

# COMP 421 - Project 3

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## Relational Schema

Stadiums(stadiumName,capacity,location,directions,vipPrice,food)

Matches(identifier,priceMultiplier,length,dateTime,round,stadiumName)

- stadiumName foreign key referencing relation to Stadiums

Team(country,name,URL,group,stadiumName,identifier)

- stadiumName foreign key referencing Matches relation to Stadiums
- identifier foreign key referencing relation to Matches

Players(number,dateOfBirth,name,position,stadiumName,identifier,country)

- stadiumName foreign key referencing Matches relation to Stadiums
- identifier foreign key referencing relation to Matches
- country foreign key referencing relation to Team

PlayersInGame(number,numberOfYellowCards,redCard,minuteEntered,minuteLeft,detailedPosition,stadiumName,identifier,country)

- number key referencing ISA relation to Players
- stadiumName foreign key referencing Matches relation to stadiums
- identifier foreign key referencing relation to Matches
- country foreign key referencing relation of Players to Team

GoalsScored(occurrence,minute,penaltyKick,stadiumName,identifier, number)

- stadiumName foreign key referencing Matches relation to Stadiums
- identifier foreign key referencing relation to Matches
- Number foreign key referencing relation to PlayersInGame

Coaches(name,dateOfBirth,role,stadiumName,identifier,country)

- stadiumName foreign key referencing Matches relation to Stadiums
- identifier foreign key referencing Team relation to Matches
- country foreign key referencing relation to Team

Referees(refID,name,yearsOfExperience,country)

RefereesInGame(refID,name,role,stadiumName,identifier)

- refID key referencing ISA relation to Referees

- stadiumName foreign key referencing Matches relation to Stadiums
- identifier foreign key referencing relation to Matches

Seat(seatNumber,seatSection,basePrice,stadiumName,identifier)

- stadiumName foreign key referencing relation to Stadium
- identifier foreign key referencing relation to Matches

Tickets(verificationNumber,finalPrice,stadiumName, seatNumber, identifier)

- stadiumName foreign key referencing Seat relation to Stadium
- seatNumber,identifier foreign key referencing relation to Seat
- identifier foreign key referencing relation to Matches

User(password,name,paymentInfo,email, verificationNumber)

- verificationNumber foreign key referencing Seat relation to Tickets

## Application Interaction

### 3.a)

i)

```
cs421g138@winter2023-comp421:~/project2/p2/p3$ db2 -t -f Q3a1.sql -v
SELECT DISTINCT m.identifier,m.dateTime,m.round,m.stadiumName,c1.COUNTRY ,c2.COUNTRY FROM Matches m, PlayersInGame c1,PlayersInGame c2 WHERE m.IDENTIFIER=c1.IDENTIFIER AND c1.IDENTIFIER=c2.identifier AND c1.country<>c2.country
```

IDENTIFIER	DATETIME	ROUND	STADIUMNAME	COUNTRY	COUNTRY
1566	2023-02-22-00.00.00.000000	Group	MetLife Stadium	Canada	China
1566	2023-02-22-00.00.00.000000	Group	MetLife Stadium	China	Canada
4780	2022-04-16-00.00.00.000000	Group	Allianz Arena	China	England
4780	2022-04-16-00.00.00.000000	Group	Allianz Arena	England	China
5949	2022-05-18-00.00.00.000000	Group	Rose Bowl	England	Ukraine
5949	2022-05-18-00.00.00.000000	Group	Rose Bowl	Ukraine	England
6985	2023-02-24-00.00.00.000000	Group	FNB Stadium	Canada	Ukraine
6985	2023-02-24-00.00.00.000000	Group	FNB Stadium	Ukraine	Canada
7450	2022-11-25-00.00.00.000000	Semi-final	Azadi Stadium	Canada	England
7450	2022-11-25-00.00.00.000000	Semi-final	Azadi Stadium	England	Canada
7972	2023-02-20-00.00.00.000000	Group	FedExField	Cuba	Jordan
7972	2023-02-20-00.00.00.000000	Group	FedExField	Jordan	Cuba

12 record(s) selected.

ii)

```
cs421g138@winter2023-comp421:~/project2/p2/p3$ javac Soccer.java
cs421g138@winter2023-comp421:~/project2/p2/p3$ java Soccer
Soccer Main Menu
1. List information of matches of a country
2. Insert initial player information for a match
3. Update a goal scorer
4. Exit application
Please Enter Your Option:
1
Please enter a country name
Canada
SELECT DISTINCT c1.country country_a,c2.country country_b,m.dateTime,m.round,count(DISTINCT g1.OCCURANCE) num_goals_a,count(DISTINCT g2.OCCURANCE) num_g
oals_b,count(DISTINCT t.VERIFICATIONNUMBER) num_tickets
FROM playersInGame c1,playersInGame c2,Matches m,goalsScored g1,goalsScored g2,tickets t
WHERE m.IDENTIFIER=c1.identifier AND c1.IDENTIFIER=c2.identifier AND c1.COUNTRY<>c2.COUNTRY AND c1.COUNTRY='Canada' AND g1.IDENTIFIER=c1.IDENTIFIER AND
g1.NUMBER=c1.NUMBER and t.IDENTIFIER=c1.IDENTIFIER AND g2.IDENTIFIER=c2.IDENTIFIER AND g2.NUMBER=c2.NUMBER
GROUP BY c1.country, c2.country, m.dateTime, m.round
Canada England 2022-11-25 00:00:00.0 Semi-final 1 1 6
Canada China 2023-02-22 00:00:00.0 Group 2 3 10
Canada Ukraine 2023-02-24 00:00:00.0 Group 1 1 12
Enter [A] to find matches of another country, [P] to go to the previous menu:
```

iii)

```
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. Update a goal scorer
4. Exit application

```
Please Enter Your Option:
```

3.b)

i)

```
cs421g138@winter2023-comp421:~/project2/p2/p3$ db2 -t -f Q3bi.sql -v
SELECT DISTINCT m.identifier,t1.COUNTRY,t2.COUNTRY, m.dateTime,m.round FROM Matches m,team t1,team t2 WHERE m.IDENTIFIER=t1.IDENTIFIER AND t1.IDENTIFIER
=t2.IDENTIFIER AND t1.COUNTRY<>t2.COUNTRY AND m.DATETIME between '2023-02-23 00:00:00.000000' and '2023-02-26 00:00:00.000000'
```

IDENTIFIER	COUNTRY	COUNTRY	DATETIME	ROUND
6985	Canada	Ukraine	2023-02-24-00.00.00.000000	Group
7948	Portugal	Indonesia	2023-02-23-00.00.00.000000	Quater-Final
7948	Indonesia	Portugal	2023-02-23-00.00.00.000000	Quater-Final
6985	Ukraine	Canada	2023-02-24-00.00.00.000000	Group
9033	Mexico	Jordan	2023-02-25-00.00.00.000000	Group
9033	Jordan	Mexico	2023-02-25-00.00.00.000000	Group

```
6 record(s) selected.
```

ii)

```
cs421g138@winter2023-comp421:~/project2/p2/p3$ db2 -t -f Q3bii.sql -v
Select p2.name,p.number,p.DETAILEDPOSITION,p.MINUTEENTERED,p.MINUTELEFT,p.NUMBEROFYELLOWCARDS,p.REDCARD FROM playersInGame p, players p2 WHERE p.number=
p2.number AND p.identifier='9033' AND p.country='Mexico'
```

NAME	NUMBER	DETAILEDPOSITION	MINUTEENTERED	MINUTELEFT	NUMBEROFYELLOWCARDS	REDCARD
------	--------	------------------	---------------	------------	---------------------	---------

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

iii)

```
cs421g138@winter2023-comp421:~/project2/p2/p3$ db2 -t -f Q3biii.sql -v
SELECT DISTINCT p.number,p.name,p.position FROM players p, PLAYERSINGAME p2 WHERE p.country='Mexico' AND p.IDENTIFIER='9033' AND p.IDENTIFIER NOT IN (S
ELECT p2.IDENTIFIER FROM PLAYERSINGAME)
```

NUMBER	NAME	POSITION
14	Morgan Seth	goalkeeper
22	Jaco Smith	forward
96	Herculie Sines	midfielder
99	Tom Sanders	midfielder

```
4 record(s) selected.
```

iv)

```
Please Enter Your Option:
2
SELECT DISTINCT m.identifier,t1.COUNTRY,t2.COUNTRY, m.dateTime,m.round
FROM Matches m,team t1,team t2
WHERE m.IDENTIFIER=t1.IDENTIFIER AND t1.IDENTIFIER=t2.IDENTIFIER AND t1.COUNTRY<>t2.COUNTRY AND m.DATETIME between '2023-02-23 00:00:00.000000' and '2023-02-26 00:00:00.000000'
Match id:6985   Canada   Ukraine   2023-02-24 00:00:00.0   Group
Match id:7948   Portugal  Indonesia 2023-02-23 00:00:00.0   Quater-Final
Match id:7948   Indonesia Portugal   2023-02-23 00:00:00.0   Quater-Final
Match id:6985   Ukraine   Canada   2023-02-24 00:00:00.0   Group
Match id:9033   Mexico    Jordan   2023-02-25 00:00:00.0   Group
Match id:9033   Jordan    Mexico   2023-02-25 00:00:00.0   Group
Please enter a match id
█
```

v) and vi)

```
Please enter a match id
9033
Please enter a country name
Mexico
Select p2.name,p.number,p.DETAILEDPOSITION,p.MINUTEENTERED,p.MINUTELEFT,p.NUMBEROFYELLOWCARDS,p.REDCARD
FROM playersInGame p, players p2
WHERE p.number=p2.number AND p.identifier='9033' AND p.country='Mexico'

The following players from Mexico are already entered for match 9033:
SELECT DISTINCT p.number,p.name,p.position
FROM players p, PLAYERSINGAME p2
WHERE p.country='Mexico' AND p.IDENTIFIER='9033' AND p.number NOT IN (SELECT NUMBER
                                                                    FROM PLAYERSINGAME)

Possible players from Mexico not yet selected:
96  Herculie Sines  midfielder
22  Jaco Smith     forward
14  Morgan Seth    goalkeeper
99  Tom Sanders    midfielder
Enter number of player you want to insert or [P] to go to the previous menu:
█
```

vii)

```

Enter number of player you want to insert or [P] to go to the previous menu:
22
Enter the specific position of player 22
right midfield
INSERT INTO PlayersInGame VALUES (22,0,FALSE,0,NULL,'right midfield','FNB Stadium',9033,'Mexico')
Select p2.name,p.number,p.DETAILEDPOSITION,p.MINUTEENTERED,p.MINUTELEFT,p.NUMBEROFYELLOWCARDS,p.REDCARD
FROM playersInGame p, players p2
WHERE p.number=p2.number AND p.identifier='9033' AND p.country='Mexico'

The following players from Mexico are already entered for match 9033:
Jaco Smith 22 right midfield From minute: 0 to minute: null yellow:0 red:0
SELECT DISTINCT p.number,p.name,p.position
FROM players p, PLAYERSINGAME p2
WHERE p.country='Mexico' AND p.IDENTIFIER='9033' AND p.number NOT IN (SELECT NUMBER
                                                                    FROM PLAYERSINGAME)

Possible players from Mexico not yet selected:
96 Herculie Sines midfielder
14 Morgan Seth goalkeeper
99 Tom Sanders midfielder
Enter number of player you want to insert or [P] to go to the previous menu:

```

viii)

```

Enter number of player you want to insert or [P] to go to the previous menu:
14
Enter the specific position of player 14
left
INSERT INTO PlayersInGame VALUES (14,0,FALSE,0,NULL,'left','FNB Stadium',9033,'Mexico')
Select p2.name,p.number,p.DETAILEDPOSITION,p.MINUTEENTERED,p.MINUTELEFT,p.NUMBEROFYELLOWCARDS,p.REDCARD
FROM playersInGame p, players p2
WHERE p.number=p2.number AND p.identifier='9033' AND p.country='Mexico'

The following players from Mexico are already entered for match 9033:
Morgan Seth 14 left From minute: 0 to minute: null yellow:0 red:0
Jaco Smith 22 right midfield From minute: 0 to minute: null yellow:0 red:0
Herculie Sines 96 left From minute: 0 to minute: null yellow:0 red:0
Maximum number of players reached. Can't insert any more players into this team for this match
Soccer Main Menu
1. List information of matches of a country
2. Insert initial player information for a match
3. Update a goal scorer
4. Exit application
Please Enter Your Option:

```

ix)

```

Maximum number of players reached. Can't insert any more players into this team for this match
Soccer Main Menu
1. List information of matches of a country
2. Insert initial player information for a match
3. Update a goal scorer
4. Exit application
Please Enter Your Option:
4
cs421g138@winter2023-comp421:~/project2/p2/p3$

```

x)

```
cs421g138@winter2023-comp421:~/project2/p2/p3$ db2 -t -f Q3bx.sql -v
Select p.number,p2.name FROM PLAYERSINGAME p, players p2 WHERE p.number=p2.number AND p.identifier=9033 AND p.country='Mexico'

NUMBER      NAME
-----
          14 Morgan Seth
          22 Jaco Smith
          96 HercuLie Sines

3 record(s) selected.
```

### 3.c)

Sometimes a mistake is made and a goal is recorded as being scored by someone other than who scored it. So for my implementation I'll allow the user to update who the goal scorer is to the player that actually scored the goal. And to prevent abuse of this system only two goal scorers can be updated in a session.

- i) Run query in database that shows goals scored in a specific match M for country C
- ii) Run query in the java program to display scores of previous matches when the user enters 3
- iii) Then ask user for specific match M and country C which they will update the goal scorer of  
Which will display the tables of iv) and v)
- iv) Run a query in the java program that displays to the user the goal scorers of C in match M
- v) Run a query in the java program that displays to the user the players of country C in the match M
- vi) Ask user for what player they want to change and what occurrence and what player to change it too
- vii) Redisplay the queries in iii) and iv) and ask if user wants to update another player or go back to the menu
- viii) Test the limit by trying to change three goals and see the error message display
- ix) Rerun query in database from i) that shows goals scored in a specific match M for country C to see the updated list

i)

```
cs421g138@winter2023-comp421:~/project2/p2/p3$ db2 -t -f Q3c.sql -v
SELECT DISTINCT p.number,g.occurance FROM playersInGame p,GOALSSCORED g WHERE p.COUNTRY='Canada' AND p.IDENTIFIER=1566 AND p.NUMBER=g.NUMBER

NUMBER      OCCURANCE
-----
          8          1
          8          6
         65          5
```

ii)

```
Please Enter Your Option:
3
SELECT DISTINCT m.IDENTIFIER,c1.country country_a,c2.country country_b,m.dateTime,m.round,count(DISTINCT g1.OCCURANCE) num_goals_a,count(DISTINCT g2.OCCURANCE) num_goals_b
FROM playersInGame c1,playersInGame c2,Matches m,goalsScored g1,goalsScored g2
WHERE m.IDENTIFIER=c1.identifier AND c1.IDENTIFIER=c2.identifier AND c1.COUNTRY<>c2.COUNTRY AND g1.IDENTIFIER=c1.IDENTIFIER AND g1.NUMBER=c1.NUMBER and
g2.IDENTIFIER=c2.IDENTIFIER AND g2.NUMBER=c2.NUMBER AND m.DATETIME BETWEEN '2002-02-23 00:00:00.000000' and '2023-02-23 00:00:00.000000'
GROUP BY m.identifier,c1.country, c2.country, m.dateTime, m.round
Match id: 1566 China Canada 2023-02-22 00:00:00.0 Group 3 2
Match id: 1566 Canada China 2023-02-22 00:00:00.0 Group 2 3
Match id: 4780 England China 2022-04-16 00:00:00.0 Group 2 1
Match id: 4780 China England 2022-04-16 00:00:00.0 Group 1 2
Match id: 5949 Ukraine England 2022-05-18 00:00:00.0 Group 1 1
Match id: 5949 England Ukraine 2022-05-18 00:00:00.0 Group 1 1
Match id: 7450 England Canada 2022-11-25 00:00:00.0 Semi-final 1 1
Match id: 7450 Canada England 2022-11-25 00:00:00.0 Semi-final 1 1
Match id: 7972 Jordan Cuba 2023-02-20 00:00:00.0 Group 1 4
Match id: 7972 Cuba Jordan 2023-02-20 00:00:00.0 Group 4 1
Please enter a match id
█
```

iii) and iv) and v)

```
Please enter a match id
1566
Please enter a country name
Canada
SELECT DISTINCT p.number,g.occurrence
FROM playersInGame p,GOALSSCORED g
WHERE p.COUNTRY='Canada' AND p.IDENTIFIER=1566 AND p.NUMBER=g.NUMBER
Goals scored by Canada in match 1566:
Player number: 8 at occurrence of: 1
Player number: 8 at occurrence of: 6
Player number: 65 at occurrence of: 5
Select number,DETAILEDPOSITION
FROM PLAYERSINGAME
WHERE IDENTIFIER=1566 AND country='Canada'
Possible players from Canada not yet selected:
Player number: 8 is a midfielder
Player number: 65 is a forward
Enter number of player who's goal you want to update or [P] to go to the previous menu:
█
```

vi) and vii)

Enter number of player who's goal you want to update or [P] to go to the previous menu:

```
8
Enter the specific occurrence of the goal:
1
Enter the player's number for the new goal scorer:
65
UPDATE GOALSSCORED
SET NUMBER=65
WHERE NUMBER=8 AND OCCURANCE=1
SELECT DISTINCT p.number,g.occurrence
FROM playersInGame p,GOALSSCORED g
WHERE p.COUNTRY='Canada' AND p.IDENTIFIER=1566 AND p.NUMBER=g.NUMBER
Goals scored by Canada in match 1566:
Player number: 8 at occurrence of: 6
Player number: 65 at occurrence of: 1
Player number: 65 at occurrence of: 5
Select number,DETAILEDPOSITION
FROM PLAYERSINGAME
WHERE IDENTIFIER=1566 AND country='Canada'
Possible players from Canada not yet selected:
Player number: 8 is a midfielder
Player number: 65 is a forward
Enter number of player who's goal you want to update or [P] to go to the previous menu:
```

viii)

```
Enter number of player who's goal you want to update or [P] to go to the previous menu:
8
Enter the specific occurrence of the goal:
6
Enter the player's number for the new goal scorer:
65
UPDATE GOALSSCORED
SET NUMBER=65
WHERE NUMBER=8 AND OCCURANCE=6
Maximum number of updates reached to prevent abuse of this feature. Will be sent back to the main menu
Soccer Main Menu
1. List information of matches of a country
2. Insert initial player information for a match
3. Update a goal scorer
4. Exit application
Please Enter Your Option:
```

ix)



```
cs421g138@winter2023-comp421:~/project2/p2/p3$ db2 -t -f Q3c.sql -v
SELECT DISTINCT p.number,g.occurance FROM playersInGame p,GOALSSCORED g WHERE p.COUNTRY='Canada' AND p.IDENTIFIER=1566 AND p.NUMBER=g.NUMBER

NUMBER      OCCURANCE
-----
          65          1
          65          5
          65          6

3 record(s) selected.
```

## Indexing

```
cs421g138@winter2023-comp421:~/project2/p2/p3$ db2 -t -f P3Q4.sql -v
CREATE INDEX priceIndex ON Seat(BASEPRICE)
DB20000I The SQL command completed successfully.
```

I choose to make an index on the seat table with the base price property. This is done so that when users want to look up prices for upcoming games and all the seat options available to them they will get the results back faster than without the index. It's also important to make the ticket buying experience fast as customers may not buy any tickets if their price info takes too long to load.

## Data Analytics

```
cs421g138@winter2023-comp421:~/project2/p2/p3$ db2 -t -f P3Q5.sql -v
SELECT country, sum(goals) Total_Goals FROM (SELECT DISTINCT p.COUNTRY, g.NUMBER,count(g.OCCURANCE) goals FROM PLAYERSINGAME p, Matches m,GOALSSCORED g
WHERE p.IDENTIFIER=m.IDENTIFIER and g.IDENTIFIER=p.IDENTIFIER AND m.ROUND='Group' AND g.NUMBER=p.NUMBER GROUP BY p.COUNTRY, g.NUMBER) GROUP BY country O
RDER BY Total_Goals desc LIMIT 5

COUNTRY      TOTAL_GOALS
-----
China        4
Cuba         4
Canada       3
England      3
Ukraine      2

5 record(s) selected.
```

```
db2 => EXPORT to p3.csv OF DEL MODIFIED BY NOCHARDEL SELECT country, sum(goals) Total_Goals FROM (SELECT DISTINCT p.COUNTRY, g.NUMBER,count(g.OCCURANCE)
goals FROM PLAYERSINGAME p, Matches m,GOALSSCORED g WHERE p.IDENTIFIER=m.IDENTIFIER and g.IDENTIFIER=p.IDENTIFIER AND m.ROUND='Group' AND g.NUMBER=p.NU
MBER GROUP BY p.COUNTRY, g.NUMBER) GROUP BY country ORDER BY Total_Goals desc LIMIT 5 ;
SQL3104N The Export utility is beginning to export data to file "p3.csv".

SQL3105N The Export utility has finished exporting "5" rows.

Number of rows exported: 5
```

```
FROM (SELECT DISTINCT p.COUNTRY, g.NUMBER,count(g.OCCURANCE) goals
FROM PLAYERSINGAME p, Matches m,GOALSSCORED g
WHERE p.IDENTIFIER=m.IDENTIFIER and g.IDENTIFIER=p.IDENTIFIER AND m.ROUND='Group'
AND g.NUMBER=p.NUMBER
GROUP BY p.COUNTRY, g.NUMBER)
```

GROUP BY country  
ORDER BY Total\_Goals desc  
LIMIT 5

;

AVERAGE of Total_Goals	Country					
Total_Goals	Canada	China	Cuba	England	Ukraine	Grand Total
2					2	2
3	3			3		3
4		4	4			4
Grand Total	3	4	4	3	2	3.2