Application Description

The database I have chosen to create describes football leagues and the football clubs they are populated with.
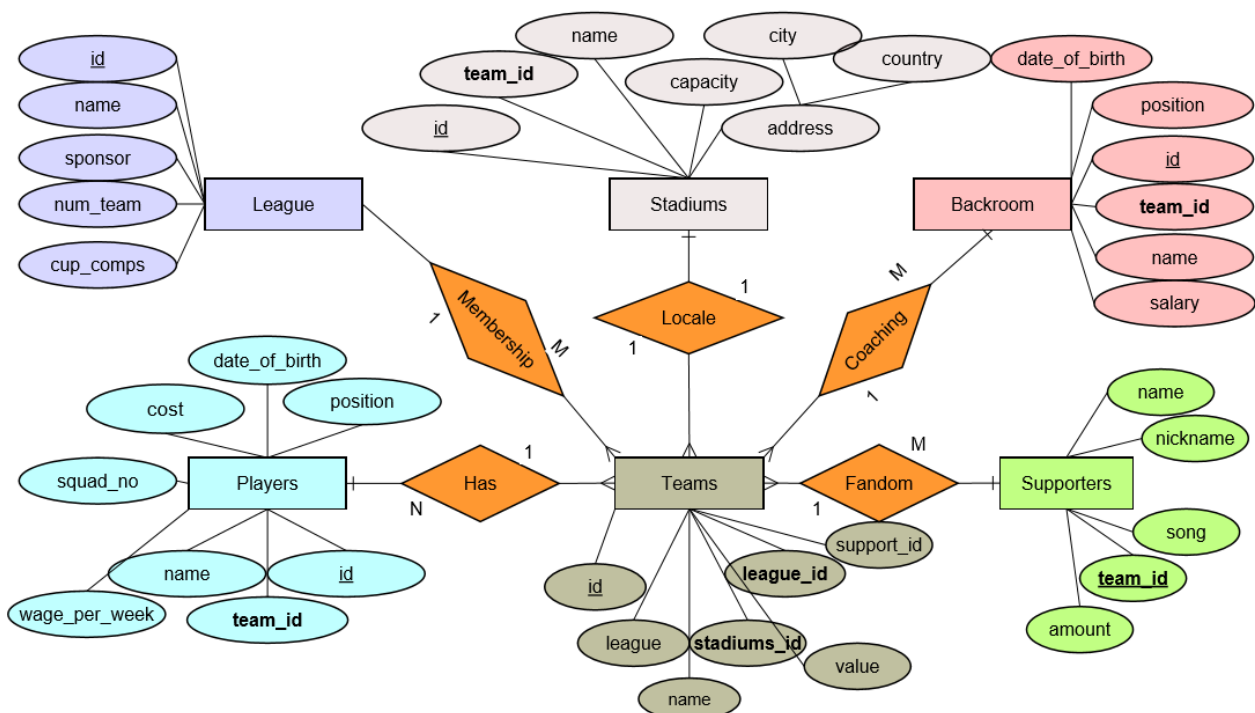
Teams contain various staff including players and the backroom staff like managers and coaches. Each team is a member of a league and has a supporters club. The team must have a stadium to play their matches.

The team must contain details of their staff and stadium as well as supporters. The league must contain details of the teams belonging to it.
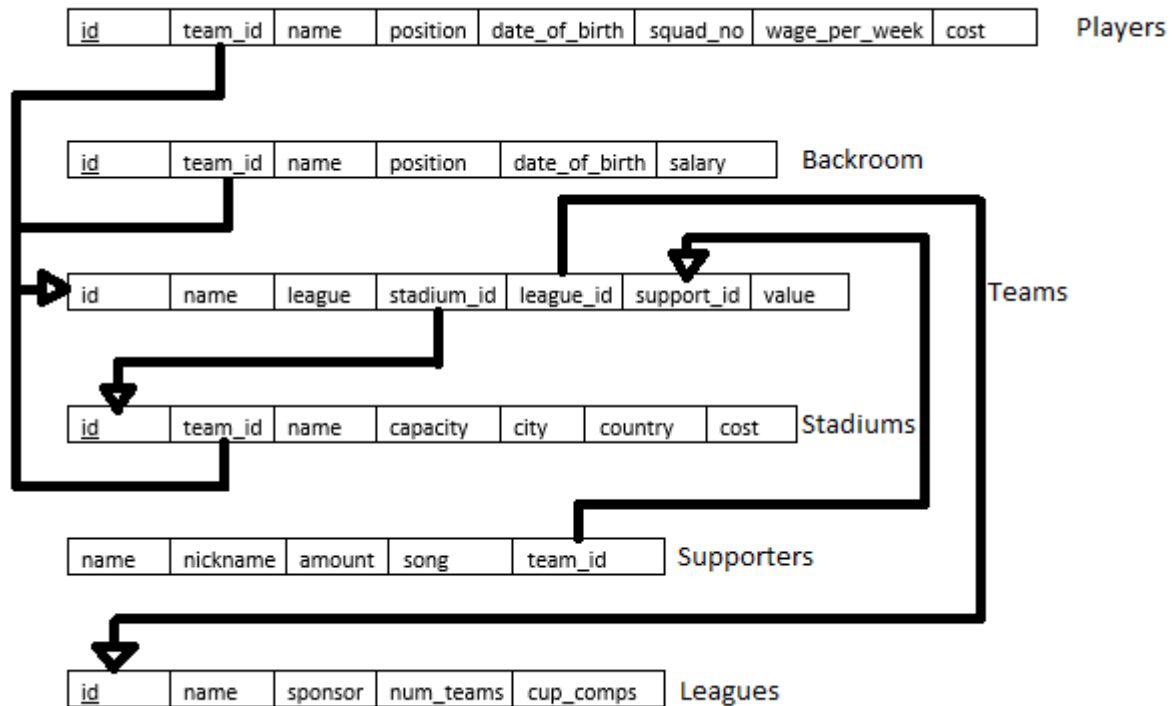
For the purposes of the assignment and the ids for the various entities. I have limited the database to the five biggest leagues in Europe and worked under assumption that each team could only register 25 players meaning the total amount of players possible is 2,450. Each team has their own stadium meaning a total of 98 stadiums and there is one supporters club per club. While there is no limit on the amount of backroom staff it is unlikely it would ever exceed 10,000 coaches. Supporters can only support one team because glory hunters are frowned upon.
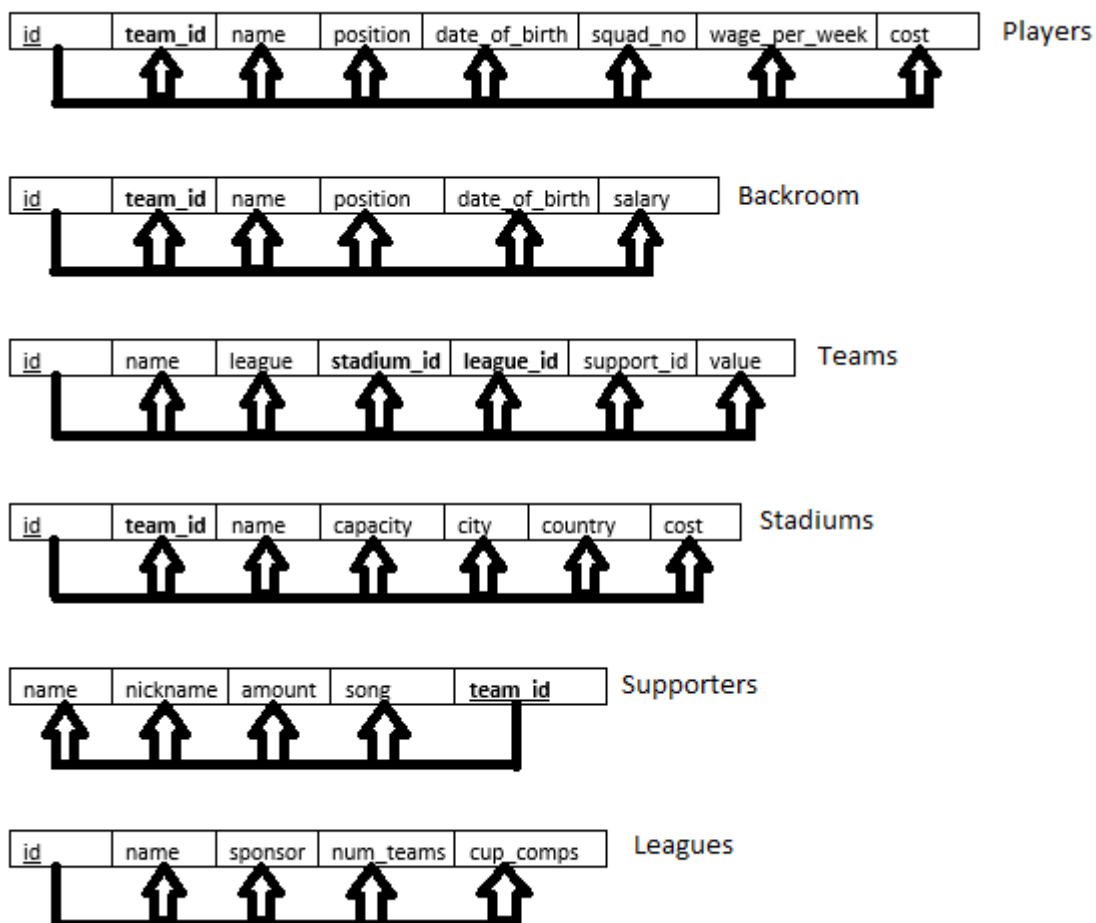
Entity Relationship Diagram

*Primary keys are underlined, foreign keys are bold.

Relational Schema

id	team_id	name	position	date_of_birth	squad_no	wage_per_week	cost	Players

id	team_id	name	position	date_of_birth	salary	Backroom

id	name	league	stadium_id	league_id	support_id	value	Teams

id	team_id	name	capacity	city	country	cost	Stadiums

name	nickname	amount	song	team_id	Supporters

id	name	sponsor	num_teams	cup_comps	Leagues

Functional Dependency Diagram

id	team_id	name	position	date_of_birth	squad_no	wage_per_week	cost	Players

id	team_id	name	position	date_of_birth	salary	Backroom

id	name	league	stadium_id	league_id	support_id	value	Teams

id	team_id	name	capacity	city	country	cost	Stadiums

name	nickname	amount	song	team_id	Supporters

id	name	sponsor	num_teams	cup_comps	Leagues

Semantic Constraints

There are a number of semantic constraints that apply to this database. The most basic of which is the requirement that each Players id must be a 7 digit number between 200000 and 300000. As well as some other id semantic constraints. Below are some of the ALTER Statements that implement these semantic constraints.

Code
```
ALTER TABLE Players ADD CHECK(id>200000 AND id<300000);
ALTER TABLE Backroom ADD CHECK(id>90000 AND id<100000);
ALTER TABLE Teams ADD CHECK(id>100 AND id<200);
ALTER TABLE Stadiums ADD CHECK(id>70000 AND id<80000);
ALTER TABLE Leagues ADD CHECK(id>9000 AND id<10000);
ALTER TABLE Leagues ADD CHECK(team_id>20000 AND team_id<30000);
```

Security

Security constraints in this database could be granted to the manager of the football club, as it would be within his discretion to buy and sell players and to hire and fire backroom staff. The manager would keep control of these entities as this is a part of the job description. He would require SELECT, DELETE and UPDATE privileges on Players and Backroom tables. He would be able to grant SELECT privileges to his assistant manager for team selection, if he was unable to do so himself.

Sample Security Commands
```
GRANT DELETE on Players TO Jurgen_Klopp;
GRANT UPDATE on Players TO Jurgen_Klopp;
GRANT SELECT on on Players TO Jurgen_Klopp WITH GRANT OPTION;

GRANT DELETE on Backroom TO Jurgen_Klopp;
GRANT UPDATE on Backroom TO Jurgen_Klopp;
GRANT SELECT on on Backroom TO Jurgen_Klopp;
```

View Creation

One view was created which allowed the starting eleven to be picked from the players on the team. The SELECT statement is used to perform table joins.

```
CREATE VIEW Starting_Eleven( p_name, p_position, team_name) AS SELECT Players.name,
Players.position, , Teams.name FROM Players, Teams WHERE Players.team_id = Teams.id
```

Triggers Update and Delete

If a team goes into administration then it has to be removed from the database but this would violate referential integrity in a few tables. So when a team is removed from the database the foreign keys of the affected tables are set to NULL which will allow for referential integrity to remain inviolate. Below is an example of the trigger performed on one of the tables affected.

Code
```
CREATE OR REPLACE TRIGGER Team_Administration_Update_Players
AFTER DELETE ON Teams
FOR EACH ROW
WHEN(OLD.id IS NOT NULL)
DECLARE
        del_id number;
BEGIN
        del_id := :OLD.id;
UPDATE Players
SET team_id = NULL
WHERE team_id=del_id;
END Team_Administration_Update_Players;
.
RUN;
```

Appendix

Create
CREATE TABLE Players (id INT NOT NULL, team_id INT, name VARCHAR(20) NOT NULL, position VARCHAR(20) NOT NULL, date_of_birth VARCHAR(20) NOT NULL, squad_no INT NOT NULL, wage_per_week VARCHAR(20), cost VARCHAR(20), PRIMARY KEY (id));

CREATE TABLE Backroom (id INT NOT NULL, team_id INT, name VARCHAR(20) NOT NULL, position VARCHAR(20) NOT NULL, date_of_birth VARCHAR(20) NOT NULL, salary VARCHAR(20), PRIMARY KEY (id));

CREATE TABLE Stadiums (id INT NOT NULL, team_id INT, name VARCHAR(20) NOT NULL, capacity INT NOT NULL, city VARCHAR(20) NOT NULL, country VARCHAR(20) NOT NULL, cost VARCHAR(20) NOT NULL, PRIMARY KEY (id));

CREATE TABLE Supporters (name VARCHAR(30) NOT NULL, nickname VARCHAR(30), amount VARCHAR(30), song VARCHAR(30) NOT NULL , team_id INT, PRIMARY KEY (team_id));

CREATE TABLE Teams (id INT NOT NULL, name VARCHAR(20) NOT NULL, league VARCHAR(20), stadium_id INT NOT NULL, league_id INT NOT NULL, support_id INT, value VARCHAR(20), PRIMARY KEY (id));

CREATE TABLE Leagues (id INT NOT NULL, name VARCHAR(15) NOT NULL, sponsor VARCHAR(20), num_teams INT NOT NULL, cup_comps INT, PRIMARY KEY (id));

Alter
ALTER TABLE Players ADD FOREIGN KEY(team_id) REFERENCES Teams(id);
ALTER TABLE Backroom ADD FOREIGN KEY(team_id) REFERENCES Teams(id);
ALTER TABLE Stadiums ADD FOREIGN KEY(team_id) REFERENCES Teams(id);
ALTER TABLE Teams ADD FOREIGN KEY(league_id) REFERENCES Leagues(id);
ALTER TABLE Supporters ADD FOREIGN KEY(team_id) REFERENCES Teams(support_id);
ALTER TABLE Teams ADD FOREIGN KEY(stadium_id) REFERENCES Stadium(id);

Insert
INSERT INTO Players Values(200001, 101, 'Sadio Mane', 'Forward', 19, '10/4/1992', '90k', '35m');
INSERT INTO Players Values(200002, 101, 'Mohamed Salah', 'Forward', 11, '15/6/1992', '90k', '40m');

INSERT INTO Players Values(200003, 102, 'Neymar', 'Forward', '5/2/1992', 10, '600k', '200m');
INSERT INTO Players Values(200004, 102, 'Marco Verratti', 'Midfielder', 6,'5/11/1992', '140k', '90m');
INSERT INTO Players Values(200005, 103, 'Sergio Ramos', 'Defender', 4, '30/3/1986', '190k', '45m');
INSERT INTO Players Values(200006, 103, 'Isco', 'Forward', '21/4/1992', 22, '120k', '70m');

INSERT INTO Players Values(200007, 104, 'Thiago Alcantara', 'Midfielder', 6, '11/4/1991', '130k', '55m');
INSERT INTO Players Values(200008, 104, 'Mats Hummels', 'Defender', 5, '16/12/1988', '120k', '50m');

INSERT INTO Players Values(200009, 105, 'Miralem Pjanic', 'Midfielder', 5, '2/4/1990', '90k', '40m');
INSERT INTO Players Values(200010, 105, 'Gianluigi Buffon', 'Goalkeeper', 1, '28/1/1978', '100k', 'Priceless');

INSERT INTO Teams Values(101, 'Liverpool FC', 'Premier League', 70001, 9001, 20001, '1.3b');
INSERT INTO Teams Values(102, 'PSG', 'Ligue 1', 70002, 9002, 20002, '1.7b');
INSERT INTO Teams Values(103, 'Real Madrid', 'La Liga', 70003, 9001, 20003, '3b');
INSERT INTO Teams Values(104, 'Bayern Munich', 'Bundesliga', 70004, 9004, 20004, '2b');
INSERT INTO Teams Values(105, 'Juventus', 'Serie A', 70005, 9005, 20005, '1.2b');

INSERT INTO Stadiums Values(70001, 101, 'Anfield', 54074, 'Liverpool', 'England');
INSERT INTO Stadiums Values(70002, 102, 'Parc des Princes', 47929, 'Paris', 'France');
INSERT INTO Stadiums Values(70003, 103, 'Santiago Bernabeu ', 81044, 'Madrid', 'Spain');
INSERT INTO Stadiums Values(70004, 104, 'Allianz Arena', 75000, 'Munich', 'Germany');
INSERT INTO Stadiums Values(70005, 105, 'Juventus Stadium', 41000, 'Turin', 'Italy');

INSERT INTO Leagues Values(9001, 'Premier League', NULL, 20, 3);
INSERT INTO Leagues Values(9002, 'Ligue 1', 'Conforama ', 20, 3);
INSERT INTO Leagues Values(9003, 'La Liga', NULL, 20, 2);
INSERT INTO Leagues Values(9004, 'Bundesliga', NULL, 18, 2);
INSERT INTO Leagues Values(9005, 'Serie A', 'TIM', 20, 2);

INSERT INTO Backroom Values(90001, 101, 'Jurgen Klopp', 'Manager', '16/6/1967', '8m');
INSERT INTO Backroom Values(90002, 101, 'Zeljko Buvac', 'Assistant Manager', '13/9/1961', '1m');
INSERT INTO Backroom Values(90003, 102, 'Unai Emery', 'Manager', '3/11/1971', '5m');
INSERT INTO Backroom Values(90004, 102, 'Pablo Villanueva', 'Assistant Manager', '3/7/1972', '900k');
INSERT INTO Backroom Values(90005, 103, 'Zinedine Zidane', 'Manager', '23/5/1972', '5m');
INSERT INTO Backroom Values(90006, 103, 'David Betoni', 'Assistant Manager', '27/2/1969', '1m');
INSERT INTO Backroom Values(90007, 104, 'Jupp Heyncke', 'Manager', '9/5/1945', '3m');

INSERT INTO Backroom Values(90008, 104, 'Peter Hermann', 'Assistant Manager', '22/3/1952', '600k');
INSERT INTO Backroom Values(90009, 105, 'Massimiliano Allegri', 'Manager', '11/8/1967', '7m');
INSERT INTO Backroom Values(90010, 105, 'Marco Landucci', 'Assistant Manager', '25/3/1964', '700k');

INSERT INTO Supporters Values('LFC Supporters Club', 'The Reds', '85m', 'You'' Never Walk Alone',20001);
INSERT INTO Supporters Values('PSG Supporters Club', 'Les Parisiens', '45m', 'Allez PSG', 20002);
INSERT INTO Supporters Values('RM Supporters Club', 'Los Blancos', '310m', 'Hala Madrid y Nada Mas', 20003);
INSERT INTO Supporters Values('BM Supporters Club', 'Die Bayern', '87m', 'Sterns des Sudens', 20004);
INSERT INTO Supporters Values('JUVE Supporters Club', 'Vecchia Signora', '70m', 'Juve, Storia Di Un Grande Amore', 20005);