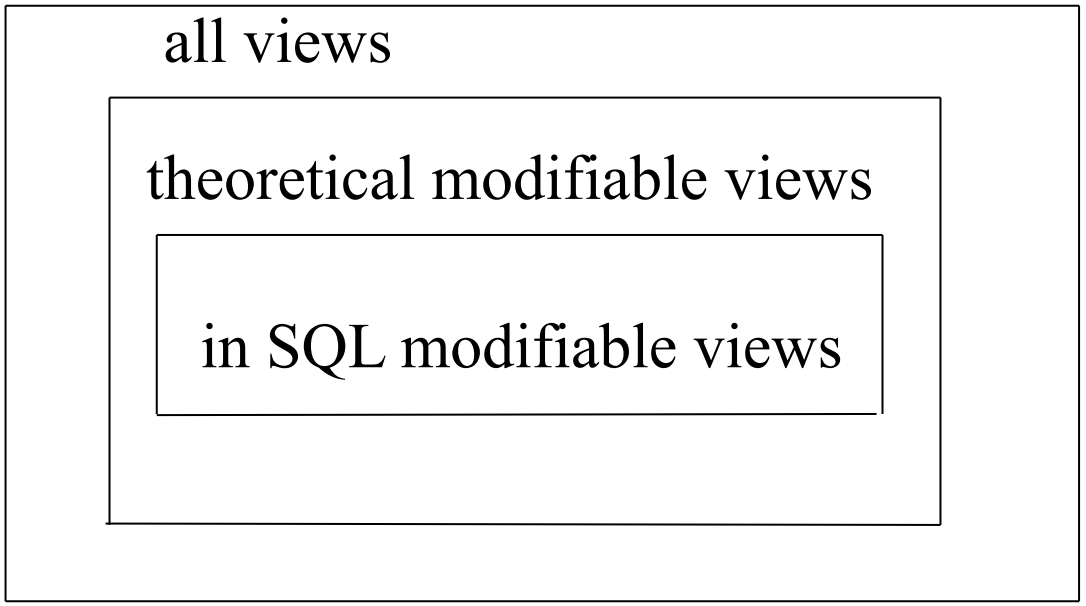
```
create view Employees as
        (select PersNr, Name from Professors)
    union
        (select PersNr, Name from Assistants)
    union
        (select * from OtherEmployees);
```

➔ supertype as view

Modifiability of views

In SQL

- Only one base relation
- Key must be part of
- No aggregation, grouping, duplicate elimination



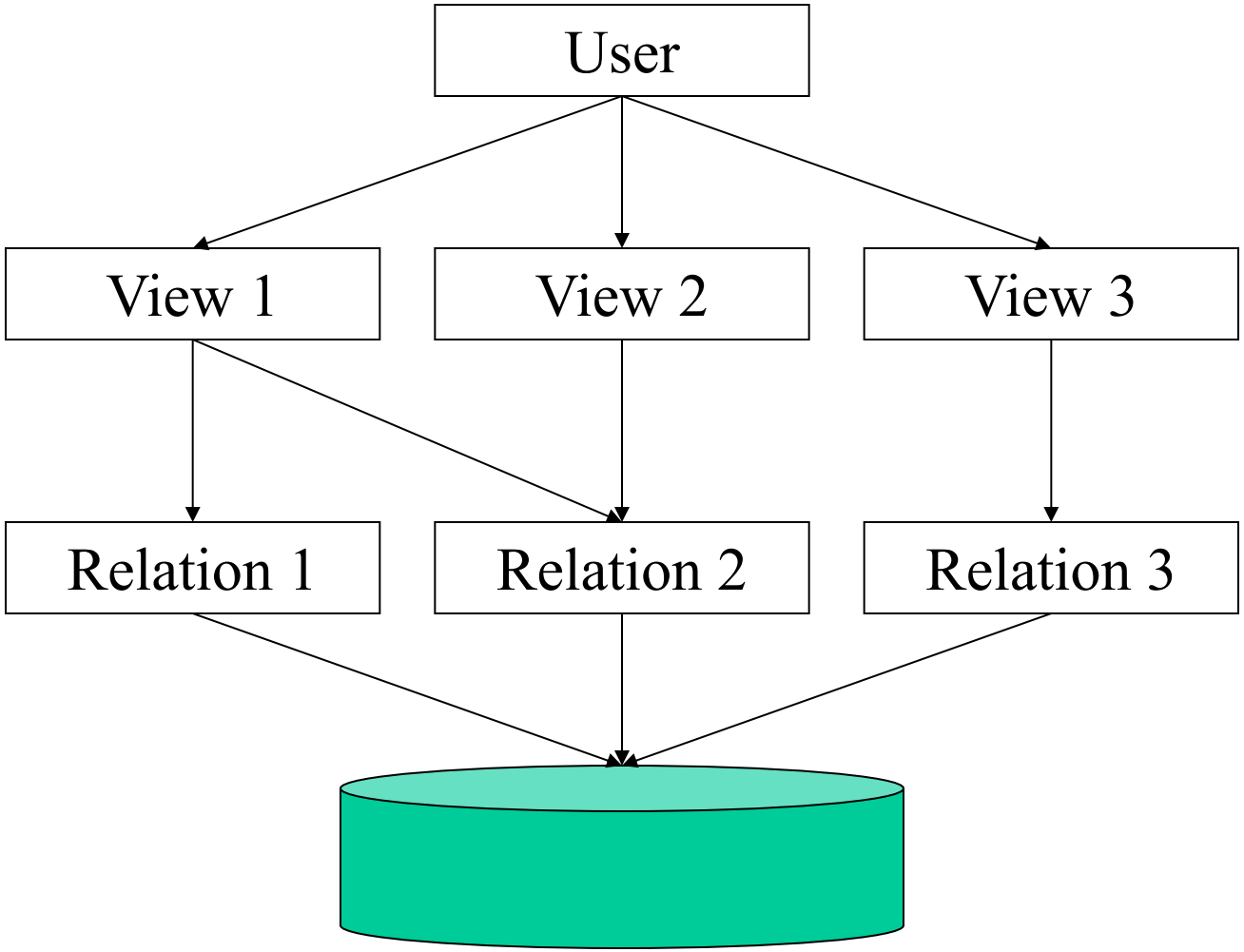
Views to guarantee data independency

logical

data independency

physical

data independency



Quiz

Table Airplane:

Producer	Type	NumberSeats
Boeing	B747-400	550
Boeing	B737-300	380
Airbus	A340-600	380
Airbus	A320-200	179
Airbus	A380	NULL

Every producer together with its type of airplane with the most seats

Result:

Producer	Type	SeatsMax
Boeing	B747-400	550
Airbus	A340-600	380

Quiz: Solution

```
with GroupProducer (Producer, SeatsMax)
as
   (select Producer, max (NumberSeats)
    from Airplane
    group by Producer)

select A.Producer, Type, SeatsMax
from Airplane A, GroupProducer G
where A.Producer = G.Producer and
          A.Seats = G.SeatsMax
```