**RELATIONAL MODEL**

**User** (facebookID, nickname, score)

facebookID → nickname, score

**Challenge** (id, startTime, endTime, isPublic, exercisePlan→ExercisePlan)

id → startTime, endTime, isPublic, exercisePlan

**ParticipationDetails** (user→User, challenge→Challenge, score, finalPlanRating)

user, challenge → score, finalPlanRating

**Execution** (id, date, duration, user→User, challenge→Challenge)

id → date, duration, user, challenge

**WeekDay** (id, dayName)

id → dayName

**ExercisePlan** (id, recomendedCooldown, difficulty)

id → recomendedCooldown, difficulty

**CustomPlan** (id→ExcercisePlan, lastTimeUsed, isPublic, creator→User)

id → lastTimeUsed, isPublic, creator

**DefaultPlan** (id→ExercisePlan)

**Exercise** (id, videoLink, description, imageURL, difficulty, type→ExerciseType)

id → videoLink, description, imageURL, difficulty, type

**CustomExercise** (id→Exercise, isPublic, creator→User)

id → isPublic, creator

**DefaultExercise** (id→Exercise)

**ExerciseParameters** (exercisePlan→ExercisePlan, exercise→Exercise, numRepetitions, numSets)

exercisePlan, exercise → numRepetitions, numSets

**ExerciseType** (id, name)

**ChallengeDay** (challenge→Challenge, weekDay→WeekDay)

**FUNCTIONAL DEPENDENCIES AND NORMAL FORM ANALYSIS**

In each of the relatitions described in the previous chapter, the left side of the functional dependencies is a key for that relation, that is, the closure of the attributes in the left side is **all** the attributes in that relation, as shown in the following paragraphs:

**User:**

{ facebookID }+ = { facebookID, nickname, score }

**Challenge:**

{ id }+ = { id, startTime, endTime, isPublic, exercisePlan }

**ParticipationDetails:**

{ user, challenge }+ = { user, challenge, score, finalPlanRating }

**Execution:**

{ id }+ = { id, date, duration, user, challenge }

**WeekDay:**

{ id }+ = { id, dayNumber }

**ExercisePlan:**

{ id }+ = { id, recomendedCooldown, difficulty }

**CustomPlan:**

{ id }+ = { id, lastTimeUsed, isPublic, creator }

**DefaultPlan:**

{ id }+ = { id }

**Exercise:**

{ id }+ = { id, videoLink, description, image, difficulty, type }

**CustomExercise:**

{ id }+ = { id, isPublic, creator }

**DefaultExercise:**

{ id }+ = { id }

**ExerciseParameters:**

{ exercisePlan, exercise }+ = { execisePlan, exercise, numRepetitions, numSets }

**ExerciseType:**

{ id }+ = { id, name }

**ChallengeDay:**

{ challenge, weekDay }+ = { challenge, weekDay }

Therefore, since in each of the relatitions the left side of the functional dependencies is a key for that relation, the relational model is in the **Boyce-Codd Normal Form** (BCNF). Since the **3rd Normal Form** (3NF) is a super set of the BCNF, that is, every relation in the BCNF is also in the 3NF, the relational model is also in the **3rd Normal Form**.

**RESTRICTIONS**

**User:**

*- score* is the sum of all the *ParticipationDetails.score* the user is in.

- default value: 0

- *nickname* must have [6..48] characters

**Challenge:**

*- startTime*  and *endTime* are both dates. *endTime*  must be greater than *startTime.*

*- IsPublic –*  boolean (true or false)

- *IsPublic* default value is **true**

**ParticipationDetails:**

*- finalPlanRating*  default value is **Null**.

- finalPlanRating ∈ [1,10]

*- score* is calculated by multiplying the difficulty of the Exercise Plan associated to the Challenge, the number of exercises associated to that plan and the number executions between the user and the challenge.

- *score* “Simplified Expression”:

score = planDifficulty \* numExercisesInPlan \* numExecutions

**WeekDay:**

*- dayNumber* can hold values in the range [0 , 6], with the following meaning:  
 0 - Sunday1 - Monday  
 2 - Tuesday  
 3 - Wednesday  
 4 - Thursday  
 5 - Friday  
 6 - Saturday

**ExercisePlan:**

*- difficulty* is the average of all the *Exercise.difficulty* associated to this plan.

**CustomPlan:**

*- isPublic –*  boolean (true or false)

- *isPublic* default value is **true**

**Exercise:**

*- difficulty*  can hold values in the range [1 , 5]

- difficulty default value: 3

**CustomExercise:**

*- isPublic –*  boolean (true or false).

- *isPublic* default value is **true**