Image 1: 1.1 (Modified Chen Notation)

Image 2: 1.1(min,max) notation

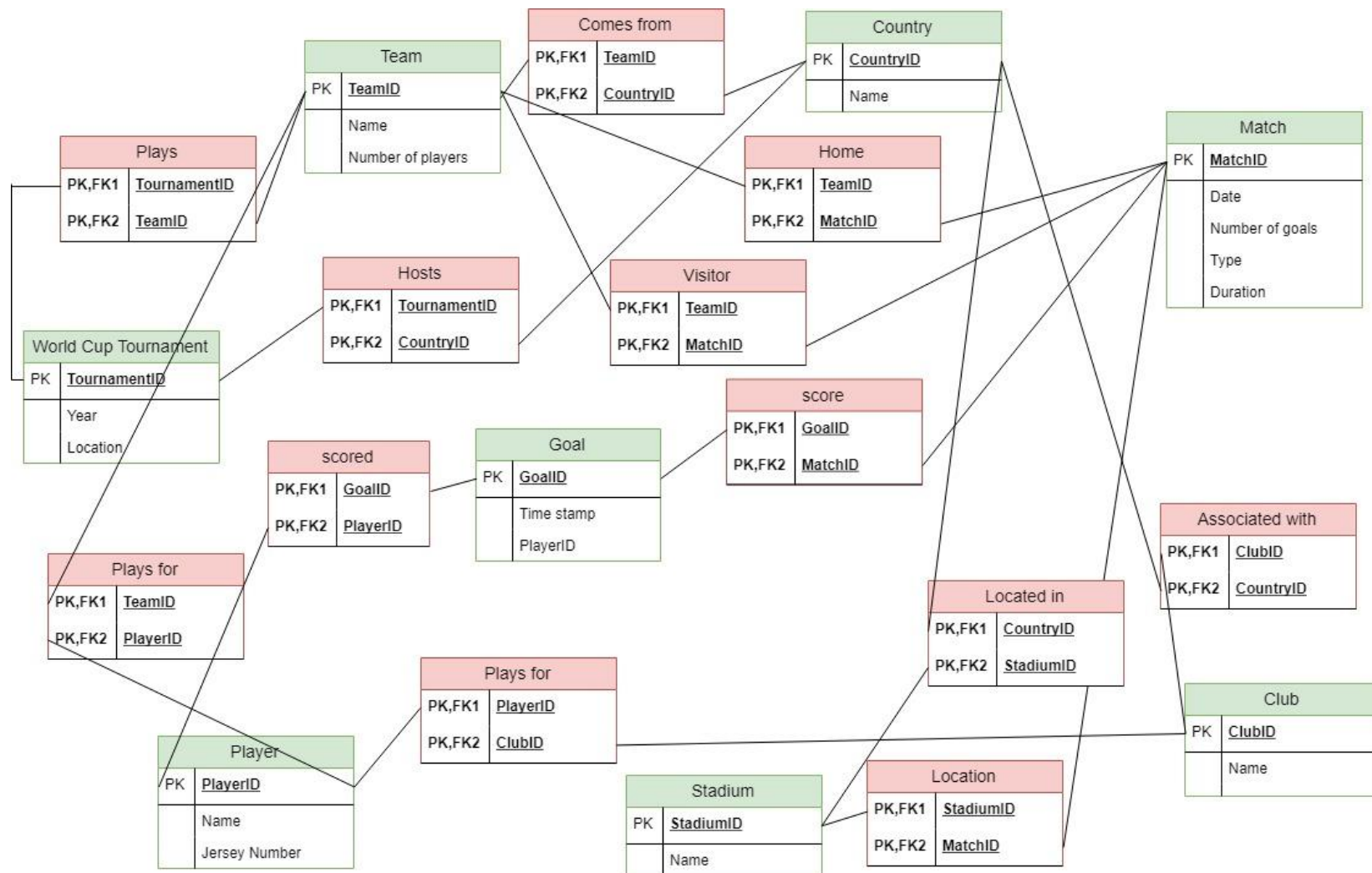# List of types of relationships in (min,max) notation

< Team > (1,1) - < comes from > - (1,1) < Country >

< Team > (1,32) - < plays > - (1,1) < Tournament >

< Player > (1,23) - < plays for > - (1,1) < Team >

< Country > (1,*) - < hosts > - (1,1) < Tournament >s

< Club > (1,*) - < associated with > - (1,1) < Country >

< Team > (1,1) - < visitor > - (1,*) < Match >

< Team > (1,1) - < home > - (1,*) < Country >

< Player > (1,*) - < plays for > - (1,1) < Club >

< Stadium > (1,*) - < located in > - (1,1) < Country >

< Match > (1,1) - < location > - (1,1) < Stadium >

< Player > (1,1) - < scored > - (0,*) < Goal >

< Goal > (0,*) - < score > - (1,1) < Match >

1.2

Comes from

| PK,FK1 | TeamID |
| PK,FK2 | CountryID |

Country

PK	CountryID
	Name

Team

PK	TeamID
	Name
	Number of players

Match

PK	MatchID
	Date
	Number of goals
	Type
	Duration

Home

| PK,FK1 | TeamID |
| PK,FK2 | MatchID |

Plays

| PK,FK1 | TournamentID |
| PK,FK2 | TeamID |

Hosts

| PK,FK1 | TournamentID |
| PK,FK2 | CountryID |

Visitor

| PK,FK1 | TeamID |
| PK,FK2 | MatchID |

World Cup Tournament

PK	TournamentID
	Year
	Location

score

| PK,FK1 | GoalID |
| PK,FK2 | MatchID |

scored

| PK,FK1 | GoalID |
| PK,FK2 | PlayerID |

Goal

PK	GoalID
	Time stamp
	PlayerID

Associated with

| PK,FK1 | ClubID |
| PK,FK2 | CountryID |

Located in

| PK,FK1 | CountryID |
| PK,FK2 | StadiumID |

Plays for

| PK,FK1 | TeamID |
| PK,FK2 | PlayerID |

Plays for

| PK,FK1 | PlayerID |
| PK,FK2 | ClubID |

Club

PK	ClubID
	Name

Player

PK	PlayerID
	Name
	Jersey Number

Stadium

PK	StadiumID
	Name

Location

| PK,FK1 | StadiumID |
| PK,FK2 | MatchID |

SQL Script:

```
1  with extra table for connecting two primary keys over the Foreign keys:
2  CREATE TABLE Tournament (TournamentID INTEGER PRIMARY KEY, Year INTEGER NOT NULL, CHECK(Year >= 1954 AND Year <= 2014 AND Year%4 == 0),Location VARCHAR(128));
3  CREATE TABLE Country (CountryID INTEGER PRIMARY KEY, Name VARCHAR(128));
4  CREATE TABLE Hosts (TournamentID integer REFERENCES Tournament, CountryID integer REFERENCES Country);
5
6  connecting over the foreign key directly in the tables:
7  CREATE TABLE Player (PlayerID INTEGER PRIMARY KEY, Name VARCHAR(128), Position VARCHAR(128), UniqueJerseyNumber INTEGER NOT NULL, ClubAffiliation VARCHAR(128));
8  CREATE TABLE Team (TeamID INTEGER PRIMARY KEY, NumberOfPlayers INTEGER NOT NULL, CHECK (NumberOfPlayers >= 1 AND NumberOfPlayers <= 23), PlayerID INTEGER FOREIGN KEY REFERENCES Player.PlayerID);
9  CREATE TABLE Club (ClubID INTEGER PRIMARY KEY, UniqueName VARCHAR(128), PlayerID INTEGER FOREIGN KEY REFERENCES Player.PlayerID);
```

1.3

In order to achieve the Third Normal Form, we have to ask ourselves weather all the attributes rely on the key. If that is not the case, we can divide the existing table and make another one to reach the third normal form.

But if we want to come to the third normal form, we have to go from the first one than second and than into the third.

1NF

To start off we have to check everything on the requirements for the first normal form which is going to be:

- We are supposed to have single valued attributes/columns
- Values stored in a column should be of the same domain type
- Columns have different names in a table
- Order does not matter

We are going to go through every single requirement on the list for my form to be in the First Normal Form.

All my attributes are single valued, because in the table Match we have Goals, with two sub-attributes which are also the same type INTEGER.
Values in every column of the table is going to be of the same type weather that is INTEGER or VARCHAR or BOOL.
Columns of course have different names which is visible in the Diagram.
Order of columns or tables does not have to do anything with the functionality of the diagram.

2NF

- Diagram is supposed to be in the First normal Form
- Not have PD (Partial Dependency)

Since the First normal Form is already checked, only remains to see if there are no Partial Dependencies.
All my columns (attributes) are relying on the PK (Primary key) and that is how it is supposed to stay.

3NF

- Diagram is supposed to be in the Second normal Form
- Not have TD (Transitive Dependency)

We confirmed the second normal Form in the previous point but lets take a look at the TD.

To put it in perspective, here is the making of the third normal form on my existing database:
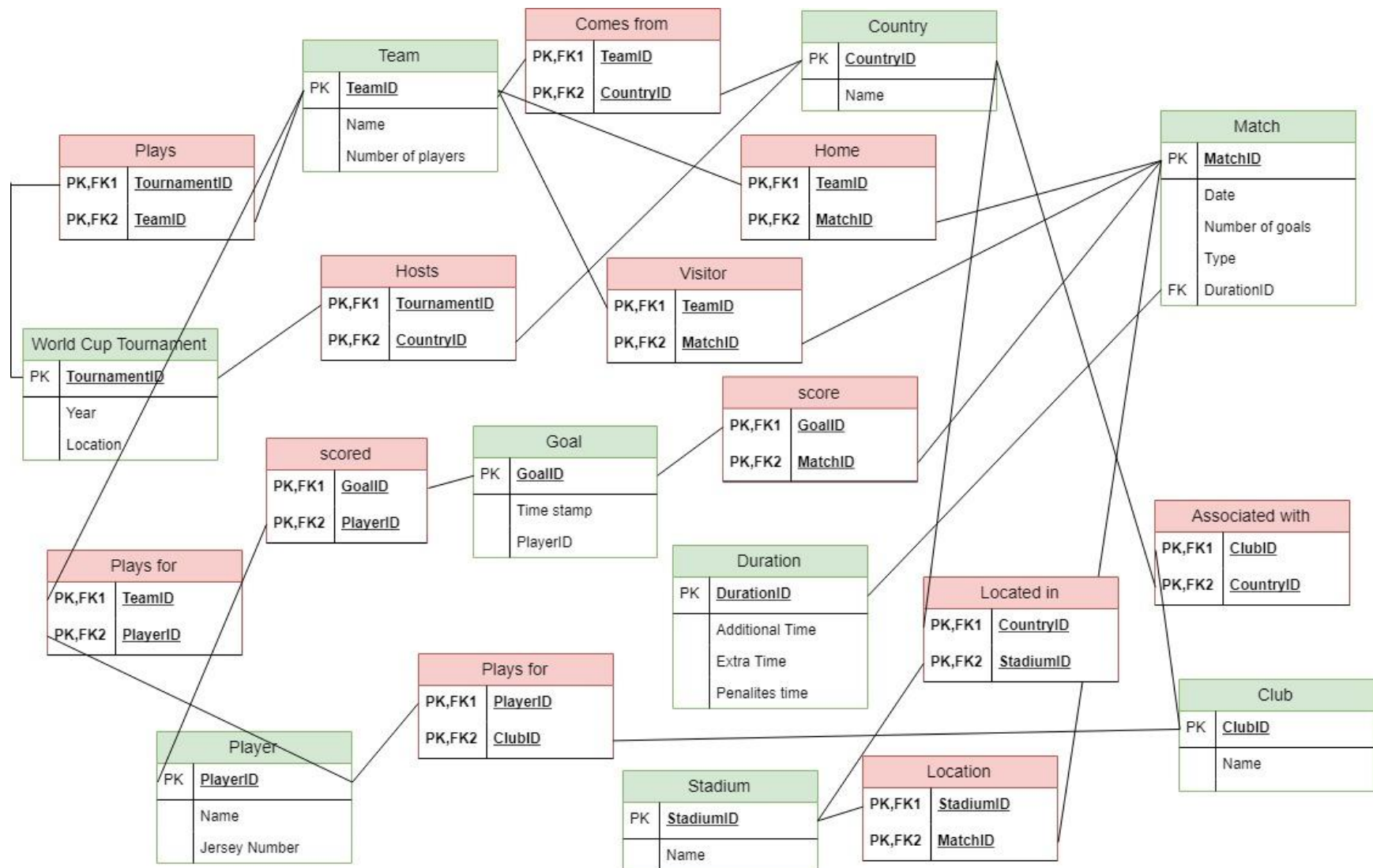
I took out the duration (attribute) of the match (entity) and made the special table for the duration of the match which would make the duration its own entity (connect them like so (DurationID <-> MatchID). I did this because the Duration is never same, it goes 90 minutes + extra time + additional time, which is referee's judgment based on the number of Goals, which is another attribute of the entity Match.
Let me explain the difference between additional and extra time:
The additional time can vary between 1 to MC minutes which would be added to basic 90 minutes, this time is added based on players injuries, stop times etc during the match. If in the higher stage of the tournament, than there is extra time which is two times 15 minutes and 10 minute break.

If the result is still a draw, we have penalties.

So here is how that is supposed to look like:

Comes from

PK,FK1	TeamID
PK,FK2	CountryID

Country

PK	CountryID
	Name

Team

PK	TeamID
	Name
	Number of players

Match

PK	MatchID
	Date
	Number of goals
	Type
FK	DurationID

Plays

PK,FK1	TournamentID
PK,FK2	TeamID

Home

PK,FK1	TeamID
PK,FK2	MatchID

Hosts

PK,FK1	TournamentID
PK,FK2	CountryID

Visitor

PK,FK1	TeamID
PK,FK2	MatchID

World Cup Tournament

PK	TournamentID
	Year
	Location

score

PK,FK1	GoalID
PK,FK2	MatchID

scored

PK,FK1	GoalID
PK,FK2	PlayerID

Goal

PK	GoalID
	Time stamp
	PlayerID

Duration

PK	DurationID
	Additional Time
	Extra Time
	Penalites time

Located in

PK,FK1	CountryID
PK,FK2	StadiumID

Associated with

PK,FK1	ClubID
PK,FK2	CountryID

Plays for

PK,FK1	TeamID
PK,FK2	PlayerID

Plays for

PK,FK1	PlayerID
PK,FK2	ClubID

Club

PK	ClubID
	Name

Player

PK	PlayerID
	Name
	Jersey Number

Stadium

PK	StadiumID
	Name

Location

PK,FK1	StadiumID
PK,FK2	MatchID

There are further steps in the normalization process, but since the 3NF (Third Normal Form) was asked for, this is where I will stop.