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COMP 421

Project 3 Deliverable:

Relational Translations:

- Entity Sets to Relations:

  - TeamMember(<u>uuid</u>, associationURL, name, DOB, role, shirtNumber, genPosition)

    - associationURL is foreign key to Team

  - Team(<u>associationURL</u>, associationName, country, group)

  - Referee(<u>rid</u>, role, country, name, yearsOfExperience)

  - Match(<u>matchID</u>, sname, round, date, duration, time)

    - sname is foreign key referencing Stadium

  - Goal(<u>gid</u>, team, uuid, matchID, duringPenaltyKick, minute, occurrence)

    - uuid references the uuid of Player

    - matchID references the matchID of Match

    - team references the associationURL of Team (Team which scored the goal)

  - Ticket(<u>tid</u>, matchID, transactionID, price)

    - matchID is a foreign key referencing Match

    - transactionID is a foreign key referencing Order

  - Client(<u>email,</u> name, address)

  - Order(<u>transactionId,</u> email, totalCost, paymentMethod)

    - email is a foreign key referencing Client

- ○ Seat(sId, sname, section, row, seatNumber)

    - ■ sname is a foreign key referencing stadium (one to one relationship)

    - ■ section is a foreign key referencing section

- ○ Section(name, capacity)

- ○ Stadium(name, capacity, location)

- Relationship Sets:

    - ○ Participate(associationURL, matchID)

        - ■ associationURL refers to Team

        - ■ matchID refers to Match (with a participation constraint i.e. every Match must have a Team participating)

        - ■ Many-many relationship

    - ○ Assigned(rid, matchID)

        - ■ rid refers to Referee

        - ■ matchID refers to Match

        - ■ Participation constraint on Match indicates that every Match must have at least one Referee

        - ■ Many-many relationship

    - ○ Plays(uuid, matchID, minEntered, minExited, detailedPosition, yellowCards, receivedRed)

        - ■ uuid refers to id number for Player of TeamMember

        - ■ matchID refers to Match

        - ■ Participation constraint on Match indicates every Match must have at least one Player playing at any given time.

■ Many-many relationship

Application Interaction:

Question 3)

a)

i) Query in the database that shows match information about ALL matches:

```
db2 => SELECT MATCH.MATCHID as MATCHID, MATCH.SNAME as stadiumName, ROUND, DATE, DURATION, TIME, t1.ASSOCIATIONNAME as country_1, t2.ASSOCIATIONNAME as country_2
FROM MATCH
        JOIN PARTICIPATE p1 on MATCH.MATCHID = p1.MATCHID
        JOIN PARTICIPATE p2 on MATCH.MATCHID = p2.MATCHID AND p1.ASSOCIATIONURL < p2.ASSOCIATIONURL
        JOIN TEAM t1 on p1.ASSOCIATIONURL = t1.ASSOCIATIONURL
        JOIN TEAM t2 on p2.ASSOCIATIONURL = t2.ASSOCIATIONURL
ORDER BY MATCH.MATCHID;db2 (cont.) => db2 (cont.) => db2 (cont.) => db2 (cont.) => db2 (cont.) => db2 (cont.) =>

MATCHID    STADIUMNAME
                                    ROUND
                                                                  DATE      DURATION  TIME    COUNTRY_1
                                                                                                                                                    COUNTRY_2
---------- -------------------------------------------- --------------------------------------------------------------------------------------------------------------------
---------------------------------------------------------- --------- --------- ------- ---------------------------------------------------------------------------------------
                                                                                                                                                    ----------------
        1 Santiago Bernabeu
                                    group-round
                                                                  03/13/2023      90 17:30:00 Spain
                                                                                                                                                    Argentina
        2 Old Trafford
                                    group-round
                                                                  03/14/2023      90 17:30:00 Germany
                                                                                                                                                    France
        3 Allianz Arena
                                    group-round
                                                                  03/15/2023      90 20:00:00 Germany
                                                                                                                                                    Brazil
        4 Parc des Princes
                                    group-round
                                                                  03/16/2023      90 21:00:00 France
                                                                                                                                                    Argentina
        5 Johan Cruyff Arena
                                    group-round
                                                                  03/17/2023      90 19:45:00 France
                                                                                                                                                    Spain

  5 record(s) selected.
```

ii-iii) Screenshot of the application (with going back to previous menu)

```
[cs421g134@winter2023-comp421:~/Project3$ java Soccer
Soccer Main Menu
        1. List information of matches of a country
        2. Insert initial player information for a match
        3. Insert a goal
        4. Exit application
[Please Enter Your Option: 1
[Please enter the country name: France
France Germany 2023-03-14 group-round 0 2 2
France Argentina 2023-03-16 group-round NULL NULL 1
France Spain 2023-03-17 group-round NULL NULL 2

[Enter [A] to find matches of another country, [P] to go to the previous menu:P
Soccer Main Menu
        1. List information of matches of a country
        2. Insert initial player information for a match
        3. Insert a goal
        4. Exit application
Please Enter Your Option: ▮
```

b)

    i) Query in the database that shows information about ALL matches that take place within 3 days of the date the query is posed:

```
db2 => SELECT MATCH.MATCHID as MATCHID, MATCH.SNAME as stadiumName, ROUND, DATE, DURATION, TIME, t1.ASSOCIATIONNAME as country_1, t2.ASSOCIATIONNAME as country_2
       FROM MATCH
JOIN PARTICIPATE p1 on MATCH.MATCHID = p1.MATCHID
JOIN PARTICIPATE p2 on MATCH.MATCHID = p2.MATCHID AND p1.ASSOCIATIONURL < p2.ASSOCIATIONURL
JOIN TEAM t1 on p1.ASSOCIATIONURL = t1.ASSOCIATIONURL
JOIN TEAM t2 on p2.ASSOCIATIONURL = t2.ASSOCIATIONURL
WHERE DAY(MATCH.date) >= DAY(CURRENT DATE) AND
      DAY(MATCH.date) <= DAY(CURRENT DATE) + 3
ORDER BY MATCH.MATCHID;db2 (cont.) => db2 (cont.) => db2 (cont.) => db2 (cont.) => db2 (cont.) => db2 (cont.) => db2 (cont.) => db2 (cont.) =>

MATCHID     STADIUMNAME
                                                ROUND
                                                                        DATE        DURATION    TIME    COUNTRY_1
                                                                                                                                                        COUNTRY_2

---------- ----------------------------------------------------------------------------------------------------------------------------------------------
------------------------------------------------------ ---------- ---------- ------- ----------------------------------------
----------------------------------------------------------------------------------------- ---------- ---------- ------- -----------------------------------
----------------------------------------------------------------------------------------------------------------------------------
     2 Old Trafford
                                                group-round
                                                                        03/14/2023      90 17:30:00 Germany
                                                                                                                                                        France
     3 Allianz Arena
                                                group-round
                                                                        03/15/2023      90 20:00:00 Germany
                                                                                                                                                        Brazil
     4 Parc des Princes
                                                group-round
                                                                        03/16/2023      90 21:00:00 France
                                                                                                                                                        Argentina
     5 Johan Cruyff Arena
                                                group-round
                                                                        03/17/2023      90 19:45:00 France
                                                                                                                                                        Spain

  4 record(s) selected.
```

    ii) Query in the database that shows for the match with MATCHID = 4 in the previous query and the country "Argentina" that plays this match, all the players of this country that play in the match:

```
db2 => SELECT name, shirtnumber, detailedposition, minentered, minexited
FROM PLAYS
JOIN TEAMMEMBER T on PLAYS.UUID = T.UUID
WHERE T.ASSOCIATIONURL = (SELECT TEAM.ASSOCIATIONURL FROM TEAM WHERE ASSOCIATIONNAME = 'Argentina') AND PLAYS.MATCHID = 4;db2 (cont.) => db2 (cont.) => db2

NAME
                                                SHIRTNUMBER DETAILEDPOSITION
                                                                                                MINENTERED  MINEXITED
----------------------------------------------------------------------------------------------------------------------------------------------
---------------------------------- ---------- ------------------------------------------------------ ---------- ----------
----------------------------------------------------------------------------------------------------- ---------- ----------

  0 record(s) selected.
```

    iii) Query that shows all the players of the team of country "Argentina":

```
db2 => SELECT UUID, name, dob, SHIRTNUMBER, GENPOSITION
FROM TEAMMEMBER
WHERE ASSOCIATIONURL = (SELECT ASSOCIATIONURL FROM TEAM WHERE ASSOCIATIONNAME = 'Argentina');db2 (cont.) => db2 (cont.) =>

UUID        NAME
                                                DOB         SHIRTNUMBER GENPOSITION

---------- -----------------------------------------------------------------------------------------------------------------------------------
----------------------------------------------------------- ---------- ---------- -------------------------------------------------
-----------------------------------------------------------------------
     1 Lionel Messi
                                                06/24/1987          10 Forward
     2 Sergio Aguero
                                                06/02/1988          19 Forward
     3 Nicolas Otamendi
                                                02/12/1988          17 Defender
    10 Angel Di Maria
                                                02/14/1988          17 Midfielder
    11 Paulo Dybala
                                                11/15/1993          17 Forward

  5 record(s) selected.
```

iiii) Screenshot of the application:

```
[cs421g134@winter2023-comp421:~/Project3$ java Soccer
Soccer Main Menu
        1. List information of matches of a country
        2. Insert initial player information for a match
        3. Insert a goal
        4. Exit application
[Please Enter Your Option: 2
Matches:
        2 Germany France 2023-03-14 group-round
        3 Germany Brazil 2023-03-15 group-round
        4 France Argentina 2023-03-16 group-round
        5 France Spain 2023-03-17 group-round

You can enter [P] to go to the previous menu
[Please enter the match ID of the match you wish to select: 4
The following countries are participating in the match:

        1. France
        2. Argentina

[Enter the number of the country you want to select or [P] to go to the previous menu: 2
The following players from Argentina are already entered for match 4:

Possible players from Argentina not yet selected:
1. Lionel Messi 10 Forward
2. Sergio Aguero 19 Forward
3. Nicolas Otamendi 17 Defender
4. Angel Di Maria 17 Midfielder
5. Paulo Dybala 17 Forward

[Enter the number of the player you want to insert or [P] to go to the previous menu: 1

[Please enter the position of the player: Center Forward
The following players from Argentina are already entered for match 4:

Lionel Messi 10 Center Forward  from minute 0 to minute 0 yellow: 0 red: 0

Possible players from Argentina not yet selected:
1. Sergio Aguero 19 Forward
2. Nicolas Otamendi 17 Defender
3. Angel Di Maria 17 Midfielder
4. Paulo Dybala 17 Forward

[Enter the number of the player you want to insert or [P] to go to the previous menu: 1
```

We can observe on the screenshot that we select the menu option 2 (Insert initial player information for a match), then we select the match with MatchID 4 and the country "Argentina". Then, we observe that there are no players added to the match yet and we add the player "Lionel Messi" (option 1).

viii) On the following screenshot, we observe that we cannot add more than 2 players in the team, then we return to the previous menu and we exit the application.

```
The following players from Argentina are already entered for match 4:

Lionel Messi 10 Center Forward  from minute 0 to minute 0 yellow: 0 red: 0
Sergio Aguero 19 Left Forward   from minute 0 to minute 0 yellow: 0 red: 0

Possible players from Argentina not yet selected:
1. Nicolas Otamendi 17 Defender
2. Angel Di Maria 17 Midfielder
3. Paulo Dybala 17 Forward

[Enter [P] to go to the previous menu: 1

You can enter a maximum of 2 players.
[Enter [P] to go to the previous menu: P
Soccer Main Menu
        1. List information of matches of a country
        2. Insert initial player information for a match
        3. Insert a goal
        4. Exit application
[Please Enter Your Option: 4
cs421g134@winter2023-comp421:~/Project3$
```
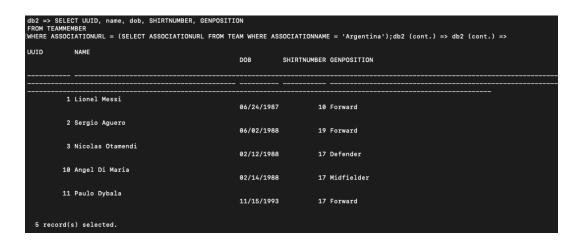
x) Query in the database that shows for match with MatchID 4 and country "Argentina", the players that play in the match:

```
db2 => SELECT name, shirtnumber, detailedposition, minentered, minexited
FROM PLAYS
JOIN TEAMMEMBER T on PLAYS.UUID = T.UUID
WHERE T.ASSOCIATIONURL = (SELECT TEAM.ASSOCIATIONURL FROM TEAM WHERE ASSOCIATIONNAME = 'Argentina') AND PLAYS.MATCHID = 4;db2 (cont.) => db2 (cont.) => db2 (cont.) =>

NAME                                                SHIRTNUMBER DETAILEDPOSITION
                                                                                                MINENTERED  MINEXITED
----------------------------------------------------------- ---------- ------------------------------------------------------------------------------------------------------------------------
------------------------------------- ---------- ------------------------------------------------------------ ---------- ----------
Lionel Messi
                                                         10 Center Forward
                                                                                                   0         0
Sergio Aguero
                                                         19 Left Forward
                                                                                                   0         0

  2 record(s) selected.
```

c) The menu item that we designed is intended to insert goals. The user must first select a match, and a country, as well as the player scoring the goal (while providing the minute the goal is scored and if it is a penalty kick).

   i) First, we query in the database to show the goals scored by the country "Argentina" in the match 4:

```
db2 => SELECT *
FROM GOAL
WHERE TEAM = (SELECT ASSOCIATIONURL FROM TEAM WHERE ASSOCIATIONNAME = 'Argentina') AND MATCHID = 4;db2 (cont.) => db2 (cont.) =>

GID         TEAM                                              UUID       MATCHID    DURINGPENALTYKICK MINUTE     OCCURRENCE

----------- ---------------------------------------------------------------------------------------------------------------------------------------
--------------------------------------------------- ---------- ---------- ---------------- ---------- -------------------------------------------
------------------------------------------------------------------------------------------------------------------
  0 record(s) selected.
```

ii) Then, we use the application to add a goal scored by the player "Lionel Messi" from the team

"Argentina" in the match 4:

```
[cs421g134@winter2023-comp421:~/Project3$ java Soccer
Soccer Main Menu
        1. List information of matches of a country
        2. Insert initial player information for a match
        3. Insert a goal
        4. Exit application
[Please Enter Your Option: 3
Matches:
        2 Germany France 2023-03-14 group-round
        3 Germany Brazil 2023-03-15 group-round
        4 France Argentina 2023-03-16 group-round
        5 France Spain 2023-03-17 group-round

You can enter [P] to go to the previous menu
[Please enter the match ID of the match you wish to select: 4
The following countries are participating in the match:

        1. France
        2. Argentina

[Enter the number of the country you want to select or [P] to go to the previous menu: 2
Argentina has scored 0 goals so far in this match.

The following players from Argentina are playing for the match 4:

1. Lionel Messi 10 Center Forward  from minute 0 to minute null
2. Sergio Aguero 19 Left Forward  from minute 0 to minute null

[Please enter the number of the player who scored the goal or enter [P] to go back: 1

[Please enter the minute of the goal: 25

[Please enter [T] if it was a penalty kick, else enter [N]: N
Argentina has scored 1 goals so far in this match.

The following players from Argentina are playing for the match 4:

1. Lionel Messi 10 Center Forward  from minute 0 to minute null
2. Sergio Aguero 19 Left Forward  from minute 0 to minute null

[Please enter the number of the player who scored the goal or enter [P] to go back: P
Soccer Main Menu
        1. List information of matches of a country
        2. Insert initial player information for a match
        3. Insert a goal
        4. Exit application
Please Enter Your Option:
```

iii) Then we query the database again, to show that a goal was added:

```
db2 => SELECT T.ASSOCIATIONNAME, T2.NAME, MINUTE, DURINGPENALTYKICK, MATCHID
FROM GOAL
JOIN TEAM T on GOAL.TEAM = T.ASSOCIATIONURL
JOIN TEAMMEMBER T2 on GOAL.UUID = T2.UUID
WHERE TEAM = (SELECT ASSOCIATIONURL FROM TEAM WHERE ASSOCIATIONNAME = 'Argentina') AND MATCHID = 4;db2 (cont.) => db2 (cont.) => db2 (cont.) => db2 (cont.) =>

ASSOCIATIONNAME
                        NAME
                                                        MINUTE      DURINGPENALTYKICK MATCHID
------------------------------------------------- ----------------------------------------------------- ----------- ----------------- -----------
-------------------------------------------------
Argentina
                        Lionel Messi
                                                            25                 0        4

  1 record(s) selected.
```

Indexing:

Q4)

CREATE INDEX goalIdx ON Plays(gid, team, uuid, matchID);

DROP INDEX goalIdx;

```
SQLSTATE=01550

cs421g134@winter2023-comp421:~/Project3$ ls
q4.sql  q5a.sql  q5b.sql
cs421g134@winter2023-comp421:~/Project3$ db2 -t -f q4.sql
DB20000I  The SQL command completed successfully.

cs421g134@winter2023-comp421:~/Project3$
```

We chose an index over the Goal relation on search key gid, team, uuid, and matchID because indexes help performance on equality searches. Additionally, due to the fact that it is a frequently accessed relation, which commonly only requires the use of its primary key and foreign references for the use of joins with relations related to the TeamMember and Team information of players participating in a specific Match, we are able to take advantage of the improved performance which indexes offer.

Data Analytics:

Q5)

Query:

/*

Derived table 'group_goals' used for finding the number of goals that each team in the tournament has scored during matches which occur during the group stage

*/

```
SELECT t.associationName, numGoals
FROM Team t, (SELECT T.associationURL, SUM(CASE WHEN m.round LIKE 'Group Round' AND
```

```
    g.gid IS NOT NULL THEN 1 ELSE 0 END) AS numGoals
FROM Team T LEFT OUTER JOIN
    Goal g
    ON T.associationURL = g.team
    JOIN
    Match m
    ON m.matchID = g.matchID
GROUP BY T.associationURL)group_goals
WHERE t.associationURL = group_goals.associationURL
ORDER BY numGoals DESC
LIMIT 5;
```

```
cs421g134@winter2023-comp421:~/Project3$ db2 -t -f q5a.sql

ASSOCIATIONNAME
                                                                                NUMGOALS
------------------------------------------------------------------------------- ----------
Argentina
                                                                                       3
France
                                                                                       2
England
                                                                                       1
Germany
                                                                                       1
Brazil
                                                                                       1

  5 record(s) selected.

cs421g134@winter2023-comp421:~/Project3$
```

//Export to google sheets/excel document statement

```
EXPORT TO workbook.csv OF DEL MODIFIED BY NOCHARDEL SELECT t.associationName, numGoals
FROM Team t, (SELECT T.associationURL, SUM(CASE WHEN m.round LIKE 'Group Round' AND
   g.gid IS NOT NULL THEN 1 ELSE 0 END) AS numGoals
FROM Team T LEFT OUTER JOIN
    Goal g
    ON T.associationURL = g.team
    JOIN
    Match m
    ON m.matchID = g.matchID
GROUP BY T.associationURL)group_goals
WHERE t.associationURL = group_goals.associationURL
```

```
ORDER BY numGoals DESC
LIMIT 5;
```