3005 Term Project

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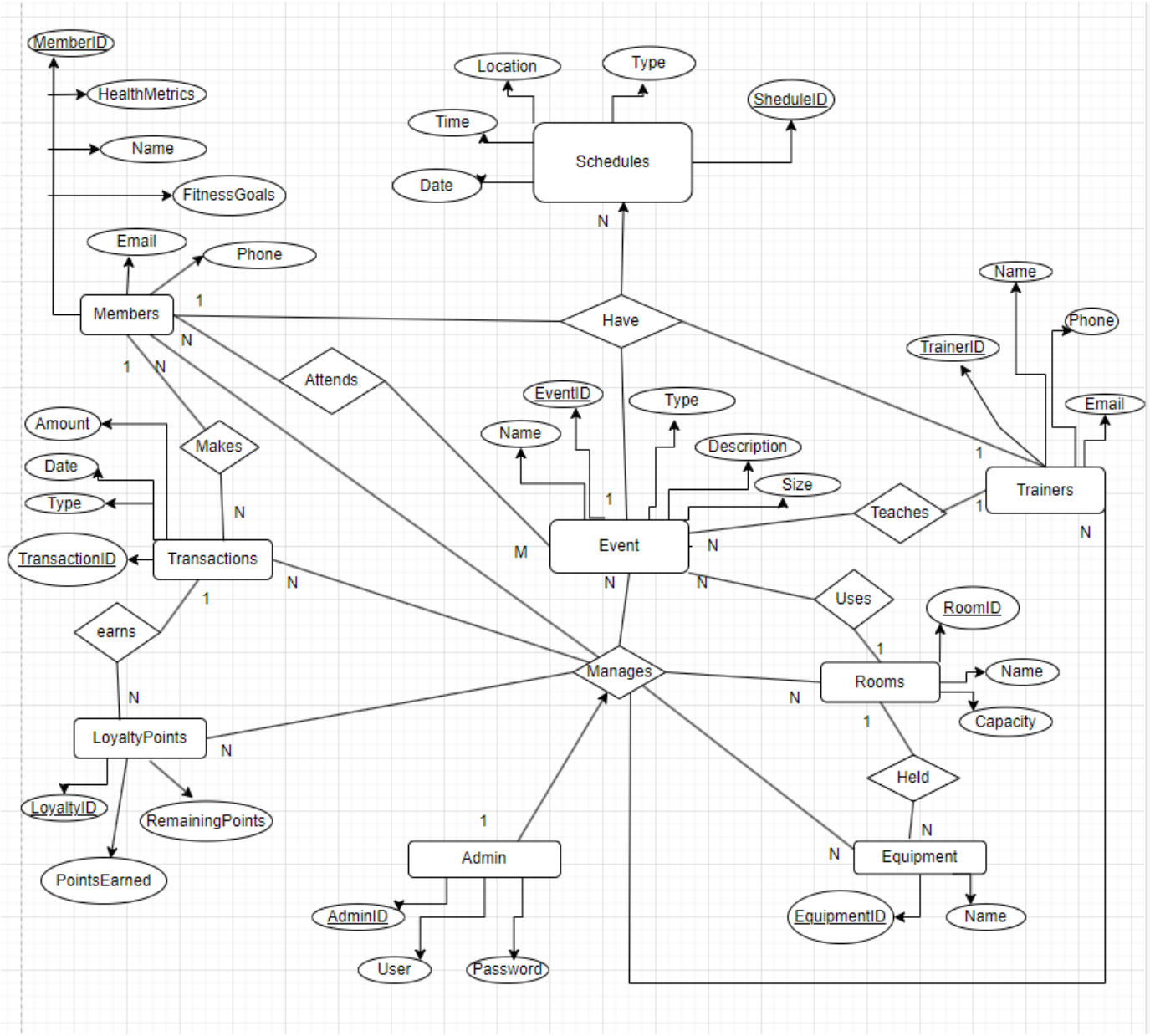
2.1 Conceptual Design:

ER Diagram



To begin, the ER Diagram consists of nine Entitites, connected through 8 relations. The Admin Entity has three attributes, Its primary key: AdminID, User, and Password. These were the only

three attributes I could find use for, within the Admin class, as most of the Admin interaction is through the website itself, not the actual Fitness center. Furthermore, the Admin class begins the largest relationship in the model Manages. The Admin will be able to manage the other 8 classes through this relationship, I denoted its hierarchy using the arrowed line, pointing to the Manage relation.

The Event class serves as an umbrella for all the activities/sessions that would be held at the gym, for this reason it has a type attribute, which would specify between events such as a personal training session or a class activity. The Event class also has an ID primary key, name, description and size attributes. Instead of having attributes relating to dates and times, the Event class has a relationship to the Schedules class.

The purpose of the Schedule class is to serve as a location/time for events, as well as a schedule for members and trainers. The class has an ID primary key, as well as a time, location, date and type attributes. Three other classes have a relation to the Schedule class through the Have relationship. All three classes have a one to many relationship to Schedules, as members and trainers should be able to have multiple schedules.

The Trainer class has the following attributes: TrainerID, Name, Phone, and Email. Alongside the Have relation, trainers also have a Teaches relation relating to an event. The teaches is 1:N, as an event will only have 1 Trainer, but a trainer can have multiple events.

The Members class, has the following attributes: MemberID, Name, Email, Phone, HealthMetrics, FitnessGoal. The class has a total of 4 relations, two of which have been mentioned, Manages, which related to Admin, and Have which allows a member to have a schedule. Furthermore, the Attends Relationship, allows members to sign up for Events, and has a N:M cardinality, as an event can have multiple members, and a member can be apart of multiple events. Lastly the Makes relation allows a member to make transactions regarding the fitness center. The Relationship is 1:N, as a member can make multiple transactions, but a transaction will only ever pertain to one member.

The Transaction Class has an ID primary jey, an Amount, Date and Type attribute. The class has an earns relationship connecting it to the LoyaltyPoints class. The relationship is 1:N in cardinality, and allows a member to earn Loyalty Points when a purchase/transaction is made.

The LoyaltyPoints class has an ID primary key, as well as PointsEarned and RemainingPoints attributes.

The Rooms class has an ID primary key, and Name and Capacity Attributes. Furthermore the Room class has a relation to the Event class throught the Uses Relationship with N:1 cardinality. The Room class also has a Held relationship with Equipment. The held relationship is 1:N because a Room can hold multipel pieces of equipments, but equipment can only be in one room at a given time.

Lastly the Equipment class has an ID primary key, as well as a name attribute.

2.2 Relational Schemas

MEMBERS (*MemberID*, Name, Email, Phone, MemberStatus, LoyaltyID, ScheduleID)

EVENTS (*EventID*, Name, Description, Type, Size, SheduleID, TrainerID)

TRAINERS (*TrainerID,* Name, Email, Phone, ScheduleID)

SCHEDULES (*ScheduleID*, Date, Time, Type, RoomID)

ROOMS (*RoomID*, Name, Capacity)

EQUIPMENT (*EquipmentID*, Name, RoomID)

TRANSACTIONS (*TransactionID*, Type, Date, Amount, MemberID, LoyaltyID)

LOYALTYPOINTS (*LoyaltyID*, RemainingPoints, EarnedPoints, MemberID)

ADMINS (*AdminID*, User, Password)

**Primary keys are underlined and italicized, foreign keys are underlined and listed last.

2.3 Normalization

First Normal Form (1NF)

The tables are in 1NF due to the following reasons:

- All entries in a column are atomic.
- There are no repeating groups or arrays.

Second Normal Form (2NF)

1. Events:

   EventID is the primary key.
   All non-prime attributes (Name, Description, Type, Size, ScheduleID, TrainerID) are fully functionally dependent on the primary key.

2. Trainers:

   TrainerID is the primary key.
   All non-prime attributes (Name, Email, Phone, ScheduleID) are fully functionally dependent on the primary key.

3. Schedules:

   ScheduleID is the primary key.
   All non-prime attributes (Date, Time, Type, RoomID) are fully functionally dependent on the primary key.

4. Rooms:

   RoomID is the primary key.
   All non-prime attributes (Name, Capacity) are fully functionally dependent on the primary key.

5. Equipment:

   EquipmentID is the primary key.
   All non-prime attributes (Name, RoomID) are fully functionally dependent on the primary key.

6. Transactions:

   TransactionID is the primary key.
   All non-prime attributes (Type, Date, Amount, MemberID, LoyaltyID) are fully functionally dependent on the primary key.

7. LoyaltyPoints:

   LoyaltyID is the primary key.
   All non-prime attributes (RemainingPoints, EarnedPoints, MemberID) are fully functionally dependent on the primary key.

Functional Dependencies:

Members:

MemberID → Name, Email, Phone, MemberStatus, LoyaltyID, ScheduleID

Events:

EventID → Name, Description, Type, Size, ScheduleID, TrainerID

Trainers:

TrainerID → Name, Email, Phone, ScheduleID

Schedules:

ScheduleID → Date, Time, Type, RoomID

Rooms:

RoomID → Name, Capacity

Equipment:

EquipmentID → Name, RoomID

Transactions:

TransactionID → Type, Date, Amount, MemberID, LoyaltyID

LoyaltyPoints:

LoyaltyID → RemainingPoints, EarnedPoints, MemberID

Admins:

AdminID → Name, Email, Phone

Third Normal Form (3NF):

Changes for 3NF:
MEMBERS:

Removed ScheduleID since it appeared to be transitively dependent on MemberID.

EVENTS:

Removed ScheduleID and TrainerID since they appeared to be transitively dependent on EventID.

TRAINERS:

Removed ScheduleID since it appeared to be transitively dependent on TrainerID.

SCHEDULES:

No changes.

EQUIPMENT:

No changes.

TRANSACTIONS:

No changes.

LOYALTYPOINTS:

No changes.

ADMINS:

No changes.

To compensate for this change, the following attributes need to be changed:

- MemberScheduleID instead of ScheduleID in MEMBERS.
- TrainerScheduleID instead of ScheduleID in TRAINERS.
- EventScheduleID instead of ScheduleID in EVENTS.

2.4 Database Schema Diagram