实验二

实验目的

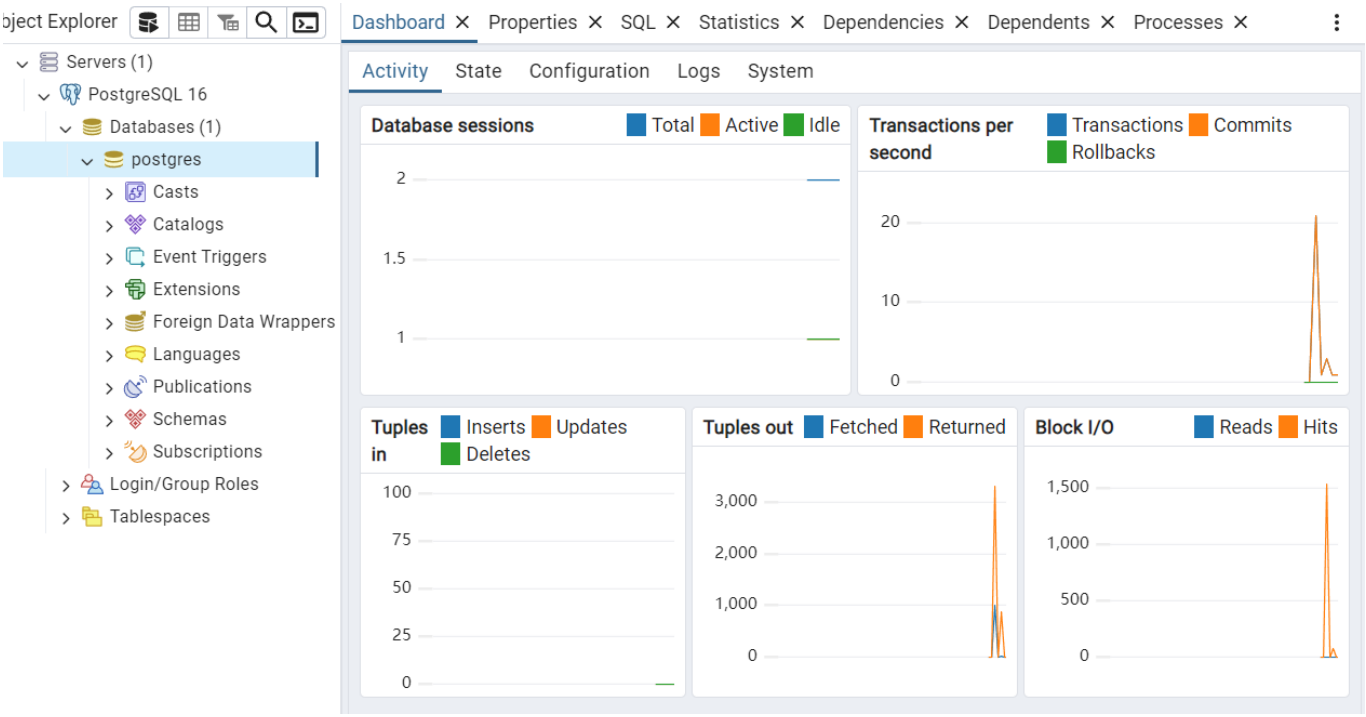
熟悉SQL的数据定义语言，能够熟练地使用SQL语句来创建和更改基本表，创建和取消索引。

实验环境

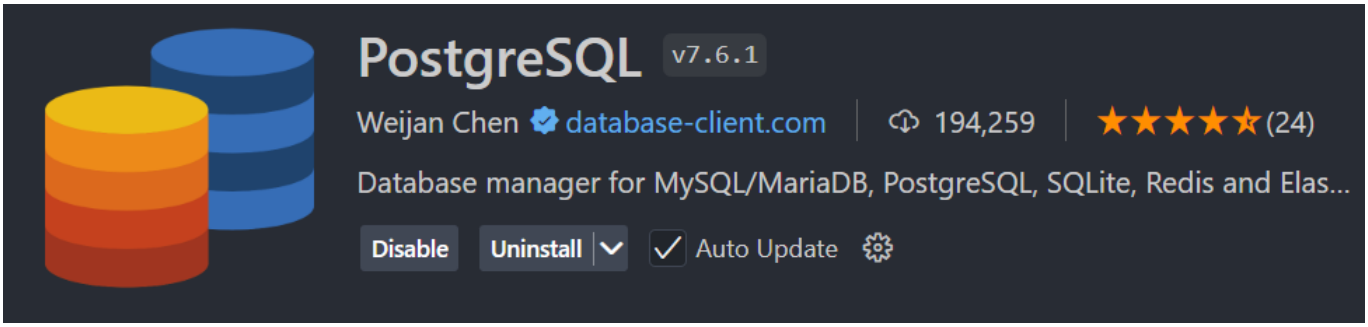
- OS: Windows 11

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

- Database: PostgreSQL 16



- IDE: Visual Studio Code (with plugin `PostgreSQL`)



实验内容

- 使用`CREATE`语句创建基本表。
- 更改基本表的定义，增加列，删除列，修改列的数据类型。

- 创建表的升降序索引。
- 取消表、表的索引或表的约束。

实验步骤

1. 使用SQL语句创建关系数据库表。

- 人员关系表 `PERSON(P#, Pname, Page, Pgender)`，其中`P#`为主键，`Page`具有约束：大于18

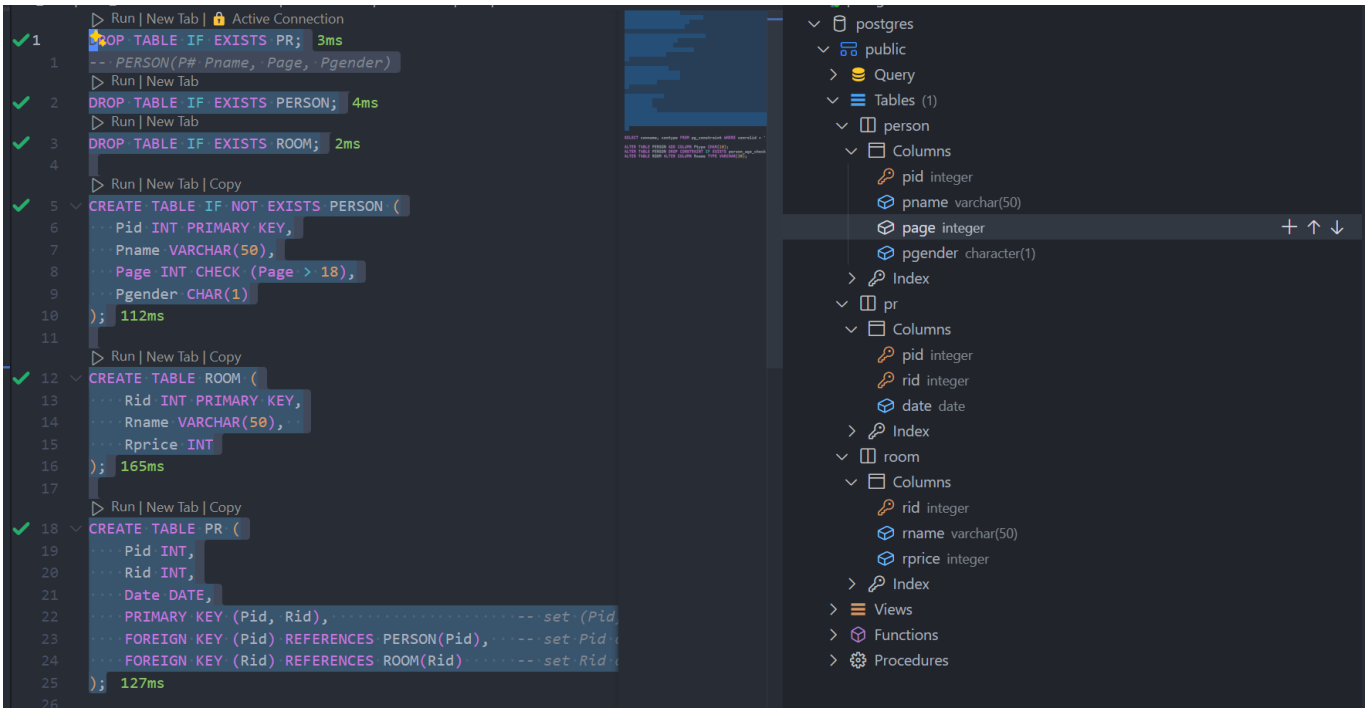
```
CREATE TABLE IF NOT EXISTS PERSON (
    Pid INT PRIMARY KEY,
    Pname VARCHAR(50),
    Page INT CHECK (Page > 18),
    Pgender CHAR(1)
);
```

- 房间表 `ROOM(R#, Rname, Rarea)`，其中`R#`为主键

```
CREATE TABLE IF NOT EXISTS ROOM (
    Rid INT PRIMARY KEY,
    Rname VARCHAR(50),
    Rarea INT
);
```

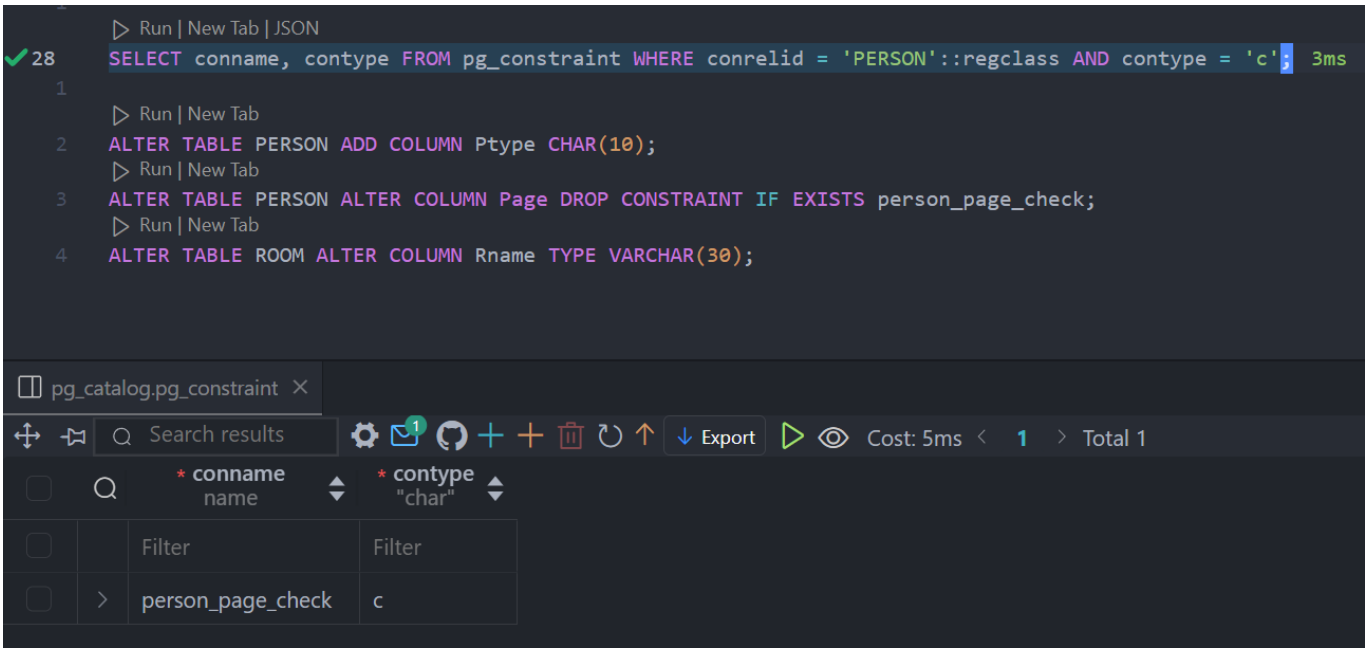
- 关系表P-R `PR(P#, R#, Date)`，其中`P#`和`R#`为外键

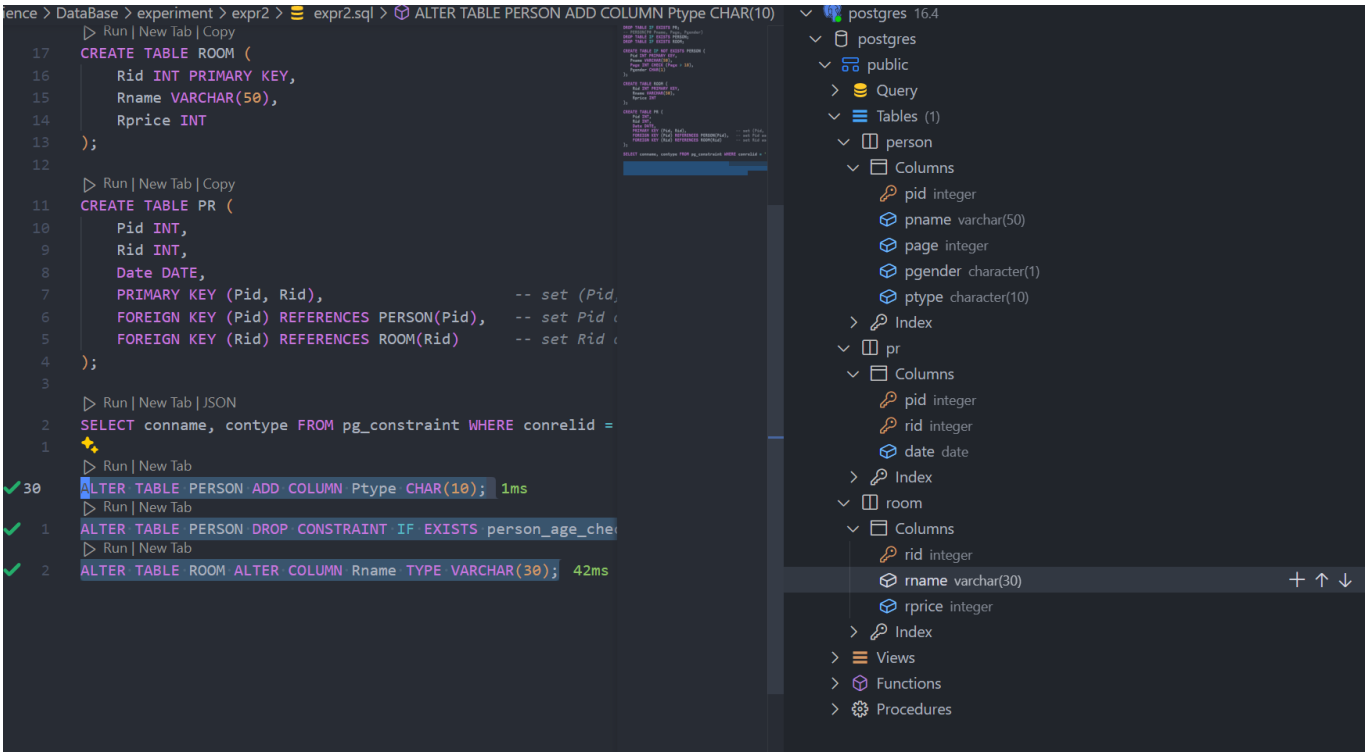
```
CREATE TABLE IF NOT EXISTS PR (
    Pid INT,
    Rid INT,
    Date DATE,
    PRIMARY KEY (Pid, Rid),                    -- set (Pid, Rid) as primary key
    FOREIGN KEY (Pid) REFERENCES PERSON(Pid),  -- set Pid as foreign key to
PERSON table
    FOREIGN KEY (Rid) REFERENCES ROOM(Rid)     -- set Rid as foreign key to ROOM
table
);
```



2. 更改表PERSON，增加属性Ptype（类型是CHAR，长度为10），取消Page大于18的约束。把表ROOM中的属性Rname的数据类型改成长度为30。

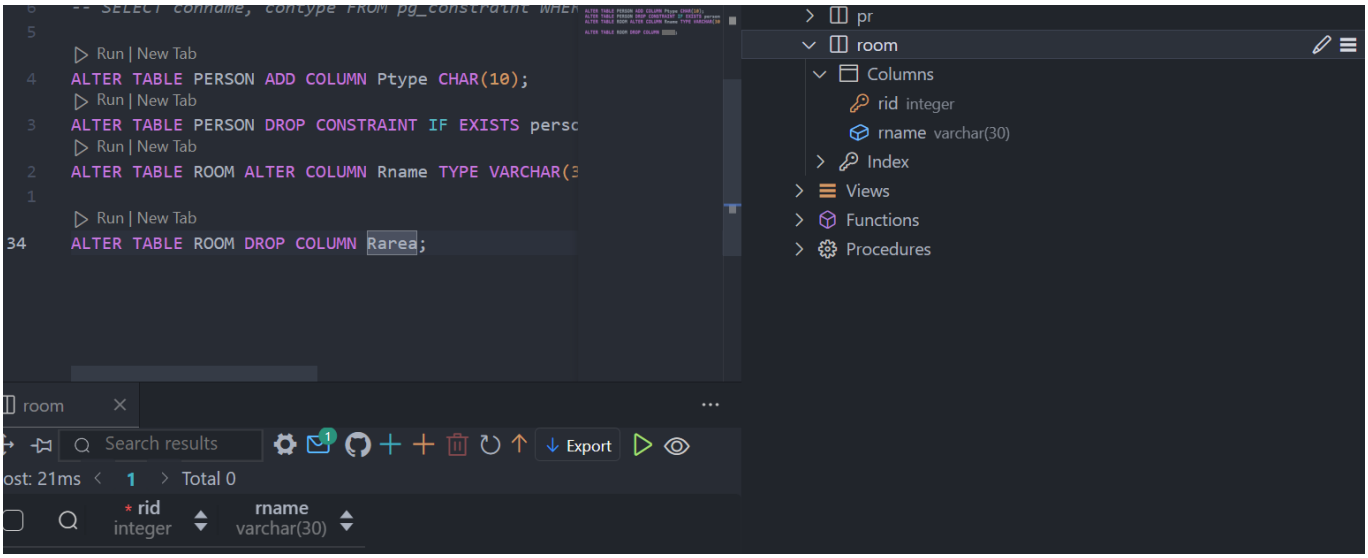
```
ALTER TABLE PERSON ADD COLUMN Ptype CHAR(10);
-- When setting the constraint condition for Page, I did not set a name for it.
-- However, it is not a problem, we can easily get the name of the anonymous constraint
-- by running the following statement:
-- `SELECT conname FROM pg_constraint WHERE conrelid = 'PERSON'::regclass AND contype = 'c'`;
-- Then we can get the name of the constraint that the database assigns to us by default,
-- which is `person_page_check`.
ALTER TABLE PERSON ALTER COLUMN Page DROP CONSTRAINT IF EXISTS person_page_check;
ALTER TABLE ROOM ALTER COLUMN Rname TYPE VARCHAR(30);
```





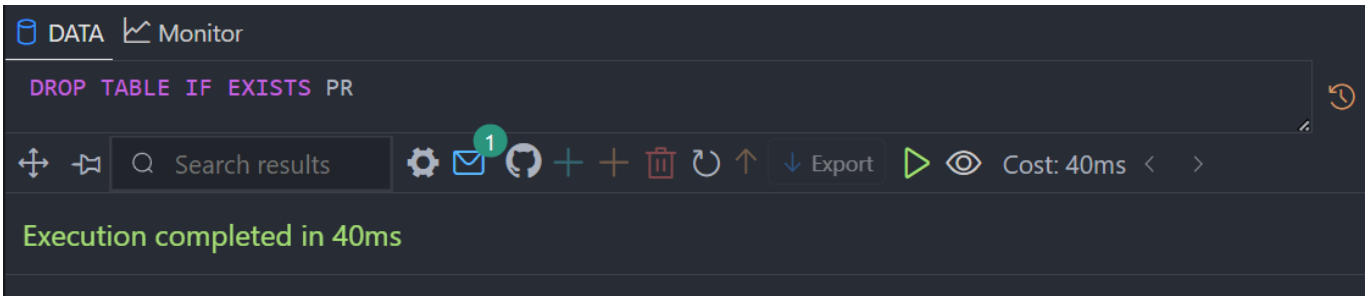
3. 删除表ROOM中的一个属性Rarea。

```
ALTER TABLE ROOM DROP COLUMN Rarea;
```



4. 取消表PR。

```
DROP TABLE IF EXISTS PR;
```

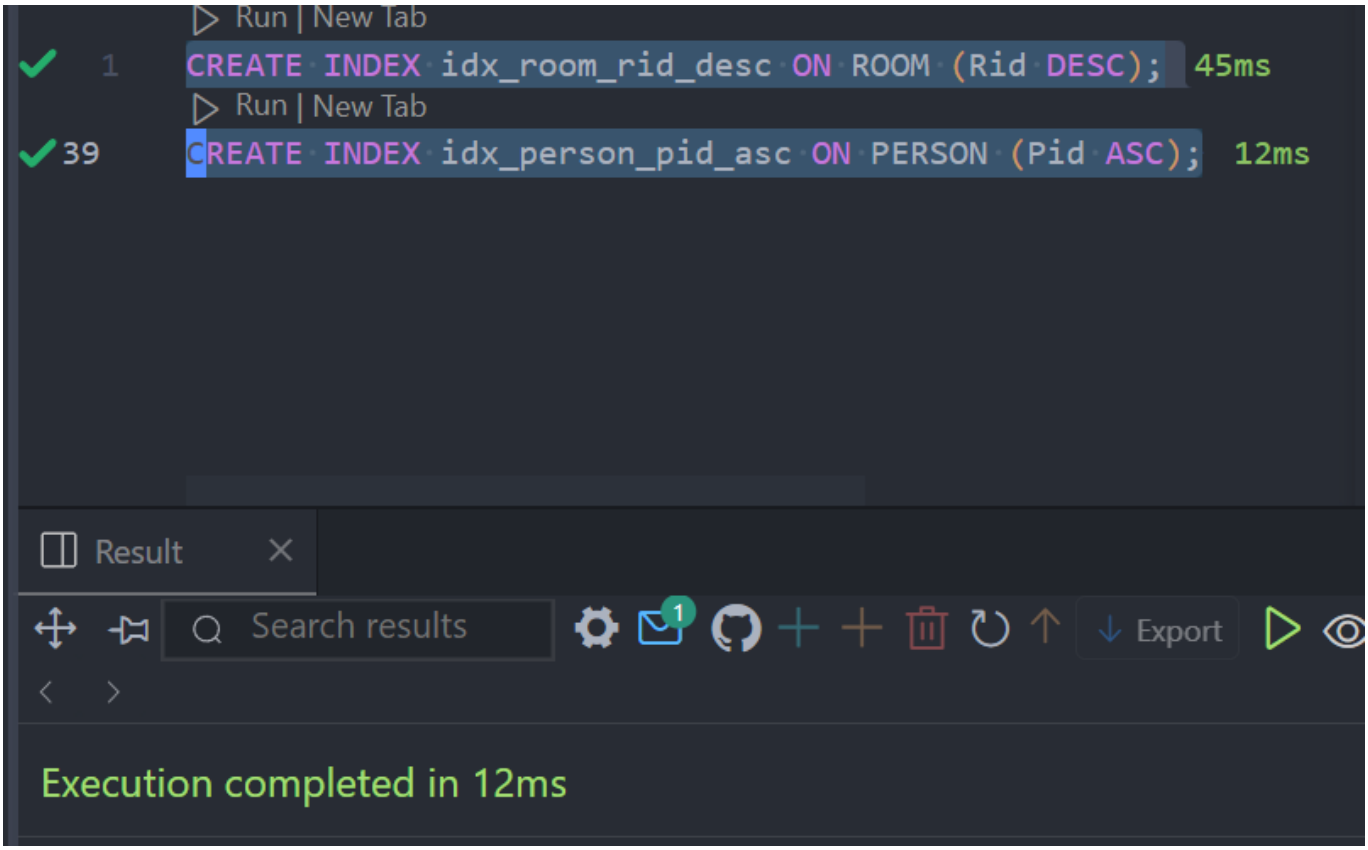


5. 为ROOM表创建按R#降序的索引。

```
CREATE INDEX idx_room_rid_desc ON ROOM (Rid DESC);
```

6. 为PERSON表创建按P#升序的索引。

```
CREATE INDEX idx_person_pid_asc ON PERSON (Pid ASC);
```

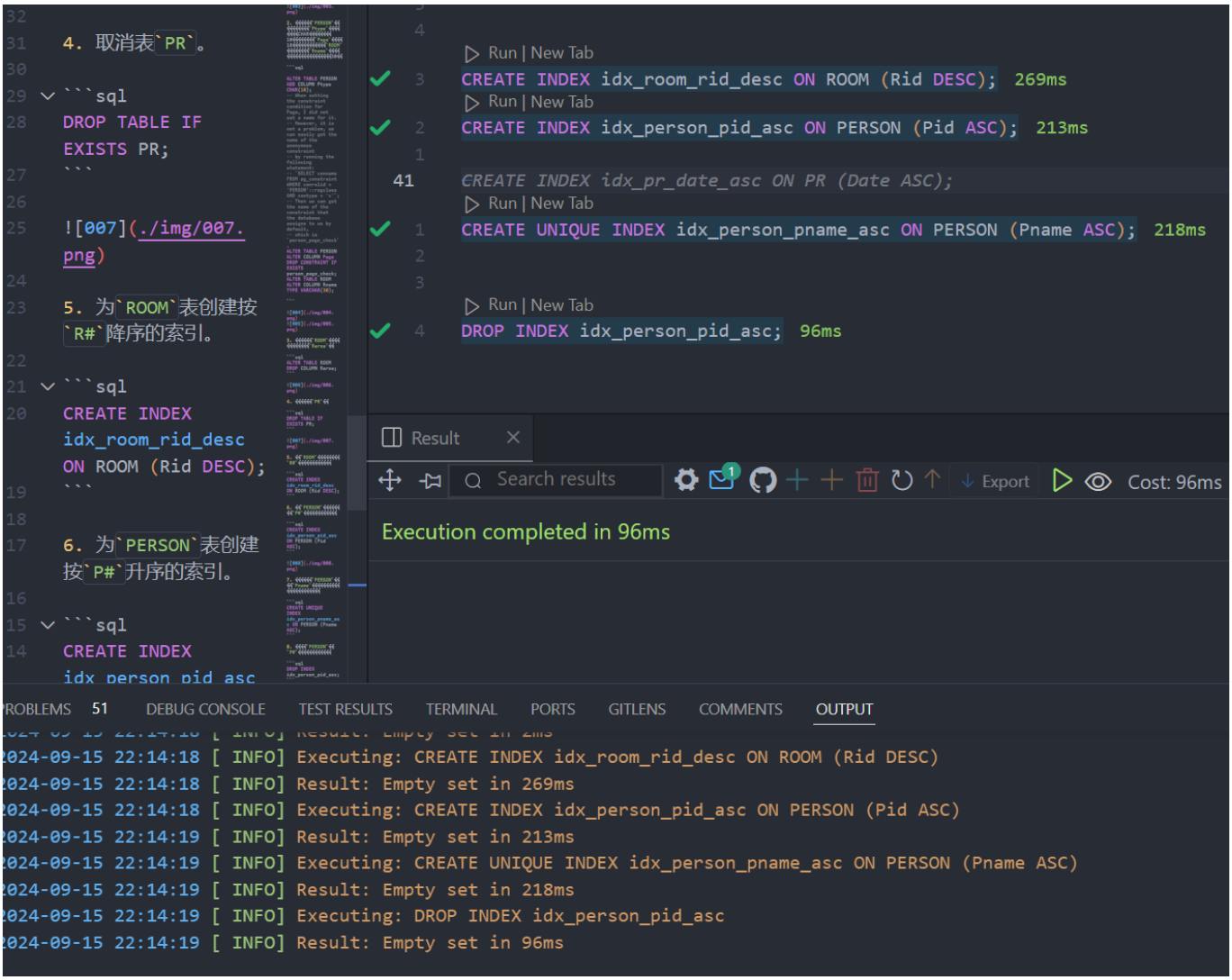


7. 创建表PERSON的按Pname升序排序的唯一性索引。

```
CREATE UNIQUE INDEX idx_person_pname_asc ON PERSON (Pname ASC);
```

8. 取消PERSON表P#的升序索引。

```
DROP INDEX idx_person_pid_asc;
```

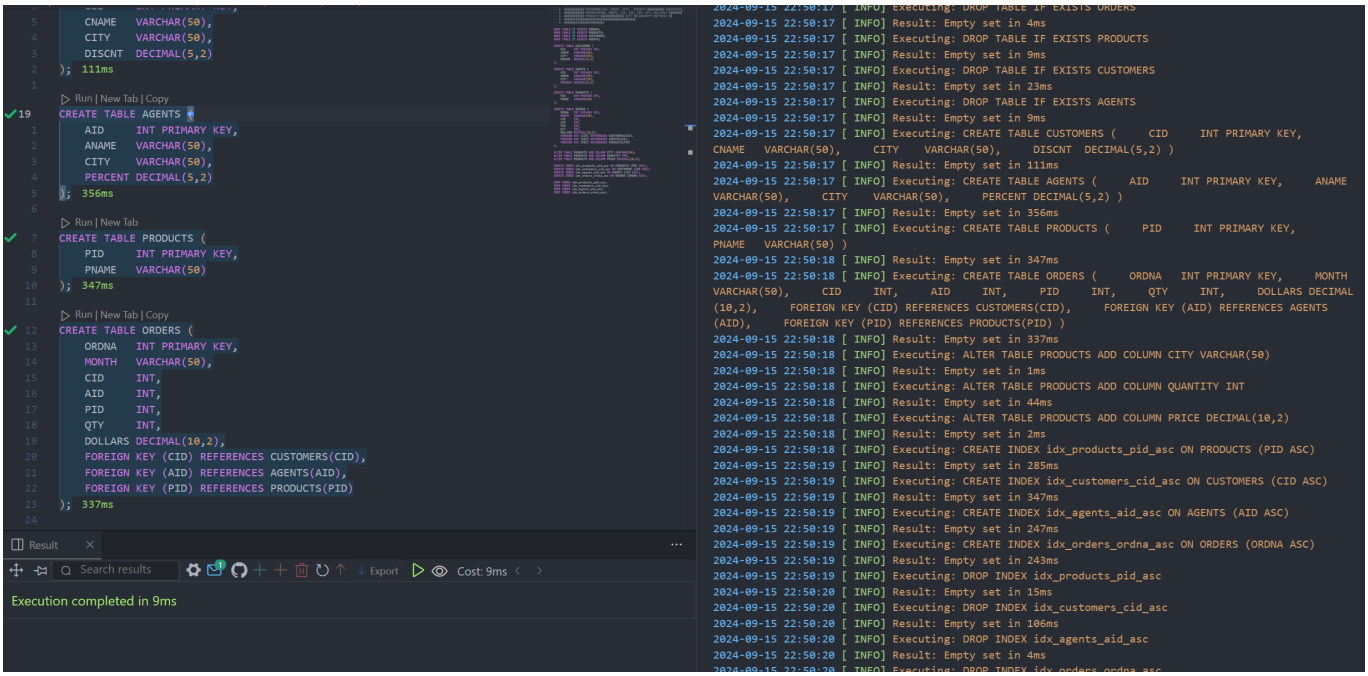


自我实践

1. 创建数据库表CUSTOMERS(CID, CNAME, CITY, DISCNT)，数据库表AGENTS(AID, ANAME, CITY, PERCENT)，数据库表PRODUCTS(PID, PNAME)。其中CID, AID, PID分别是各表的主键，具有唯一性约束。
2. 创建数据库表ORDERS(ORDNA, MONTH, CID, AID, PID, QTY, DOLLARS)。其中，ORDNA是主键，具有唯一性约束。CID, AID, PID是外键，分别参照的是表CUSTOMERS的CID字段，表AGENTS的AID字段，表PRODUCTS的PID字段。
3. 增加数据库表PRODUCTS的三个属性列：CITY, QUANTITY, PRICE。
4. 为以上4个表建立各自的按主键增序排列的索引。
5. 取消步骤4建立的4个索引。

```
DROP TABLE IF EXISTS ORDERS;
DROP TABLE IF EXISTS PRODUCTS;
DROP TABLE IF EXISTS CUSTOMERS;
DROP TABLE IF EXISTS AGENTS;

CREATE TABLE CUSTOMERS (
    CID     INT PRIMARY KEY,
    CNAME   VARCHAR(50),
    CITY    VARCHAR(50),
    DISCNT  DECIMAL(5,2)
```

```
);

CREATE TABLE AGENTS (
    AID     INT PRIMARY KEY,
    ANAME   VARCHAR(50),
    CITY    VARCHAR(50),
    PERCENT DECIMAL(5,2)
);

CREATE TABLE PRODUCTS (
    PID     INT PRIMARY KEY,
    PNAME   VARCHAR(50)
);

CREATE TABLE ORDERS (
    ORDNA   INT PRIMARY KEY,
    MONTH   VARCHAR(50),
    CID     INT,
    AID     INT,
    PID     INT,
    QTY     INT,
    DOLLARS DECIMAL(10,2),
    FOREIGN KEY (CID) REFERENCES CUSTOMERS(CID),
    FOREIGN KEY (AID) REFERENCES AGENTS(AID),
    FOREIGN KEY (PID) REFERENCES PRODUCTS(PID)
);

ALTER TABLE PRODUCTS ADD COLUMN CITY VARCHAR(50);
ALTER TABLE PRODUCTS ADD COLUMN QUANTITY INT;
ALTER TABLE PRODUCTS ADD COLUMN PRICE DECIMAL(10,2);

CREATE INDEX idx_products_pid_asc ON PRODUCTS (PID ASC);
CREATE INDEX idx_customers_cid_asc ON CUSTOMERS (CID ASC);
CREATE INDEX idx_agents_aid_asc ON AGENTS (AID ASC);
CREATE INDEX idx_orders_ordna_asc ON ORDERS (ORDNA ASC);

DROP INDEX idx_products_pid_asc;
DROP INDEX idx_customers_cid_asc;
DROP INDEX idx_agents_aid_asc;
DROP INDEX idx_orders_ordna_asc;
```


CNAME VARCHAR(50),
CITY VARCHAR(50),
DISCNT DECIMAL(5,2)
); 111ms
Run | New Tab | Copy
CREATE TABLE AGENTS (
AID INT PRIMARY KEY,
ANAME VARCHAR(50),
CITY VARCHAR(50),
PERCENT DECIMAL(5,2)
); 356ms
Run | New Tab
CREATE TABLE PRODUCTS (
PID INT PRIMARY KEY,
PNAME VARCHAR(50)
); 347ms
Run | New Tab | Copy
CREATE TABLE ORDERS (
ORDNA INT PRIMARY KEY,
MONTH VARCHAR(50),
CID INT,
AID INT,
PID INT,
QTY INT,
DOLLARS DECIMAL(10,2),
FOREIGN KEY (CID) REFERENCES CUSTOMERS(CID),
FOREIGN KEY (AID) REFERENCES AGENTS(AID),
FOREIGN KEY (PID) REFERENCES PRODUCTS(PID)
); 337ms
Result
Search results
Export
Cost: 9ms
Execution completed in 9ms
2024-09-15 22:50:17 [INFO] Executing: DROP TABLE IF EXISTS ORDERS
2024-09-15 22:50:17 [INFO] Result: Empty set in 4ms
2024-09-15 22:50:17 [INFO] Executing: DROP TABLE IF EXISTS PRODUCTS
2024-09-15 22:50:17 [INFO] Result: Empty set in 9ms
2024-09-15 22:50:17 [INFO] Executing: DROP TABLE IF EXISTS CUSTOMERS
2024-09-15 22:50:17 [INFO] Result: Empty set in 23ms
2024-09-15 22:50:17 [INFO] Executing: DROP TABLE IF EXISTS AGENTS
2024-09-15 22:50:17 [INFO] Result: Empty set in 9ms
2024-09-15 22:50:17 [INFO] Executing: CREATE TABLE CUSTOMERS (CID INT PRIMARY KEY,
CNAME VARCHAR(50), CITY VARCHAR(50), DISCNT DECIMAL(5,2))
2024-09-15 22:50:17 [INFO] Result: Empty set in 111ms
2024-09-15 22:50:17 [INFO] Executing: CREATE TABLE AGENTS (AID INT PRIMARY KEY, ANAME
VARCHAR(50), CITY VARCHAR(50), PERCENT DECIMAL(5,2))
2024-09-15 22:50:17 [INFO] Result: Empty set in 356ms
2024-09-15 22:50:17 [INFO] Executing: CREATE TABLE PRODUCTS (PID INT PRIMARY KEY,
PNAME VARCHAR(50))
2024-09-15 22:50:18 [INFO] Result: Empty set in 347ms
2024-09-15 22:50:18 [INFO] Executing: CREATE TABLE ORDERS (ORDNA INT PRIMARY KEY, MONTH
VARCHAR(50), CID INT, AID INT, PID INT, QTY INT, DOLLARS DECIMAL
(10,2), FOREIGN KEY (CID) REFERENCES CUSTOMERS(CID), FOREIGN KEY (AID) REFERENCES AGENTS
(AID), FOREIGN KEY (PID) REFERENCES PRODUCTS(PID))
2024-09-15 22:50:18 [INFO] Result: Empty set in 337ms
2024-09-15 22:50:18 [INFO] Executing: ALTER TABLE PRODUCTS ADD COLUMN CITY VARCHAR(50)
2024-09-15 22:50:18 [INFO] Result: Empty set in 1ms
2024-09-15 22:50:18 [INFO] Executing: ALTER TABLE PRODUCTS ADD COLUMN QUANTITY INT
2024-09-15 22:50:18 [INFO] Result: Empty set in 44ms
2024-09-15 22:50:18 [INFO] Executing: ALTER TABLE PRODUCTS ADD COLUMN PRICE DECIMAL(10,2)
2024-09-15 22:50:18 [INFO] Result: Empty set in 2ms
2024-09-15 22:50:18 [INFO] Executing: CREATE INDEX idx_products_pid_asc ON PRODUCTS (PID ASC)
2024-09-15 22:50:19 [INFO] Result: Empty set in 285ms
2024-09-15 22:50:19 [INFO] Executing: CREATE INDEX idx_customers_cid_asc ON CUSTOMERS (CID ASC)
2024-09-15 22:50:19 [INFO] Result: Empty set in 347ms
2024-09-15 22:50:19 [INFO] Executing: CREATE INDEX idx_agents_aid_asc ON AGENTS (AID ASC)
2024-09-15 22:50:19 [INFO] Result: Empty set in 247ms
2024-09-15 22:50:19 [INFO] Executing: CREATE INDEX idx_orders_ordna_asc ON ORDERS (ORDNA ASC)
2024-09-15 22:50:19 [INFO] Result: Empty set in 243ms
2024-09-15 22:50:19 [INFO] Executing: DROP INDEX idx_products_pid_asc
2024-09-15 22:50:20 [INFO] Result: Empty set in 15ms
2024-09-15 22:50:20 [INFO] Executing: DROP INDEX idx_customers_cid_asc
2024-09-15 22:50:20 [INFO] Result: Empty set in 106ms
2024-09-15 22:50:20 [INFO] Executing: DROP INDEX idx_agents_aid_asc
2024-09-15 22:50:20 [INFO] Result: Empty set in 4ms