3005 Project

Health and Fitness Club Management System

Members:

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Functional Requirements:

- Member Functions:
    - User Registration
    - Profile Management
    - Dashboard
    - PT Session Scheduling
    - Group Class Registration
- Trainer Functions:
    - Set Availability
    - Schedule View
- Administrative Staff Functions:
    - Room Booking
    - Equipment Maintenance
    - Class Management

Entities:

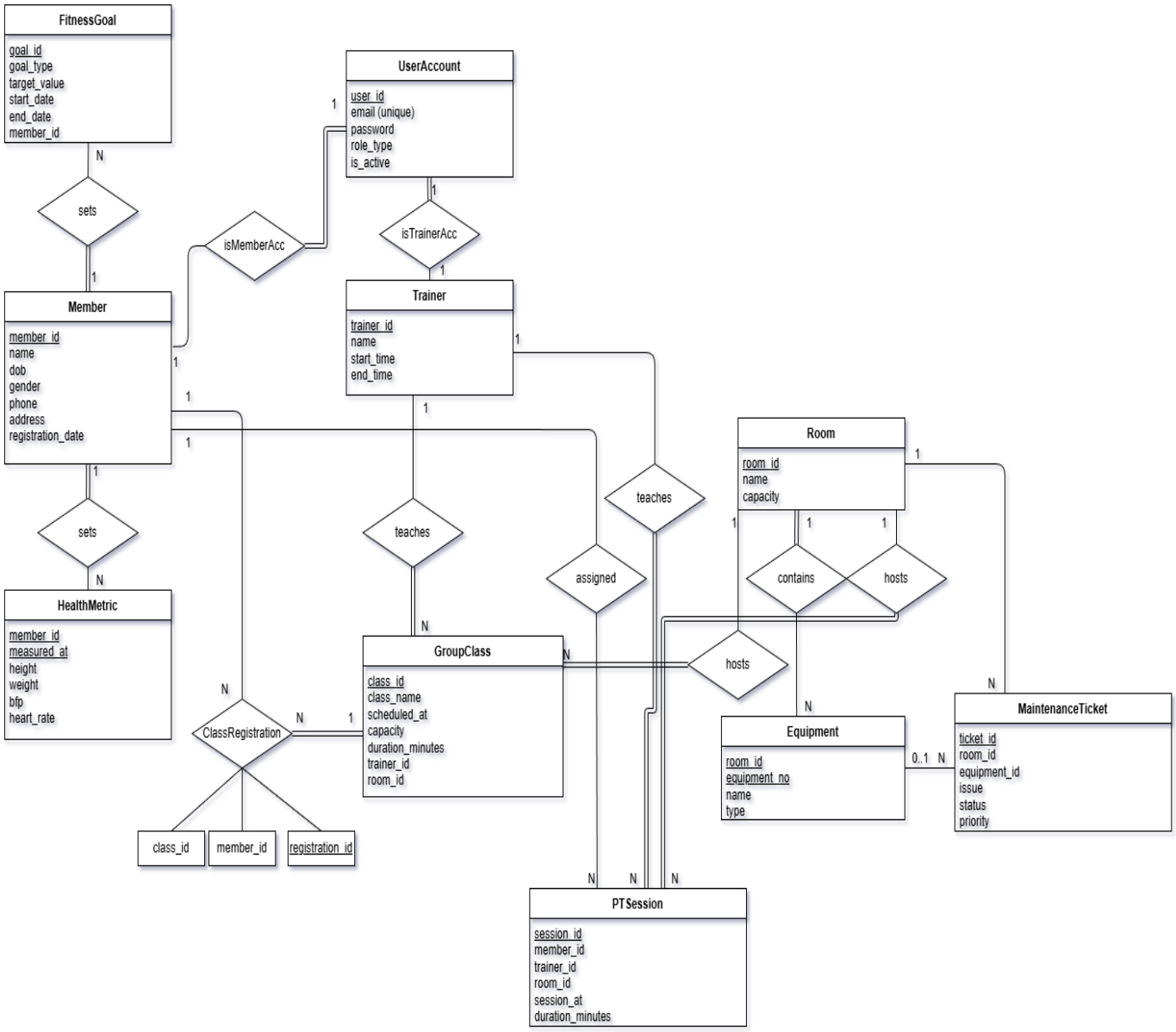
- UserAccount
- Member
- Trainer
- FitnessGoal
- HealthMetric
- GroupClass
- PTSession
- Room
- Equipment
- MaintenanceTicket

Relations:

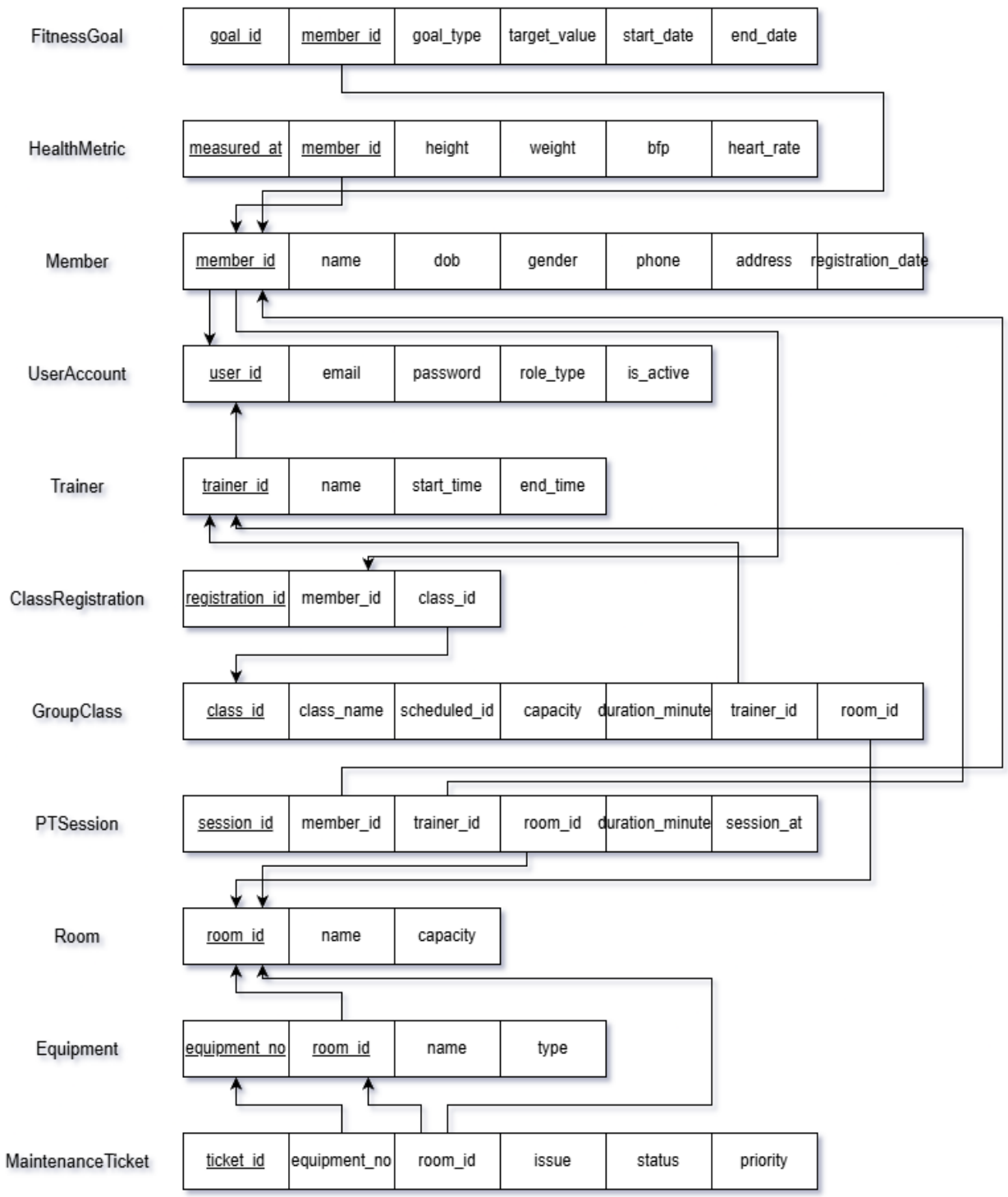
- Member -> isMemberAcc -> UserAccount
- Trainer -> isTrainerAcc -> UserAccount
- Member -> sets -> FitnessGoal
- Member -> sets -> HealthMetric
- Member -> sessionRegistration -> PTSession
- Member -> ClassRegistration -> GroupClass

- Trainer -> Teaches -> GroupClass
- Trainer -> assigned -> PTSession
- Room -> hosts -> PTSession
- Room -> hosts -> GroupClasses
- Room -> contains -> Equipment

ER-Model:



RDS Diagram:


FitnessGoal
goal_id
member_id
goal_type
target_value
start_date
end_date
HealthMetric
measured_at
member_id
height
weight
bfp
heart_rate
Member
member_id
name
dob
gender
phone
address
registration_date
UserAccount
user_id
email
password
role_type
is_active
Trainer
trainer_id
name
start_time
end_time
ClassRegistration
registration_id
member_id
class_id
GroupClass
class_id
class_name
scheduled_id
capacity
duration_minute
trainer_id
room_id
PTSession
session_id
member_id
trainer_id
room_id
duration_minute
session_at
Room
room_id
name
capacity
Equipment
equipment_no
room_id
name
type
MaintenanceTicket
ticket_id
equipment_no
room_id
issue
status
priority

Normalization Justification:

1. UserAccount

   Attributes / key

   - Key: user_id
   - Other: email, password, role_type, is_active

   Functional dependencies

   - user_id -> email, password, role_type, is_active
   - email -> user_id, password, role_type, is_active (email is a candidate key)

   Normalization

   - 2NF: PK is a single attribute = no partial dependencies.
   - 3NF: Every non-key attribute depends on a key (either user_id or email), and no non-key attribute determines another non-key attribute as a non-key determinant.

2. Member

   Attributes / key

   - Key: member_id (also FK to UserAccount(user_id))
   - Other: name, dob, gender, phone, address, registration_date

   FDs

   - member_id -> name, dob, gender, phone, address, registration_date

   Normalization

   - 2NF: Single-attribute PK = no partial dependencies.
   - 3NF: All non-key attributes depend directly on member_id, and there are no non-key → non-key FDs inside this table.

3. Trainer

   Attributes / key

- Key: trainer_id (also FK to UserAccount(user_id))
- Other: name, start_time, end_time, created_at

FDs

- trainer_id -> name, start_time, end_time, created_at

Normalization

- 2NF: Single-attribute PK = no partial dependencies.
- 3NF: All non-key attributes depend on the key; no non-key attribute determines another non-key attribute.

4. FitnessGoal

   Attributes / key

   - Key: goal_id
   - Other: member_id, goal_type, target_value, start_date, end_date

   FDs

   - goal_id -> member_id, goal_type, target_value, start_date, end_date

   Normalization

   - 2NF: Single-attribute PK = no partial dependencies.
   - 3NF: All non-key attributes depend on goal_id; there are no non-key determinants (e.g., we do not enforce member_id or (member_id, goal_type, start_date) as a key here).

5. HealthMetric

   Attributes / key

   - Key: (member_id, measured_at)
   - Other: height, weight, bfp, heart_rate

   FDs

   - (member_id, measured_at) -> height, weight, bfp, heart_rate

   2NF (partial dependency)

- height, weight, bfp, heart_rate do not depend solely on member_id (a member has many measurements).
- They also do not depend solely on measured_at (different members can share timestamps).
- All non-key attributes depend on the full composite key, not on a subset.

3NF (transitive)

- Only determinant for non-key attributes is the composite key (member_id, measured_at).
- No non-key attribute determines another non-key attribute.

6. Room

   Attributes / key

   - Key: room_id
   - Other: name, capacity, location

   FDs

   - room_id -> name, capacity, location

   Normalization

   - 2NF: Single-attribute PK = no partial dependencies.
   - 3NF: No non-key attribute is modeled as a determinant; all depend on room_id.

7. Equipment

   Attributes / key

   - Key: (room_id, equipment_no)
   - Other: name, type

   FDs

   - (room_id, equipment_no) → name, type

   2NF

   - name and type do not depend on room_id alone or equipment_no alone (equipment_no is only unique within a room).

- Non-key attributes depend on the full composite key.

3NF

- No non-key attribute determines another non-key attribute.

8. MaintenanceTicket

   Attributes / key

   - Key: ticket_id
   - Other: room_id, equipment_no, issue, priority, status

   FDs

   - ticket_id -> room_id, equipment_no, issue, priority, status

   Normalization

   - 2NF: Single-attribute PK = no partial dependencies.
   - 3NF: All non-key attributes depend on ticket_id; no non-key determinants.

9. GroupClass

   Attributes / key

   - Key: class_id
   - Other: class_name, trainer_id, room_id, scheduled_at, capacity, duration_minutes

   FDs

   - class_id -> class_name, trainer_id, room_id, scheduled_at, capacity, duration_minutes

   Normalization

   - 2NF: Single-attribute PK = no partial dependencies.
   - 3NF: Non-key attributes are not used as determinants inside this table; any extra semantics (e.g., trainer_id -> trainer_name) live in other tables.

10. ClassRegistration

    Attributes / key

    - Key: registration_id

- Other: class_id, member_id
- Additional constraint: UNIQUE (class_id, member_id)

FDs

- registration_id -> class_id, member_id
- (class_id, member_id) -> registration_id (because of UNIQUE; this is a candidate key)

Normalization

- 2NF: Chosen PK is single attribute registration_id = no partial dependencies w.r.t. that key.
- 3NF: Determinants are keys (registration_id or (class_id, member_id)); there are no non-key determinants.

11. PTSession

    Attributes / key

    - Key: session_id
    - Other: member_id, trainer_id, room_id, session_at, duration_minutes

    FDs

    - session_id -> member_id, trainer_id, room_id, session_at, duration_minutes

    Normalization

    - 2NF: Single-attribute PK = no partial dependencies.
    - 3NF: Non-key attributes all depend on the key, and there are no additional non-keys -> non-key FDs defined in this relation.

Overall, given the assumed functional dependencies, all relations in the schema satisfy Second Normal Form and Third Normal Form. There are no partial dependencies on a proper subset of any candidate key, and there are no non-key attributes that functionally determine other non-key attributes within a relation.