《数据库系统》—— 结构化查询语言

高级SQL

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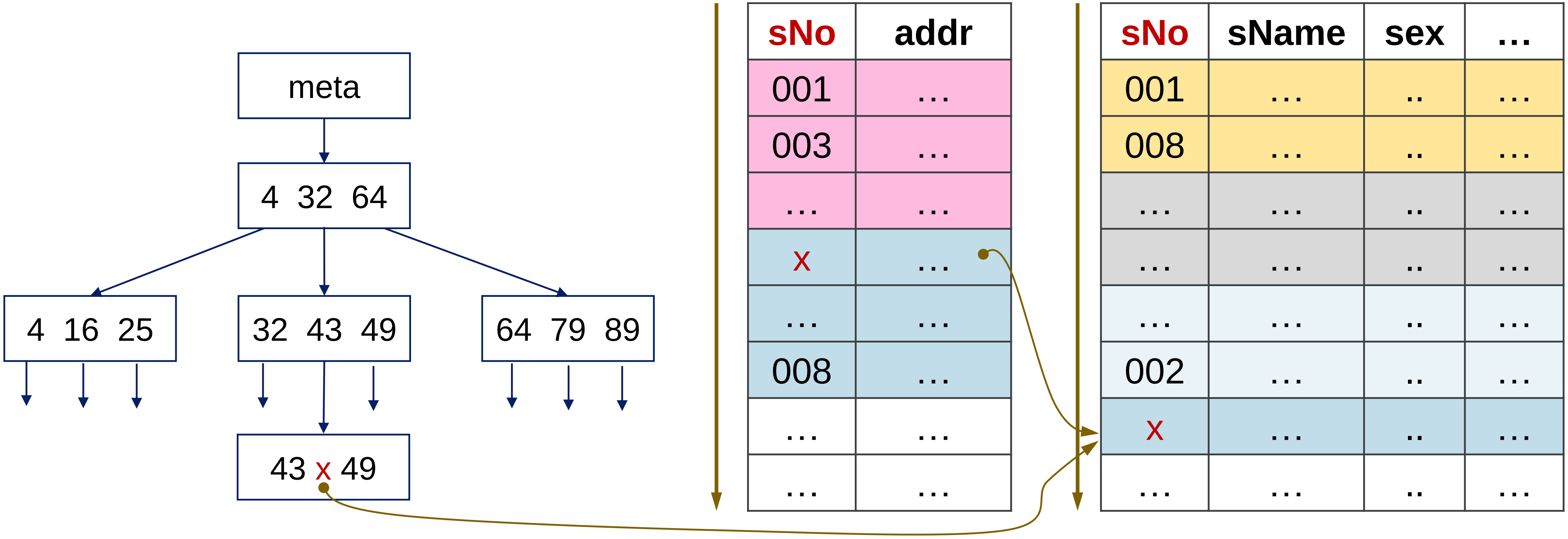
高级SQL

□ 索引(Index)

– An index is a structure that provides accelerated access to the rows of a table based on the values of one or more columns.

– We will discuss the index in detail in another topic.



sNo	addr
001	…
003	…
…	…
x	…
…	…
008	…
…	…
…	…

sNo	sName	sex	…
001	…	..	…
008	…	..	…
…	…	..	…
…	…	..	…
…	…	..	…
002	…	..	…
x	…	..	…
…	…	..	…

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□ Creating an Index (CREATE INDEX)

```
CREATE [UNIQUE] INDEX IndexName
ON TableName [ USING method ] (columnName[ASC|DESC][,…])

DROP INDEX IndexName

CREATE INDEX sName-index ON Student(sName);
DROP INDEX sName-index;
```

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- □ 视图(VIEW)
  - – The dynamic result of one or more relational operations on the base relations to produce another relation.
  - – A view is a *virtual relation* that does not necessarily exist in the in the database but can be produced upon request by a particular user, at the time of request.
  - – The DBMS stores the definition of the view but not the data in the database.

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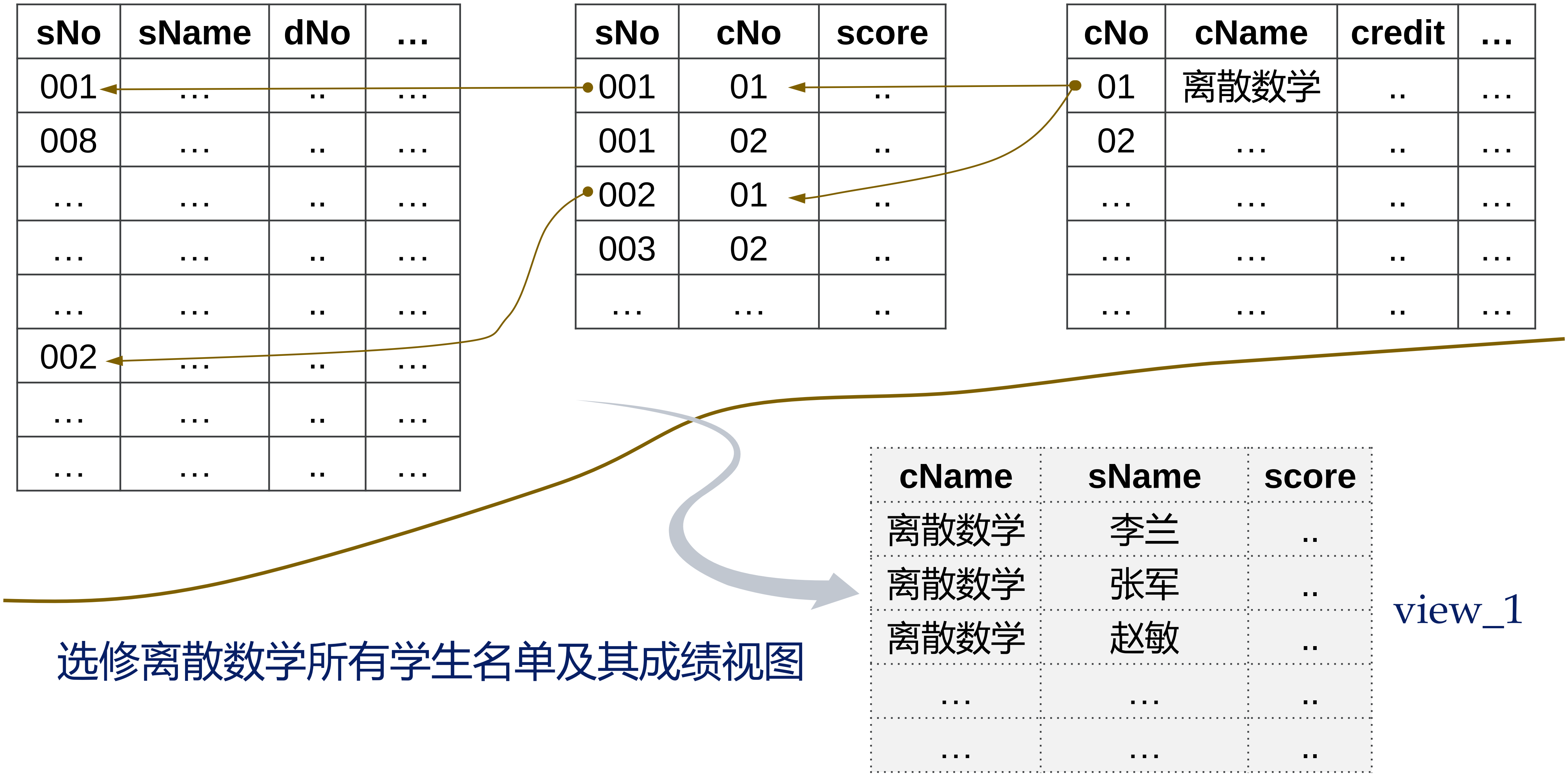

sNo	sName	dNo	…
001	…	..	…
008	…	..	…
…	…	..	…
…	…	..	…
…	…	..	…
002	…	..	…
…	…	..	…
…	…	..	…

sNo	cNo	score
001	01	..
001	02	..
002	01	..
003	02	..
…	…	..

cNo	cName	credit	…
01	离散数学	..	…
02	…	..	…
…	…	..	…
…	…	..	…
…	…	..	…

cName	sName	score
离散数学	李兰	..
离散数学	张军	..
离散数学	赵敏	..
…	…	..
…	…	..

view_1

选修离散数学所有学生名单及其成绩视图

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- □ Creating a View (CREATE VIEW)

```
CREATE VIEW ViewName[(newColumnName[,…])]
AS subselect [WITH [CASCADED | LOCAL] CHECK OPTION];
```

– If WITH CHECK OPTION is specified, SQL ensures that if a row fails to satisfy the WHERE clause of the defining query of a view, it is not added to the underlying base table of the view.

- □ Removing a View (DROP VIEW)

```
DROP VIEW ViewName [RESTRICT | CASCADE];
```

– If CASCAE is specified, DROP VIEW deletes all related dependent objects, in other words, all objects that reference the view.

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□ 案例

```
CREATE VIEW view_1
 AS SELECT s.sName, c.cName, sc.score
      FROM Student s, Course c, sc
      WHERE s.sNo=sc.sNo and c.cNo=sc.cNo
        and c.cName='离散数学';
```

```
SELECT sName, score
FROM view-1
WHERE score<60;
```

```
CREATE VIEW view_2(cNo, numberOf)
 AS SELECT cNo, COUNT(*)
      FROM sc
      GROUP BY cNo;
```

```
SELECT *
FROM view_2
WHERE numberOf>100;
```

```
DROP VIEW view_1;
```

```
DROP VIEW view_2;
```

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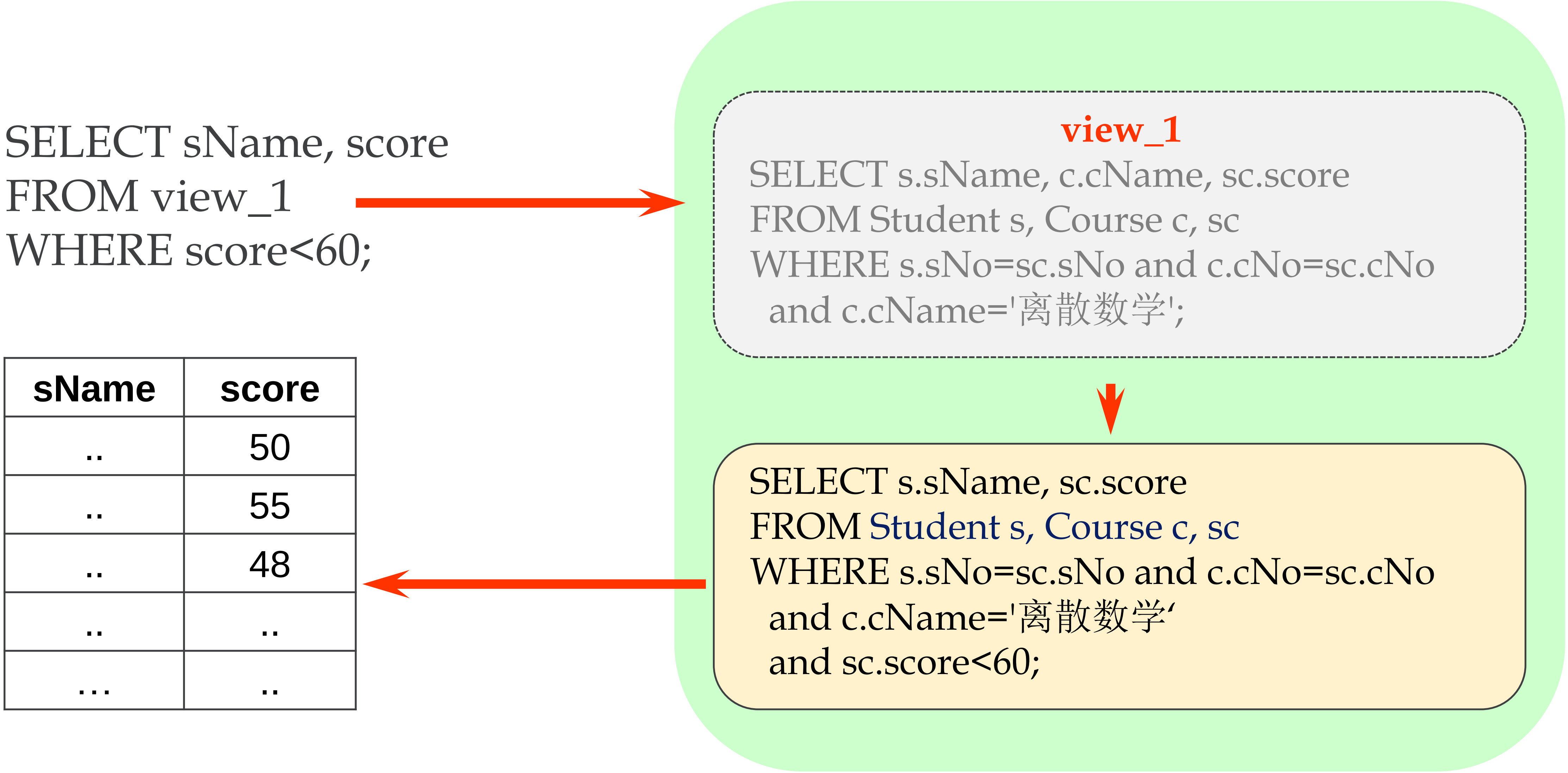
□ View Resolution



```
SELECT sName, score
FROM view_1
WHERE score<60;
```

sName	score
..	50
..	55
..	48
..	..
…	..

view_1

```
SELECT s.sName, c.cName, sc.score
FROM Student s, Course c, sc
WHERE s.sNo=sc.sNo and c.cNo=sc.cNo
  and c.cName='离散数学';
```

```
SELECT s.sName, sc.score
FROM Student s, Course c, sc
WHERE s.sNo=sc.sNo and c.cNo=sc.cNo
  and c.cName='离散数学‘
  and sc.score<60;
```

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- □ View Updatability
  - – All updates to a base table are immediately reflected in all views that encompass that base table.
  - – Similarly,we may except that if a view is updated then the base table(s) will reflect that change.
  - – Consider that if any view is updatable.

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□ 案例

```
CREATE VIEW IS_Student
AS SELECT sNo,sName,sex,age
  FROM student
  WHERE dNo IN(select dNo
                from department
                where dName='信息学院');
```

```
UPDATE IS_Student
SET sName=‘马成功'
WHERE sNo='070115';
```

```
UPDATE Student
SET sName='马成功'
WHERE sNo='070115'
  AND dNo IN(…);
```

```
INSERT INTO IS_Student
VALUES(‘170199', '刘锋', '男', 20);
```

```
INSERT INTO Student
VALUES(‘070116’, ‘刘锋’, ‘男’, 20, null);
```

```
DROP VIEW IS_Student;
```

```
DELETE FROM Student
WHERE sNo=‘170199’;
```

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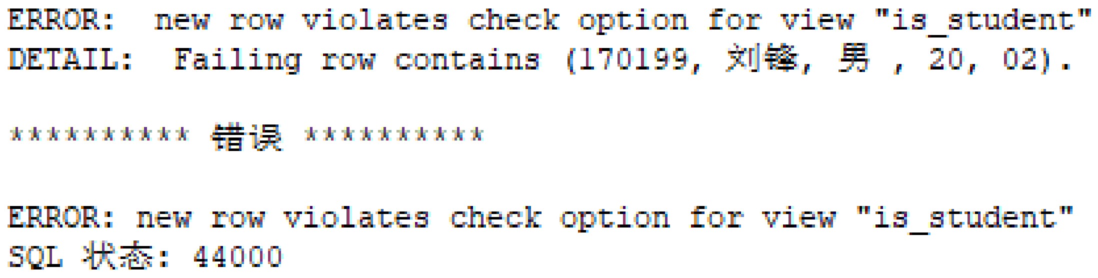
□ WITH CHECK OPTION

– The rows that enter or leave a view are called migrating rows.

– The WITH CHECK OPTION clause of the CREATE VIEW statement prohibits a row migrating out of the view.

```
CREATE VIEW IS_Student
AS SELECT *
     FROM student
     WHERE dNo IN(SELECT dNo
               FROM department
               WHERE dName='信息学院')
WITH CHECK OPTION;
```

```
INSERT INTO IS_Student
VALUES('170199', '刘锋', '男', 20, ‘02’);
```



```
ERROR:  new row violates check option for view "is_student"
DETAIL:  Failing row contains (170199, 刘锋, 男 , 20, 02).

********** 错误 **********

ERROR: new row violates check option for view "is_student"
SQL 状态: 44000
```

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□ Advantages of using view

- – Data independence
- – Currently
- – Improved security
- – Reduced complexity
- – Convenience
- – Customization
- – Data integrity

□ Disadvantages of using view

- – Update restriction
- – Structure restriction
- – Performance

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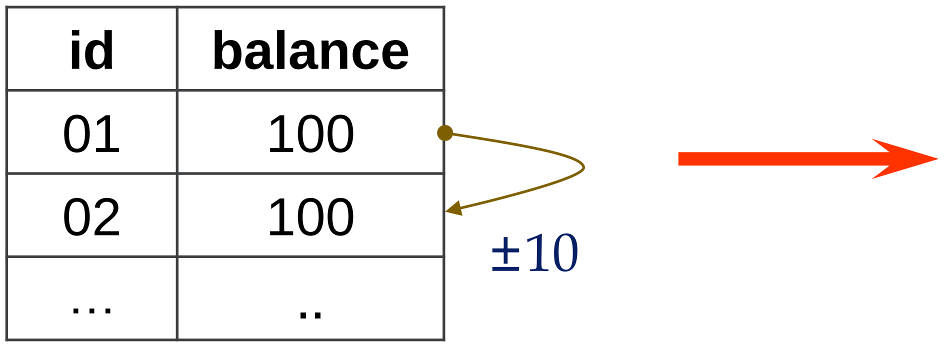
- 事务(Transaction)
  - A transaction is a sequence of database statements that needs to execute atomically.
- A database transaction consists of one of the following:
  - DML statements which constitute one consistent change to the data.
  - One DDL statement
  - One DCL statement



id	balance
01	100
02	100
…	..

```
UPDATE account
SET balance = balance - 10
WHERE id = '01';

UPDATE account
SET balance = balance + 10
WHERE id = '02';
```

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- □ Beginning and end of transaction
  - – Implicitly declare
  - – Explicitly declare (begin transaction, commit / rollback)
- □ Beginning and end of transaction in PostgreSQL through interactive terminal

```
UPDATE account
SET balance = balance - 10
WHERE id = ‘01’;

UPDATE account
SET balance = balance + 10
WHERE id = ‘02’;
```

→

```
BEGIN TRANSACTION (implicit)
UPDATE account
SET balance = balance - 10
WHERE id = ‘01’;
COMMIT (implicit)
BEGIN TRANSACTION (implicit)
UPDATE account
SET balance = balance + 10
WHERE id = ‘02’;
COMMIT (implicit)
```

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- □ Beginning and end of transaction in PostgreSQL through interactive terminal

```
BEGIN TRANSACTION (explicit)
 UPDATE account
 SET balance = balance - 10
 WHERE id = ‘01’;

 UPDATE account
 SET balance = balance + 10
 WHERE id = ‘02’;
COMMIT (explicit)
```

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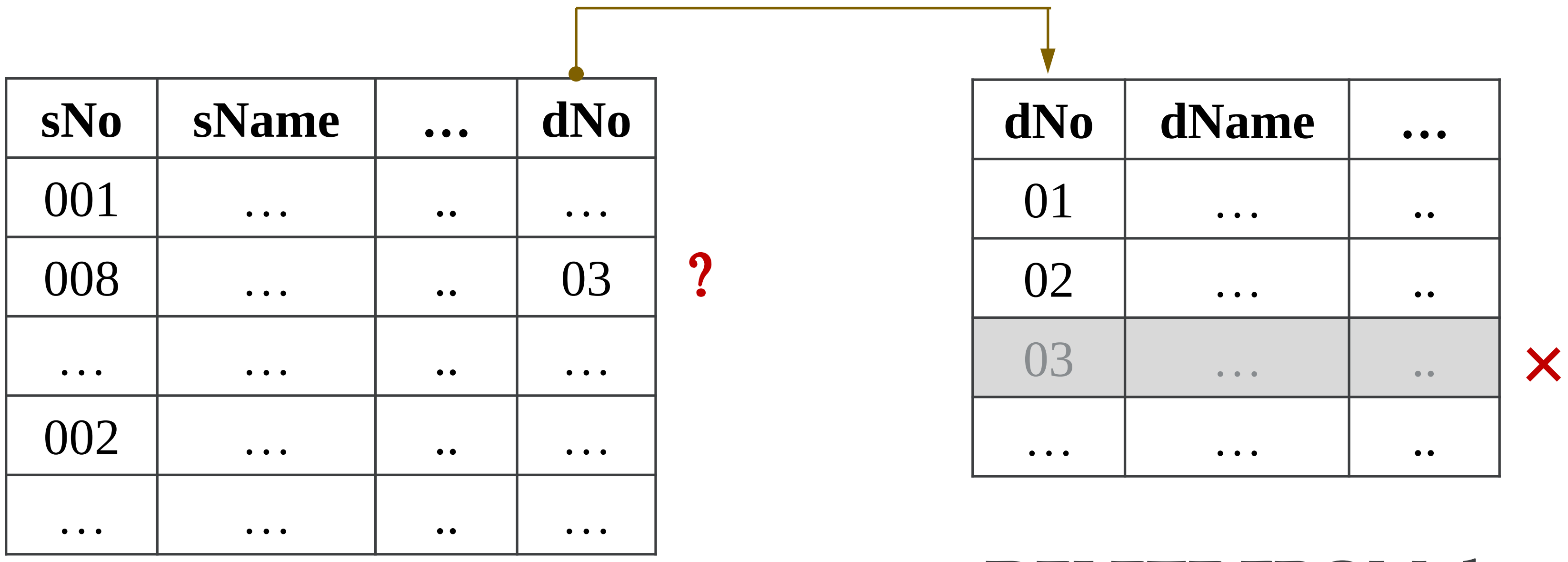
□ 完整性约束(Integrity Constraints)

插入、更新和删除操作可能导致的数据不一致性问题



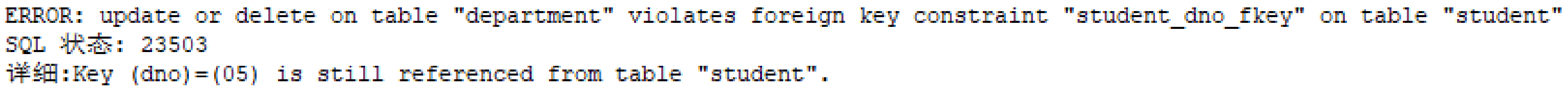
sNo	sName	…	dNo
001	…	..	…
008	…	..	03
…	…	..	…
002	…	..	…
…	…	..	…

?

dNo	dName	…
01	…	..
02	…	..
03	…	..
…	…	..

×

DELETE FROM department
WHERE dNo='03';



```
ERROR: update or delete on table "department" violates foreign key constraint "student_dno_fkey" on table "student"
SQL 状态: 23503
详细:Key (dno)=(05) is still referenced from table "student".
```

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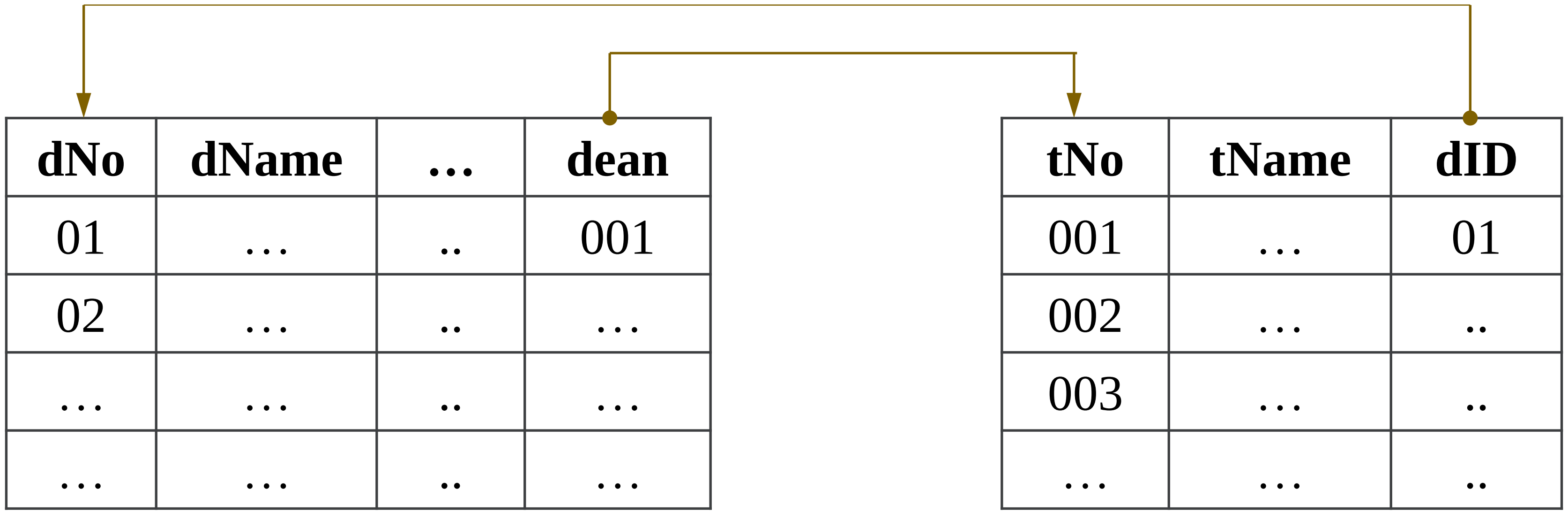
□ 完整性约束(Integrity Constraints)

插入、更新和删除操作可能导致的数据不一致性问题



dNo	dName	…	dean
01	…	..	001
02	…	..	…
…	…	..	…
…	…	..	…

tNo	tName	dID
001	…	01
002	…	..
003	…	..
…	…	..

INSERT INTO department
VALUES(‘01’, …, ‘001’);

?

INSERT INTO teacher
VALUES(‘001’, …, ‘01’);

高级SQL

□ 完整性约束(Integrity Constraints)

```
ALTER TABLE student
  ALTER CONSTRAINT student_dno_fkey
    DEFERRABLE INITIALLY DEFERRED;

BEGIN TRANSACTION;
  DELETE FROM department
  WHERE dno='03';

  UPDATE student
  SET dno='02'
  WHERE sno='008';
commit;
```

```
ALTER TABLE XXX
  ALTER CONSTRAINT XXX
    DEFERRABLE
    INITIALLY DEFERRED;

BEGIN TRANSACTION;
  INSERT INTO department
  VALUES(‘01’, …, ‘001’);

  INSERT INTO teacher
  VALUES(‘001’, …, ‘01’);
commit;
```

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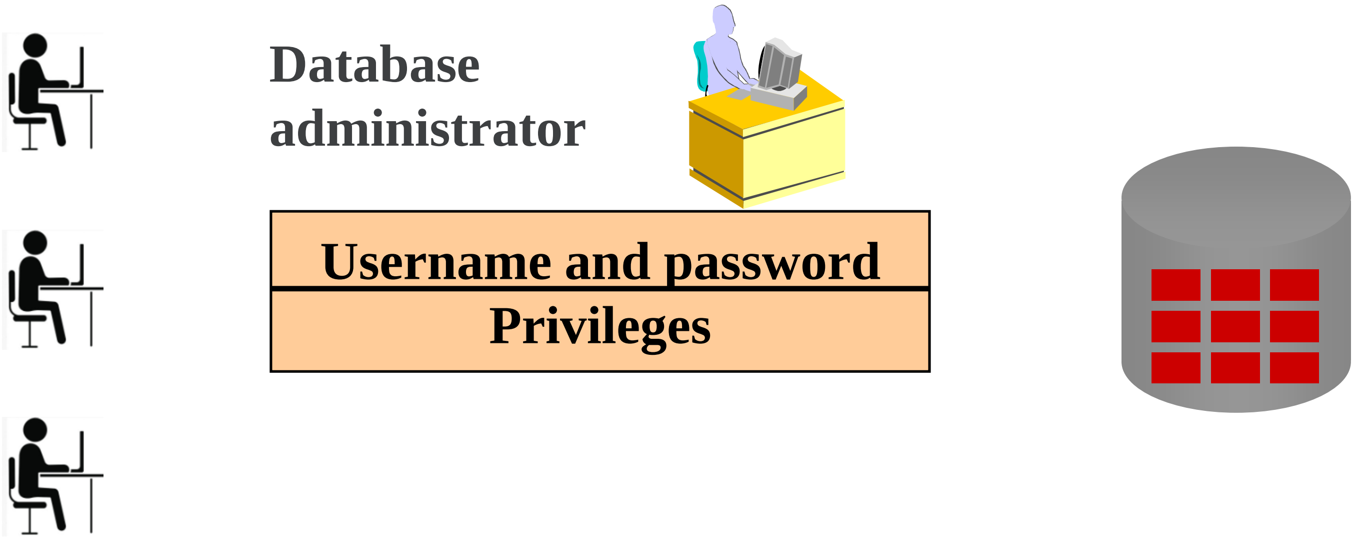
- □ 访问控制(Access control)



Database administrator

Username and password

Privileges

- □ Access privileges: Gaining access to the database
  - – System privileges: Gaining access to the database
  - – Object privileges: Manipulating the content of the database objects

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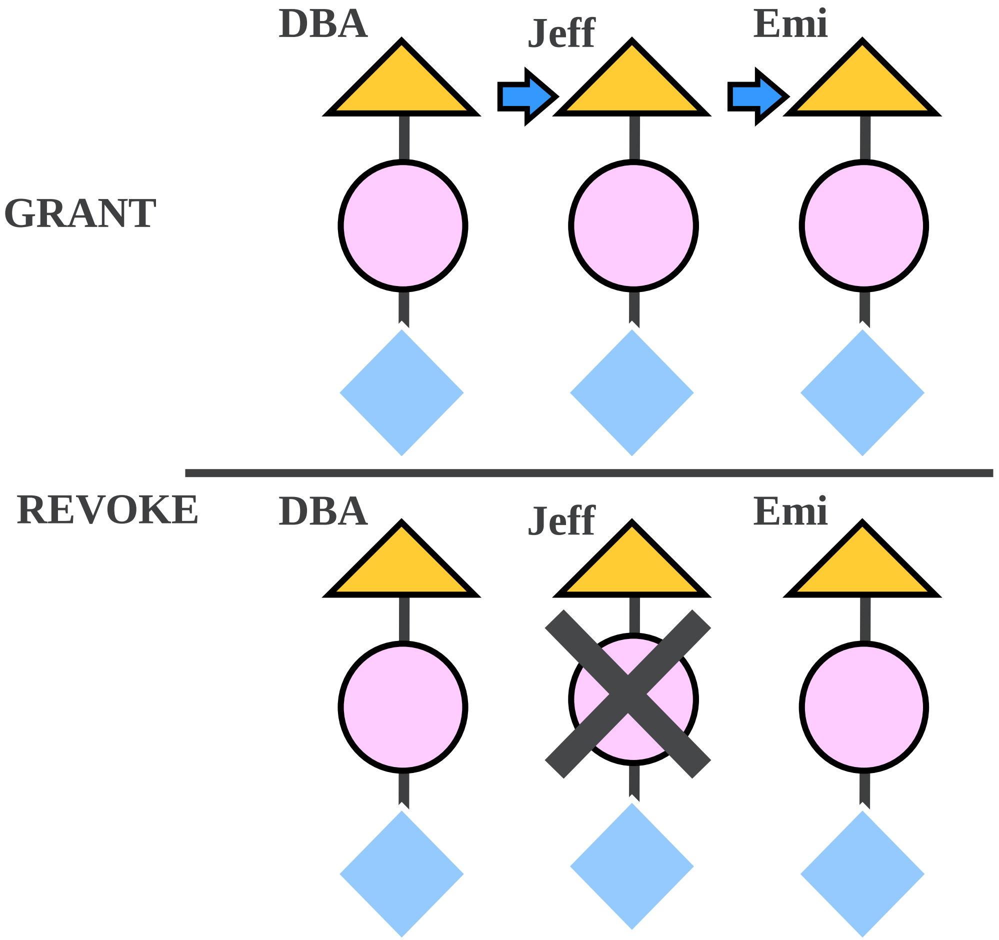
- □ Grant and revoke system privileges

```
GRANT {system_privilege|role}
           [, {system_privilege|role} ]…
TO {user|role| |PUBLIC}
     [, {user|role| |PUBLIC}]
[WITH ADMIN OPTION];

REVOKE {system_privilege|role}
            [, {system_privilege|role} ]…
FROM {user|role| |PUBLIC}
          [, {user|role| |PUBLIC}]…;
```



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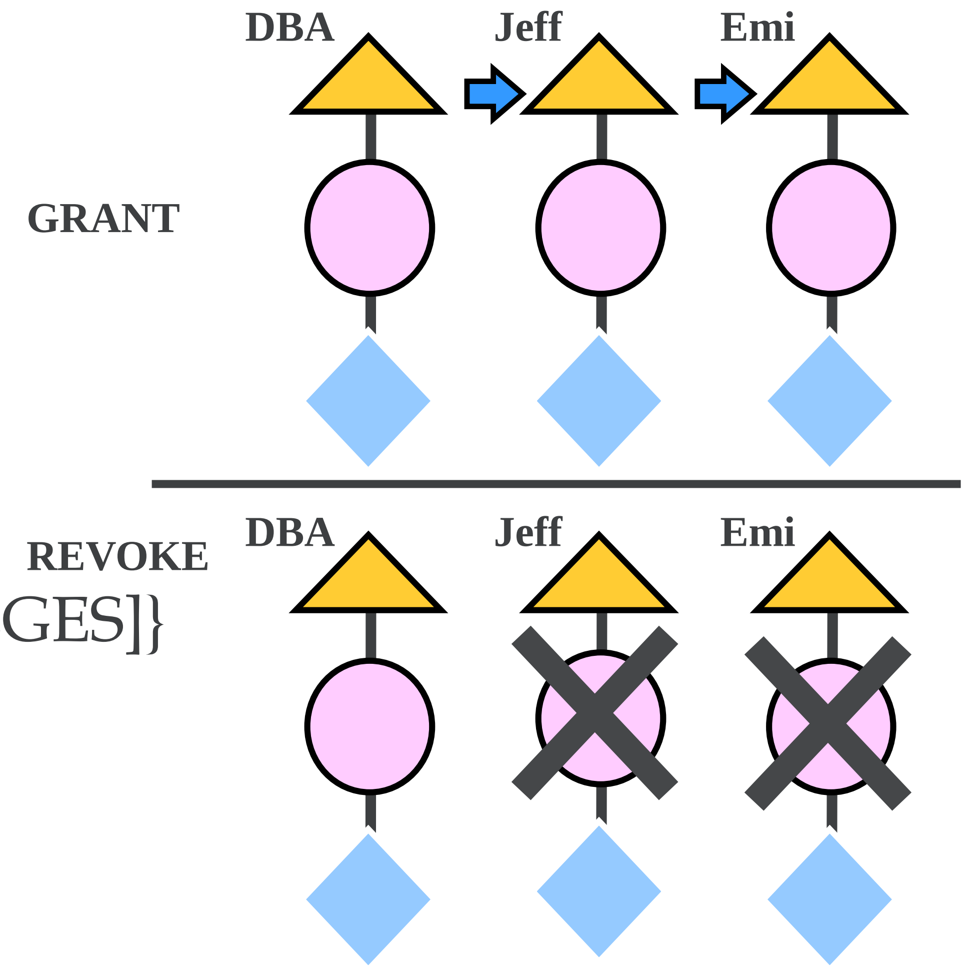
□ Grant and revoke object privileges

```
GRANT {object_privilege[(column_list)]
               [, object_privilege[(column_list)] …
                | ALL [PRIVILEGES]}
ON [schema.]object
TO {user | role | PUBLIC}[,{user | role | PUBLIC}]
[WITH GRANT OPTION];
```

```
REVOKE {object_privilege
                 [, object_privilege ]… | ALL [PRIVILEGES]}
ON [schema.] object
FROM {user | role | | PUBLIC}
             [, {user | role | | PUBLIC}]...
[CASCADE CONSTRAINTS];
```



关于本讲内容

祝各位学习愉快！

感谢观看！

讲解人：陆伟 教授