Team number:36
Team members:
Annan Chen ac4619
Jiepeng Lian jl5521

PostgreSQL account name: jl5521 PGPASSWORD=6447 psql -U jl5521 -h 35.231.103.173 -d proj1part2

Part 4 of our NBA project includes the following updates:

1. Add text type attributes "description" to table Teams, which contains the introduction to this team and some other basic infomation,
allowing full text search

2. Create array attributes: quarter_shot_number in a new table quarter_shots. This attributes contains a four-element array that calculate each players total attempts in every quarter,
indicating players' tendency to shot in every quarter.

3. Create composite type: stadium_type and table stadium_composite - containing all information about this stadium such as size, location and name and build a table for it. This composite type will be more convenient for future expansion if there is any more stadium added or changed into the database, so that any change to the stadium will also be reflected in other tables linked to this one.

Examples query:
Select * from stadium_composite limit 5;

```
   stadium_name      | size  | stadium_location
-----------------------+-------+------------------
 TD Garden             | 18624 | Boston
 Barclays Center       | 17732 | New York City
 Madison Square Garden | 19812 | New York City
 Wells Fargo Center    | 21600 | Philadelphia
 Scotiabank Arena      | 19800 | Toronto
```

Expansion Rationale: These updates will benefit our original database as we can understand more about teams information, including their past history and a brief introduction. The new attributes added in player's shot information will enrich our player and match search function in the part 3 database. And the user can not only see each player's overall performance during each game, but also their favorite players' quarter performance and result, having a more detailed look in descriptive analysis like which player does best in which quarter - for example, some players might outperform others when the game is closed at the end, and some might have a hot hand at the beginning of each game.

- Some example queries for new updating functions of text type and array attributes(composite type is shown below):

-- Find teams that has descirption containing "NBA finals" or "champion"

select team_name, found_year from teams where plainto_tsquery('NBA finals')||plainto_tsquery('champion') @@ to_tsvector(description);

And the output will be:

```
      team_name         | found_year
------------------------+------------
```

```
 New York Knicks         |       1946
 Indiana Pacers          |       1967
 Atlanta Hawks           |       1946
 Miami Heat              |       1988
 Orlando Magic           |       1989
 Washington Wizards      |       1961
 Denver Nuggets          |       1967
 Minnesota Timberwolves  |       1989
 Oklahoma City Thunder   |       1967
 Portland Trail Blazers  |       1970
 Utah Jazz               |       1974
 Los Angeles Lakers      |       1947
 Phoenix Suns            |       1968
 Houston Rockets         |       1967
(14 rows)
```

(It doesn't means the rest teams never enter finals)

-- Find the top 10 players that has the highest shot attempts in fourth quarter

```
select player_name as player, max(quarter_shot_number[4]) as fourth_shot from quarter_shots q, players p
where p.player_id = q.player_id
 group by player ORDER BY fourth_shot DESC limit 10;
```

And the output will be:

```
   player      | fourth_shot
---------------+-------------
 Chris Paul    |          18
 Jordan Hill   |          18
 Nikola Mirotic|          17
 Aaron Brooks  |          14
 Stephen Curry |          13
 Jeremy Lin    |          13
 Lou Williams  |          13
 Isaiah Thomas |          12
 JJ Redick     |          12
 LeBron James  |          12
(10 rows)
```

This resulst shows that Chris Paul and Jordan Hill are the two players who has the highest tendency to shot at the end of games, shooting in total 18 times in just fourth quarter in their matches during our database time horizon.

Appendix:

Schema

```
CREATE TYPE stadium_type AS (stadium_name varchar(40), size numeric(8,0), stadium_location
varchar(20));

CREATE TABLE stadium_composite OF stadium_type (
   PRIMARY KEY (stadium_name),
 size check (size>0),
 stadium_location
);

ALTER TABLE stadium_composite
ADD CONSTRAINT stadium_composite_stadium_name_fkey FOREIGN KEY (stadium_name)
REFERENCES Stadiums(stadium_name) ;

CREATE TABLE quarter_shots (
   player_id       varchar(16),
   quarter_point   integer array[4],
   primary key (player_id),
   foreign key (player_id) references Players
);

select player_id,
array[coalesce((select count(s.shot_id) from shots s, shot_to_player sp where sp.shooter_id = p.player_id and
sp.shot_id = s.shot_id and s.quarter = 1 group by p.player_id),0),
     coalesce((select count(s.shot_id) from shots s, shot_to_player sp where sp.shooter_id = p.player_id and
sp.shot_id = s.shot_id and s.quarter = 2 group by p.player_id),0),
     coalesce((select count(s.shot_id) from shots s, shot_to_player sp where sp.shooter_id = p.player_id and
sp.shot_id = s.shot_id and s.quarter = 3 group by p.player_id),0),
     coalesce((select count(s.shot_id) from shots s, shot_to_player sp where sp.shooter_id = p.player_id and
sp.shot_id = s.shot_id and s.quarter = 4 group by p.player_id),0)] as quarter_point
from players p
```