Ain Shams University – Faculty of Engineering I-CHEP

Gym Membership Database Design

Project Report

CSE244 - Database Systems Design

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Submitted to:

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1 Introduction

This report documents our group's design for a relational database for a Gym Management System, fulfilling the requirements of Phase 1. The report includes an analysis of our Entity-Relationship Diagram (ERD), a discussion of normalization, and our relational schema.

2 Entity-Relationship Diagram (ERD) Analysis

Our group created an ERD to model the core entities and relationships within a gym management system. However, upon review, we recognize that the ERD contains significant flaws that prevent direct implementation as a relational database.

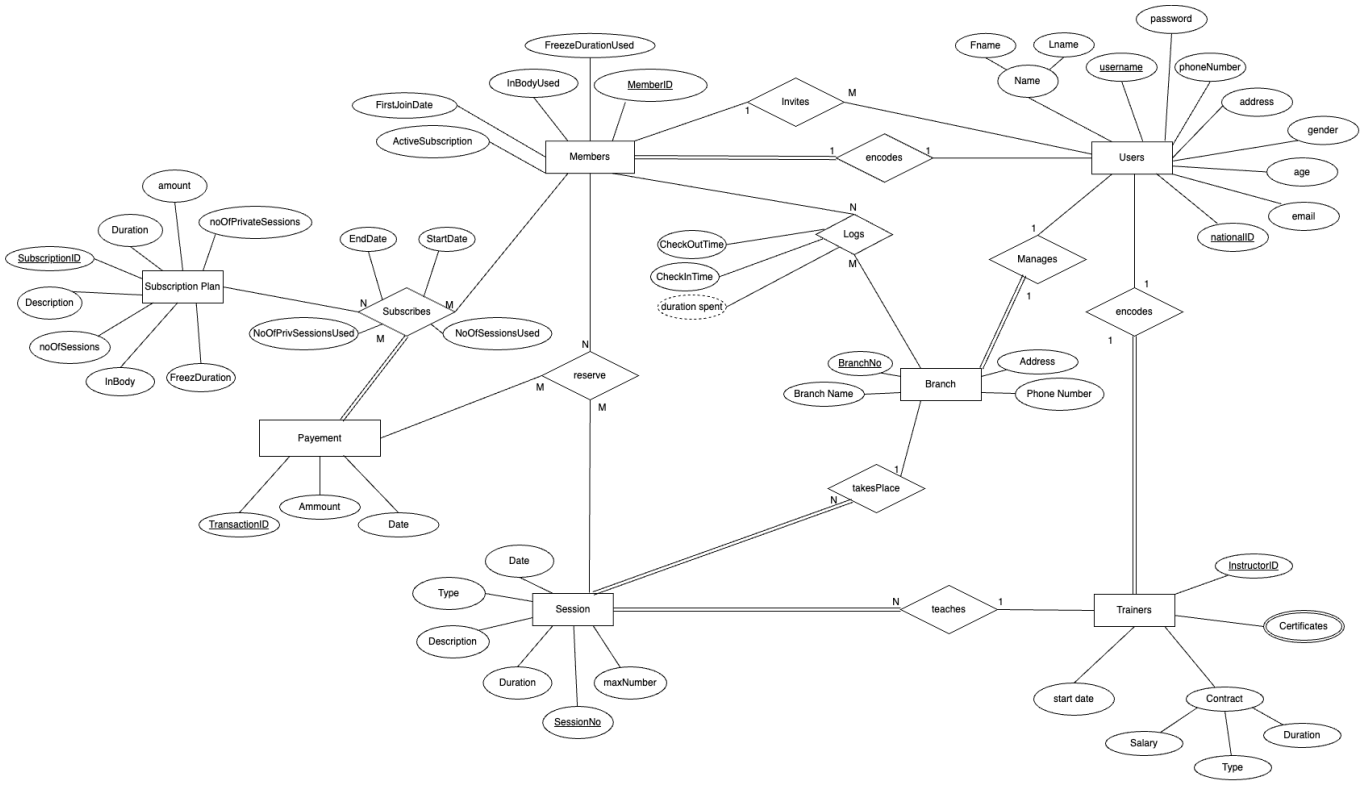
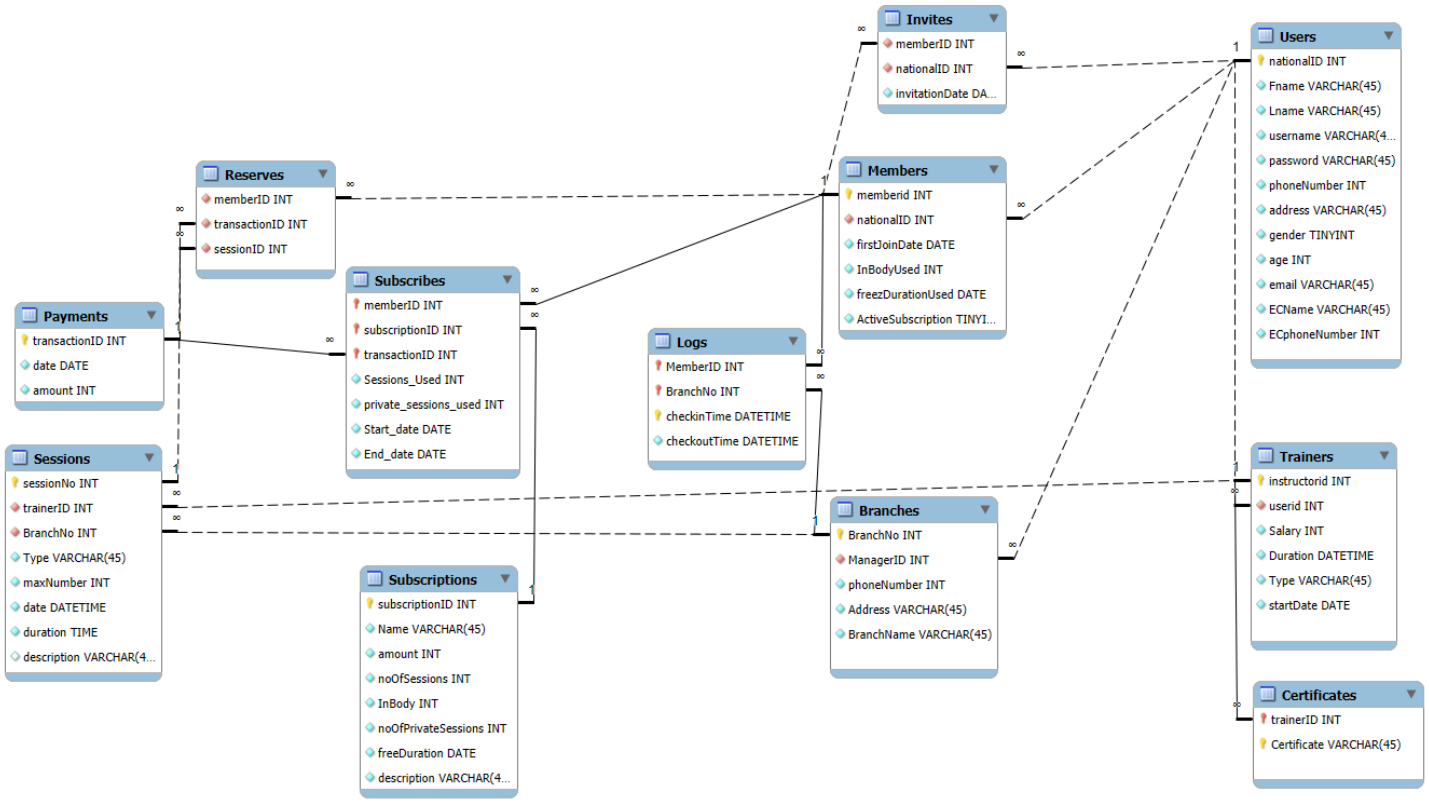


Figure 1 Entity Relation Diagram for the Gym Membership Management System

2.1 Database Schema



2.2 Entities and Attributes

This section lists the entities in our current ERD, their attributes, immediate critiques, *and a paragraph explaining the intended purpose and design choices for each entity*.

2.2.1 Users

This entity represents *any* user who interacts with the system. Our design *does* distinguish between different user types through the Members and Trainers entities, which inherit from Users via foreign key relationships. This establishes a form of subtyping. We do not distinguish a user that it is not a member neither a trainer (e.g. a Guest).

Users

Attribute	Datatype	Primary Key	Non-Null	Unique
NationalID	INT	Yes	Yes	Yes
Fname	VARCHAR(45)		Yes	
Lname	VARCHAR(45)		Yes	
username	VARCHAR(45)		Yes	

Password	VARCHAR(45)		Yes	
PhoneNumber	INT		Yes	Yes
ECName	VARCHAR(45)		Yes	
ECPhoneNumber	INT		Yes	
Address	VARCHAR(45)		Yes	
Gender	TINYINT		Yes	
Age	INT		Yes	
Email	VARCHAR(45)		Yes	Yes

Figure 2 User Entity - Attributes and Datatype

2.2.2 Trainers

This entity stores information about personal trainers. We included relevant attributes for their professional details.

Trainers

Attribute	Datatype	Primary Key	Non-Null	Unique
InstructorID	INT	Yes	Yes	Yes
userID	INT			
salary	INT		Yes	
Duration	DATETIME		Yes	
Type	VARCHAR(45)		Yes	
StartDate	INT		Yes	

Figure 3 Trainer Entity - Attributes and Datatype

2.2.3 Members

This entity represents gym members once a payment was successful (Subscribed to any plan). We included attributes to track their join date and usage of various gym services.

Members

Attribute	Datatype	Primary Key	Non-Null	Unique
MemberID	INT	Yes	Yes	Yes
nationalID	INT		Yes	
inBodyUsed	INT		Yes	
FreezeDurationUsed	INT		Yes	
FirstJoinDate	DATETIME		Yes	
ActiveSubscription	TINYINT		Yes	

Figure 4 Members Entity - Attributes and Datatype

2.2.4 Branch

This entity represents different physical gym locations. The design is straightforward and includes basic location information.

Branch

Attribute	Datatype	Primary Key	Non-Null	Unique
BranchNo	INT	Yes	Yes	Yes
MangerID	INT		Yes	
PhoneNumber	INT		Yes	Yes
Address	VARCHAR(45)		Yes	
Branchname	VARCHAR(45)		Yes	

Figure 5 Branch Entity - Attributes and Datatype

2.2.5 Session

This entity represents specific classes or training sessions, they have a maximum number of attendees, the attenders or reservations are stored in a sperate table having the SessionNo and MemberID as Primary Key.

Session

Attribute	Datatype	Primary Key	Non-Null	Unique
SessionNo	INT	Yes	Yes	Yes
Type	VARCHAR(45)		Yes	
Date	DATETIME		Yes	
Duration	TIME		Yes	
maxNumber	INT		Yes	
Description	VARCHAR(45)		Yes	
TrainerID	INT		Yes	

Figure 6 Session Entity - Attributes and Datatype

2.2.6 Subscription Plan

This entity represents different membership options.

SubscriptionPlan

Attribute	Datatype	Primary Key	Non-Null	Unique
SubscriptionID	INT	Yes	Yes	Yes
Description	VARCHAR(45)		Yes	
Amount	INT		Yes	
Duration	TIME		Yes	
noOfPrivateSessions	INT		Yes	
noOfSessions	VARCHAR(45)		Yes	
FreezDuration	TIME		Yes	
InBody	INT		Yes	

Figure 7 SubscriptionPlan Entity - Attributes and Datatype

2.2.7 Payment

This entity records financial transactions.

Payment

Attribute	Datatype	Primary Key	Non-Null	Unique
TransactionID	INT	Yes	Yes	Yes
Amount	INT		Yes	
Date	DATETIME		Yes	

Figure 8 Payment Entity - Attributes and Datatype

2.2.8 Certificates

This entity records Certificate data.

Certificates

Attribute	Datatype	Primary Key	Non-Null	Unique
TrainerID	INT	Yes	Yes	Yes
Certificates	VARCHAR(45)		Yes	

2.3 Relationship

2.3.1 Users - Manages - Branch (1:1)

- Description: One User manages one Branch, and a Branch is managed by one User. This implies a one-to-one relationship.
- Implementation: the Branch table would have a foreign key (ManagerID) referencing the Users table's primary key.

2.3.2 Users - is a - Members (1:1)

- Description: A User can be a Member, and a Member is a User. This represents a one-to-one relationship, indicating that Members is a subtype of Users.
- Implementation: The Members table's primary key also acts as a foreign key, referencing the Users table's primary key.

2.3.3 Users - is a - Trainers (1:1)

- Description: A User can be a Trainer, and a Trainer is a User. This is another one-to-one relationship, with Trainers as a subtype of Users.
- Implementation: The Trainers table's primary key also acts as a foreign key, referencing the Users table's primary key.

2.3.4 Members - Subscribes - Subscription Plan (M:M)

- Description: A Member can subscribe to multiple Subscription Plans, and a Subscription Plan can have many Members.
- Implementation: This requires a junction table, which our ERD correctly provides as the Subscription entity. Subscription should have foreign keys referencing Members.

Subscribes

Attribute	Datatype	Primary Key	Non-Null	Unique
MemberID	INT	Yes	Yes	
TransactionID	INT	Yes	Yes	
SessionsUsed	INT		Yes	
PrivateSessionsUsed	INT		Yes	
SubscriptionID	INT	Yes	Yes	
StartDate	DATETIME		Yes	
EndDate	DATETIME		Yes	

Figure 9 Subscribes Relation - Attributes and Datatype

2.3.5 Members - Invites - User (M:M)

- Description: A Member can invite multiple Users, and a User can be invited by multiple Members.
- Implementation: The Inviting Member's used session count is incremented when a user is invited.

Invites

Attribute	Datatype	Primary Key	Non-Null	Unique
MemberID	INT	Yes	Yes	
NationnalID	INT	Yes	Yes	
InvitationDate	DateTime		Yes	

2.3.6 Members - Reserves - Session (M:M)

- Description: A Member can reserve spots in multiple Sessions, and a Session can have multiple Members (reservations).
- Implementation: A junction table is *required*, with foreign keys referencing MemberID and SessionNo.

Reservation

Attribute	Datatype	Primary Key	Non-Null	Unique
MemberID	INT	Yes	Yes	
SessionNo	INT	Yes	Yes	
TransactionID	INT	Yes	Yes	

Figure 10 Reservation Relation - Attributes and Datatype

2.3.7 Trainers - Teaches - Sessions(M:M)

- Description: One Trainer can teach multiple Sessions, but each Session is taught by only one Trainer.
- Implementation: The Session table has a foreign key TrainerID referencing the Trainers table's primary key (InstructorID).

2.3.8 Session - Takes Place at - Branch (M:1)

- Description: Many Sessions take place at one Branch.
- Implementation: A foreign key BranchNo should be in the Session table, referencing BranchNo.

2.3.9 Subscription - Requires - Payment (1:M)

- Description: A Subscription can have multiple associated Payments.
- Implementation: A foreign key SubscribtionID should be present in the Payment table, referencing SubscribtionID.

2.3.10 Members - PunchIn - Branch (M:M)

- Description: Many Members can PunchIn in Many Branches.
- Implementation: A junction table is required. This table has foreign keys referencing MemberID and BranchNo.

Joined Table for the relationship between the entities Member, Branch.

Logs

Attribute	Datatype	Primary Key	Non-Null	Unique
MemberID	INT	Yes	Yes	Yes
BranchID	VARCHAR(45)	Yes	Yes	
CheckIntime	DATETIME	Yes	Yes	
CheckoutTime	INT			

Figure 11 Punch In Relation - Attributes and Datatype