

# Contents

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## 数据库系统实验六-数据更新

### 实验目的

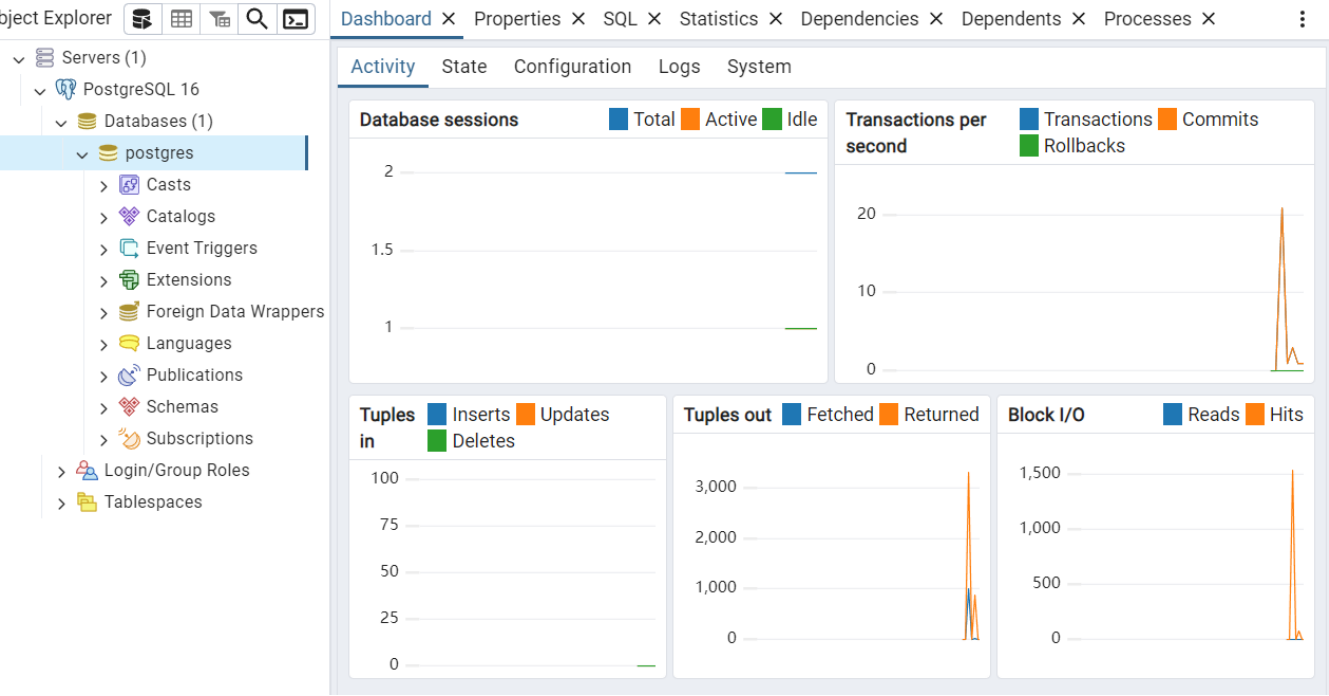
熟悉数据库的数据更新操作，能够使用 SQL 语句对数据库进行数据的插入、更新、删除操作。

### 实验环境

- OS: Windows 11

```
OsName : Microsoft Windows 11 企业版
OsType : WINNT
OsOperatingSystemSKU : EnterpriseEdition
OsVersion : 10.0.22631
```

- Database: PostgreSQL 16



- UI: harlequin-postgres



## 实验内容

在本次实验中，主要的内容是如何使用 SQL 语句对数据进行更新。

本节实验的主要内容包括：

- 使用 INSERT INTO 语句插入数据，包括插入一个元组或将子查询的结果插入到数据库中两种方式。
- 使用 SELECT INTO 语句，产生一个新表并插入数据。
- 使用 UPDATE 语句可以修改指定表中满足 WHERE 子句条件的元组，有三种修改的方式：修改某一个元组的值，修改多个元组的值，带子查询的修改语句。
- 使用 DELETE 语句删除数据：删除某一个元组的值，删除多个元组的值，带子查询的删除语句。

注：“SELECT INTO”是 SQL 查询语句的一部分，用于将查询的结果插入到新表中。它的语法如下：

```
SELECT column1, column2, ...
INTO new_table
FROM existing_table
WHERE condition;
```

其中：

column1, column2, ... 是要选择的列。

new\_table 是要将结果插入的新表。

existing\_table 是要从中选择数据的现有表。

condition 是可选的筛选条件。

这个语句执行时，它会从现有表中选择指定列的数据，并将结果插入到新表中

## 课内实验

要求：

以 school 数据库为例（与前两次实验的数据同），在该数据库中存在 4 张表格，分别为：

STUDENTS(sid,sname,email,grade)

TEACHERS(tid,tname,email,salary)

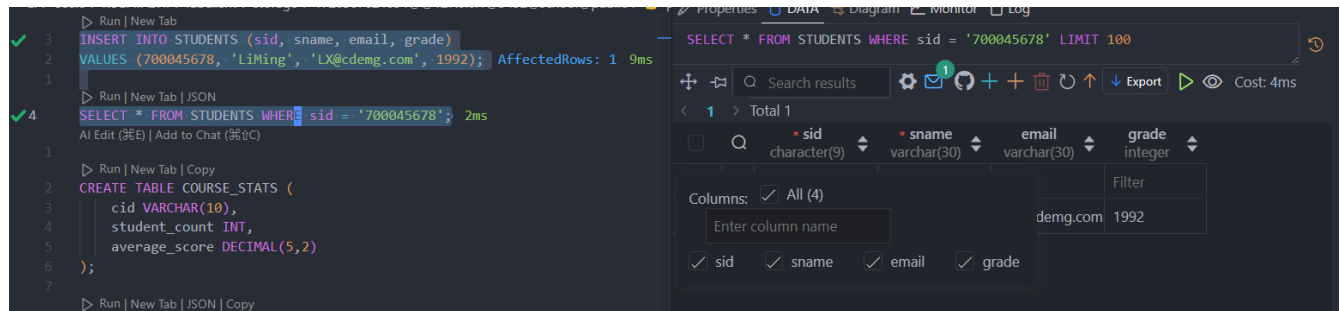
COURSES(cid,cname,hour)

CHOICES(no,sid,tid,cid,score)

在数据库 school 中按下列要求进行数据更新。

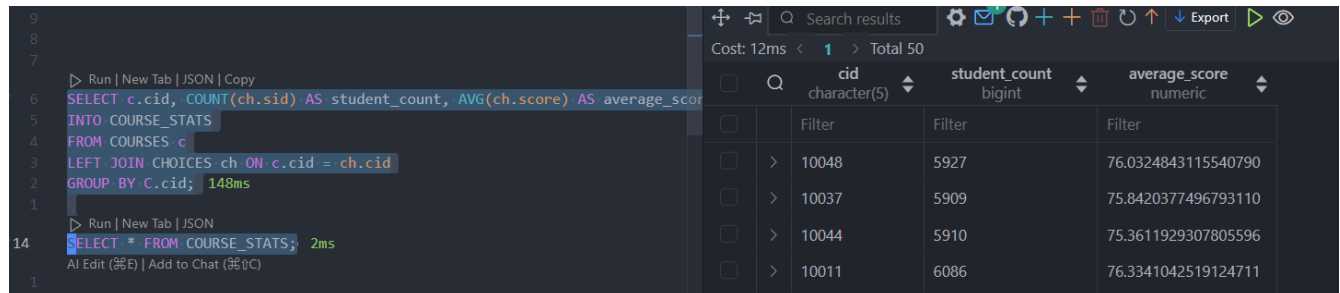
1. 使用 SQL 语句向 STUDENTS 表中插入元组 (编号: 700045678; 名字: LiMing; EMAIL: LX@cdemg.com; 年级: 1992);

```
INSERT INTO STUDENTS (sid, sname, email, grade)
VALUES (700045678, 'LiMing', 'LX@cdemg.com', 1992);
```



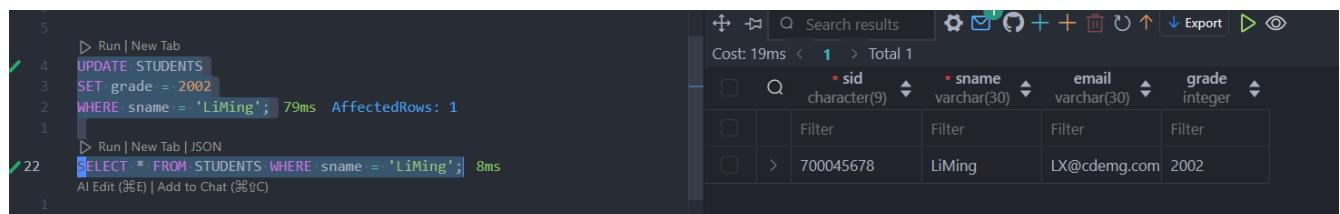
2. 对每个课程, 求学生的选课人数和学生的平均成绩, 并把结果存入数据库。使用 SELECT INTO 和 INSERT INTO 两种方法实现。(提示: 可先创建一个新表再插入数据);

```
SELECT c.cid, COUNT(ch.sid) AS student_count, AVG(ch.score) AS average_score
INTO COURSE_STATS
FROM COURSES c
LEFT JOIN CHOICES ch ON c.cid = ch.cid
GROUP BY C.cid;
```



3. 在 STUDENTS 表中使用 SQL 语句将姓名为 “LiMing” 的学生的年级改为 “2002”;

```
UPDATE STUDENTS
SET grade = 2002
WHERE sname = 'LiMing';
```



4. 在 TEACHERS 表中使用 SQL 语句将所有教师的工资多加 500 元;

```
UPDATE TEACHERS
SET salary = salary + 500;
```

5		1	2	3	4	...	150	>	Total 15000
4									
3	Run   New Tab								
2	UPDATE TEACHERS								
1	SET salary = salary + 500; 96ms AffectedRows: 15000								
30	Run   New Tab   JSON								
	SELECT * FROM TEACHERS; 3ms								
1	AI Edit (⌘E)   Add to Chat (⌘C)								
2									

5. 将姓名为 zapyv 的学生的课程“C”的成绩加上 5 分;

```
UPDATE CHOICES
SET score = score + 5
WHERE sid = (SELECT sid FROM STUDENTS WHERE sname = 'zapyv')
AND cid = (SELECT cid FROM COURSES WHERE cname = 'c');
```

5	Run   New Tab								
4	UPDATE CHOICES								
3	SET score = score + 5								
2	WHERE sid = (SELECT sid FROM STUDENTS WHERE sname = 'zapyv')								
1	AND cid = (SELECT cid FROM COURSES WHERE cname = 'c'); 64ms AffectedRows: 1								
30	Run   New Tab   JSON								
	SELECT * FROM CHOICES WHERE sid = (SELECT sid FROM STUDENTS WHERE sname = 'zapyv'); 71ms								
1	AI Edit (⌘E)   Add to Chat (⌘C)								
2									

6. 在 STUDENTS 表中使用 SQL 语句删除姓名为“LiMing”的学生信息;

```
DELETE FROM STUDENTS
WHERE sname = 'LiMing';
```

5									
4	Run   New Tab								
3	DELETE FROM STUDENTS								
2	WHERE sname = 'LiMing'; 77ms AffectedRows: 1								
1	Run   New Tab   JSON								
48	SELECT FROM STUDENTS WHERE sname = 'LiMing'; 7ms								
	AI Edit (⌘E)   Add to Chat (⌘C)								
1									
2									

7. 删除所有选修课程“Java”的选课记录;

```
DELETE FROM CHOICES
WHERE cid = (SELECT cid FROM COURSES WHERE cname = 'Java');
```

6									
5									
4	Run   New Tab								
3	DELETE FROM CHOICES								
2	WHERE cid = (SELECT cid FROM COURSES WHERE cname = 'Java'); 15ms								
1	Run   New Tab   JSON								
56	SELECT * FROM CHOICES WHERE cid = (SELECT cid FROM COURSES WHERE cname = 'Java'); 14ms								
	AI Edit (⌘E)   Add to Chat (⌘C)								
1									

8. 对 COURSES 表做删去时间 <48 的元组的操作, 并讨论该删除操作所受到的约束;

```
DELETE FROM COURSES
WHERE hour < 48;
```

4	-- wait								
3	Run   New Tab								
2	DELETE FROM COURSES								
1	WHERE hour < 48; 25ms								
56	Run   New Tab   JSON								
	SELECT FROM COURSES WHERE hour < 48;								
	AI Edit (⌘E)   Add to Chat (⌘C)								
1									

该删除操作所受到的约束: CHOICES 表中的外键约束

修改后的 sql 语句应为:

```

ALTER TABLE CHOICES
DROP CONSTRAINT FK_CHOICES_COURSES;

DELETE FROM CHOICES
WHERE cid IN (SELECT cid FROM COURSES WHERE hour < 48);

DELETE FROM COURSES
WHERE hour < 48;

ALTER TABLE CHOICES
ADD CONSTRAINT FK_CHOICES_COURSES
FOREIGN KEY (cid) REFERENCES COURSES(cid);

```

### 自我实践

1. 向 STUDENTS 表插入编号是“800022222”且姓名是“WangLan”的元组;

```

INSERT INTO STUDENTS (sid, sname)
VALUES ('800022222', 'WangLan');

```

sid	sname	email	grade
800022222	WangLan	(NULL)	(NULL)

2. 向 TEACHERS 表插入元组 (“200001000”, “LXL”, “s4zrck@pew.net”, “3024”);

```

INSERT INTO TEACHERS (tid,tname, email, salary)
VALUES ('200001000', 'LXL', 's4zrck@pew.net', '3024');

```

tid	tname	email	salary
200001000	LXL	s4zrck@pew.net	3024

3. 将 TEACHERS 表中编号为“200010493”的老师工资改为 4000;

```

UPDATE TEACHERS
SET salary = 4000
WHERE tid = '200010493';

```

tid	tname	email	salary
200010493	xzgkflko	zcf_m@def.com	4000

4. 将 TEACHERS 表中所有工资小于 2500 的老师工资改为 2500;

```

UPDATE TEACHERS
SET salary = 2500
WHERE salary < 2500;

```

```

8
7
6
5
4 > Run | New Tab
3 UPDATE TEACHERS
2 SET salary = 2500
1 WHERE salary < 2500; AffectedRows: 4014 92ms
108 > Run | New Tab | JSON
SELECT * FROM TEACHERS WHERE salary < 2500; 4ms
AI Edit (⌘E) | Add to Chat (⌘C)

```

SELECT \* FROM TEACHERS WHERE salary < 2500 LIMIT 100

Cost: 6ms < 1 > Total 0

* tid	* tname	email	salary
character(9)	varchar(30)	varchar(30)	integer
Filter	Filter	Filter	Filter

5. 将由编号为“200016731”的老师讲授的课程全部改成由姓名为“rnupx”的老师讲授;

```

UPDATE CHOICES
SET tid = (SELECT tid FROM TEACHERS WHERE tname = 'rnupx')
WHERE tid = '200016731';

```

```

8
7
6
5 > Run | New Tab
4 UPDATE CHOICES
3 SET tid = (SELECT tid FROM TEACHERS WHERE tname = 'rnupx')
2 WHERE tid = '200016731'; 89ms AffectedRows: 23
108 > Run | New Tab | JSON
SELECT * FROM CHOICES WHERE tid = '200016731'; 40ms
AI Edit (⌘E) | Add to Chat (⌘C)

```

Cost: 42ms < 1 > Total 0

* no	* sid	* tid	* cid
integer	character(9)	character(9)	character(5)
Filter	Filter	Filter	Filter

6. 更新编号“800071780”的学生年级为“2001”;

```

UPDATE STUDENTS
SET grade = 2001
WHERE sid = '800071780';

```

```

8
7
6
5 > Run | New Tab
4 UPDATE STUDENTS
3 SET grade = 2001
2 WHERE sid = '800071780'; AffectedRows: 1 9ms
108 > Run | New Tab | JSON
SELECT * FROM STUDENTS WHERE sid = '800071780'; 2ms
AI Edit (⌘E) | Add to Chat (⌘C)

```

Cost: 4ms < 1 > Total 1

* sid	* sname	email	grade	
character(9)	varchar(30)	varchar(30)	integer	
Filter	Filter	Filter	Filter	
>	800071780	iscmwink	htoactp@aof.gov	2001

7. 删除没有学生选修的课程;

```

DELETE FROM COURSES
WHERE cid NOT IN (SELECT cid FROM CHOICES);

```

```

7
6
5 > Run | New Tab | JSON
4 SELECT * FROM COURSES
3 WHERE cid NOT IN (SELECT cid FROM CHOICES); 1ms
2 > Run | New Tab
1 DELETE FROM COURSES
WHERE cid NOT IN (SELECT cid FROM CHOICES); 2ms
124 AI Edit (⌘E) | Add to Chat (⌘C)

```

WHERE cid NOT IN (SELECT cid FROM CHOICES)

Cost: 2ms < >

DELETE FROM COURSES WHERE cid NOT IN (SELECT cid FROM CHOICES)

AffectedRows: 0

8. 删除年级高于 1998 的学生信息;

```

ALTER TABLE CHOICES
DROP CONSTRAINT FK_CHOICES_STUDENTS;

DELETE FROM CHOICES
WHERE sid IN (SELECT sid FROM STUDENTS WHERE grade > 1998);

DELETE FROM STUDENTS
WHERE grade > 1998;

ALTER TABLE CHOICES
ADD CONSTRAINT FK_CHOICES_STUDENTS

```

```
FOREIGN KEY (sid) REFERENCES STUDENTS(sid);
```

```
C:\Users\KOBAYASHI>.dbclient>storage>1726307624654@@127.0.0.1@5432@school@public>public.sql>ALTER
-- Active: 1726307624654@@127.0.0.1@5432@school@public PostgreSQL postgres
1
  Run | New Tab | AI Edit (⌘E) | Add to Chat (⌘C)
3 ALTER TABLE CHOICES
1 DROP CONSTRAINT FK_CHOICES_STUDENTS; 4ms
2
  Run | New Tab
3 DELETE FROM CHOICES
4 WHERE sid IN (SELECT sid FROM STUDENTS WHERE grade > 1998); 332ms AffectedRows: 120014
5
  Run | New Tab
6 DELETE FROM STUDENTS
7 WHERE grade > 1998; 48ms AffectedRows: 40092
8
  Run | New Tab
9 ALTER TABLE CHOICES
10 ADD CONSTRAINT FK_CHOCIES_STUDENTS
11 FOREIGN KEY (sid) REFERENCES STUDENTS(sid); 58ms
```

Result

ALTER TABLE CHOICES  
ADD CONSTRAINT FK\_CHOCIES\_STUDENTS  
FOREIGN KEY (sid) REFERENCES STUDENTS(sid)

9. 删除没有选修课程的学生信息;

```
ALTER TABLE CHOICES
DROP CONSTRAINT FK_CHOICES_STUDENTS;

DELETE FROM STUDENTS
WHERE sid NOT IN (SELECT sid FROM CHOICES);

ALTER TABLE CHOICES
ADD CONSTRAINT FK_CHOICES_STUDENTS
FOREIGN KEY (sid) REFERENCES STUDENTS(sid);
```

```
1  Run | New Tab | AI Edit (⌘E) | Add to Chat (⌘⇧C)
✓ 3  ALTER TABLE CHOICES
1    DROP CONSTRAINT FK_CHOCIES_STUDENTS; 2ms
2
2  Run | New Tab
✓ 3  DELETE FROM STUDENTS
4    WHERE sid NOT IN (SELECT sid FROM CHOICES); 48ms AffectedRows: 1
5
5  Run | New Tab
✓ 6  ALTER TABLE CHOICES
7    ADD CONSTRAINT FK_CHOICES_STUDENTS
8    FOREIGN KEY (sid) REFERENCES STUDENTS(sid); 36ms
```

Result

Search results

ALTER TABLE CHOICES  
ADD CONSTRAINT FK\_CHOICES\_STUDENTS  
FOREIGN KEY (sid) REFERENCES STUDENTS(sid)

10. 删除成绩不及格的选课记录;

```
DELETE FROM CHOICES
WHERE score < 60;
```

```
3  -- Active: 1726307624654@@127.0.0.1@5432@school@pu
2
2  Run | New Tab
✓ 1  DELETE FROM CHOICES
4    WHERE score < 60; 40ms AffectedRows: 21627
```