Basics of database systems Project – Database design

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Basics of database systems
Spring 2025
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The Four Nations cup was held earlier this year in Canada on February 12 - 20. It is an ice hockey tournament in which teams Sweden, Finland, Canada and USA played against each other. The database stores details about players, countries, match results, umpires, sponsors and rankings. Without a structured system, managing this data manually can lead to errors. The goal is to provide an efficient way to retrieve tournament information. This database will solve issues such as tracking player participations in matches. Storing match details including umpires and results. It will maintain rankings and handle sponsorships for each player. This database is useful for people who want to get quick access to player records and match outcomes.

The following database queries have to be implemented: 1) Show Player Information, Ranking and Tournament name. 2) List all players in four nations cup. 3) List players sponsored by a specific company. 4) Show all matches and umpires there. 5) display match information with team name and score

1.
```
SELECT Player.player_id, Player.name, Ranking.rank, Tournament.name AS tournament_name
FROM Player
JOIN Ranking ON Player.player_id = Ranking.player_id
JOIN Player_in_tournament ON Player.player_id = Player_in_tournament.player_id
JOIN Tournament ON Player_in_tournament.tournament_id = Tournament.tournament_id;
```

2.
```
SELECT Player.player_id, Player.name
FROM Player
JOIN Player_in_tournament ON Player.player_id = Player_in_tournament.player_id;
```

3.
```
SELECT Player.player_id, Player.name, Sponsor.name AS sponsor_name FROM Player
JOIN Sponsored_by ON Player.player_id = Sponsored_by.player_id
JOIN Sponsor ON Sponsored_by.sponsor_id = Sponsor.sponsor_id
WHERE Sponsor.name = 'Veikkaus';
```

4.
```
SELECT Match.match_id, Tournament.name AS tournament_name, Umpire.name AS umpire_name
FROM Match
JOIN Tournament ON Match.tournament_id = Tournament.tournament_id
JOIN Umpire ON Match.umpire_id = Umpire.umpire_id
WHERE Umpire.name = 'Gord Dwyer';
```

5.
```
SELECT Results.match_id, WinnerCountry.name AS winner_team, LoserCountry.name AS loser_team,
Results.winner_score, Results.loser_score FROM Results
JOIN Player AS Winner ON Results.winner_id = Winner.player_id
JOIN Country AS WinnerCountry ON Winner.country_id = WinnerCountry.country_id
JOIN Player AS Loser ON Results.loser_id = Loser.player_id
JOIN Country AS LoserCountry ON Loser.country_id = LoserCountry.country_id;
```

6.

2 MODELING **3**

2.1 Data model

Figure 1 (in below) shows the data of the database.

The Four Nations Cup database is designed to store and manage data such as tournament, players, matches, rankings and sponsor. Figure 1 represents illustrative model of the database detailing the entities, their relationships and cardinalities. From the figure one can see primary keys (PK) and foreign keys (FK) each database stores. There are two interim relations: Player_in_tournament, Player_in_match**.** It has following entities and relationships:

Country strores the countries participating in the tournament. It has 1:N relationship with Player where one country can have multiple players. Also it has 1:1 relationship with tournament where many countries are in one tournament.

Player stores player details and their country. It has 1:1 relationship with ranking since each player has a single rank. Also it has N:M relationship with Match through player_in_match because a player can participate in many matches. also it has 1:N relation ship with tournament with Player_in_tournament where players can play in one tournament. it also has 1:1 relation ship with sponsored by.

Ranking stores player rankings. it has 1:1 relationship with Player where each player has one rank.

Tournament stores its details. it has 1:N relationship with match because one tournament has multiple matches.

Umpire stores its details. it has 1:N relationship with match where one umpire can officiate multiple matches.

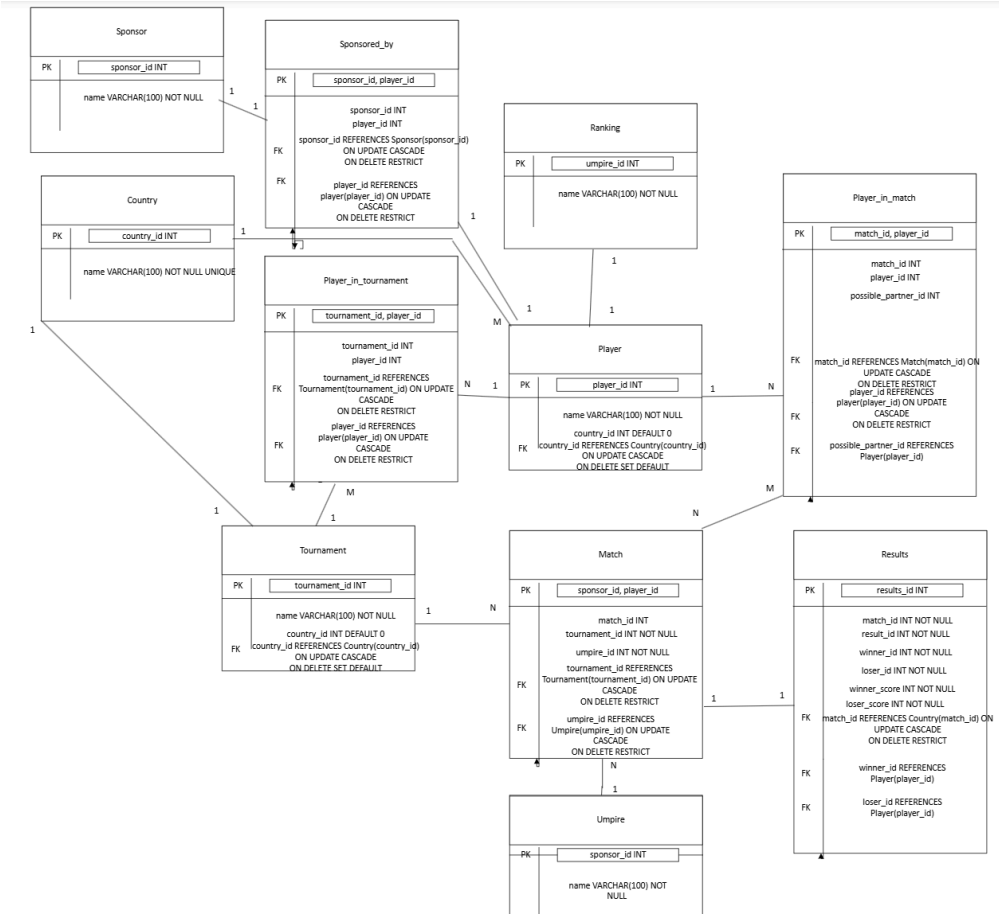
Match stores information about each match. It has N:M relationship with player through players in match where multiple players can compete in same game.

Results stores match results such as loser, winner and scores. it has 1:1 result with match because each match has one result. It has 1:N relationship with player.

Sponsor has 1:1 relationship with player through sponsored_by where one sponsor can have one player.

There are also two index created for results match index and player name index. The name index speeds up searches for players and can be used: SELECT * FROM Player WHERE name = 'Alexander Barkov';

Match result can be used: SELECT * FROM Results WHERE match_id = 1; to find quickly results for a specific match.



Database figure 1

Entities and Attributes:

- **Country**
  - **country_id** PRIMARY KEY
  - **name** cannot be NULL and is UNIQUE
- **Player**
  - **player_id** PRIMARY KEY
  - **name** cannot be NULL
  - **country_id** is FOREIGN KEY for Country which is set Default 0 and cascades on update and sets default on delete)
- **Ranking**
  - **ranking_id** PRIMARY KEY
  - **player_id** cannot be NULL and is UNIQUE
  - **rank** Checks that **rank > 0**
  - **player_id** is FOREIGN KEY for Player which update cascade and has on delete restrict
- **Tournament**
  - **tournament_id** PRIMARY KEY
  - **name** Cannot be NULL
  - **country_id** is SET to default 0 and is FOREIGN KEY for Country and cascades on update and deletes set default)
- **Umpire**
  - **umpire_id** PRIMARY KEY
  - **name** cannot be NULL
- **Match**
  - **match_id** PRIMARY KEy
  - **tournament_id** CANNOT BE NULL and FOREIGN KEY for Tournament and updates on cascade and delete restrict
  - **umpire_id** cannot be NULL and FOREIGN KEY for Umpire and has on update cascade and delete restrict
- **Results**
  - **result_id** PRIMARY KEY
  - **match_id** FOREIGN KEY for match which update cascade and delete restrict
  - **winner_id** FOREIGN KEY for Player player_id
  - **loser_id** FOREIGN KEY for Player player_id
  - **winner_score** cannot be NULL
  - **loser_score** cannot be NULL
- **Sponsor**
  - **sponsor_id** PRIMARY KEY
  - **name** cannot be NULL
- **Player_in_match**
  - **match_id** PRIMARY KEY and has FOREIGN KEY for Match and which has update on cascade and delete restrict
  - **player_id** is PRIMARY KEY and has FOREIGN KEY for Player which has update on cascade and delete restrict
  - **possiblepartner_id** is FOREIGN KEY for Player player_id

- **Player_in_tournament**
  - **tournament_id** PRIMARY KEY and FOREIGN KEY for tournament which updates cascade and delete restrict
  - **player_id** PRIMARY KEY and FOREIGN KEY for Player which updates Cascade and on delete restrict.
- **Sponsored_by**
  - **sponsor_id** PRIMARY KEY and FOREIGN KEY for Sponsor which has update cascade and on delete restrict
  - **player_id** PRIMARY KEY and FOREIGN KEY for Player which has update cascade and delete restrict.

In addition to the integrity constraints listed above, the database will also implement two indices: One based on the Player name in the Player table, other based on Optimization queries retrieving results for specific match. These indices will make querying player names faster as well as analyze match outcomes quick.

4 DISCUSSION 6

The Four Nations Cup database has been made in a way that it can efficiently store and manage information about players, tournaments, rankings, matches, and sponsorships. The relational design ensures that data integrity is maintained, with constraints to manage cascading updates and deletions. Also rank has a check marker. One of the key challenges in designing the database was making sure that player rankings and tournament performance could be showed efficently. To make this happen, indexing was implemented frequently. Furthermore, relationships between entities such as players, sponsors, and matches were modeled in a way that it presented real world dependencies accurately.

Future improvements could include more detailed statistics for players, adding historical data for rankings and expanding the database to support many tournaments rather than just the Four Nations Cup. UI could also be created which would allow users to manage tournament data way easier. Also more data should be inserted to the database since currently each table has only five rows now.