HW2 - Entity Relationship Diagrams

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1 CMSC 608 - Advanced Database Systems

1.0.1 **Instructor:** Thomas Gyeera

1.1 GitHub Repository

👉 AdvancedDatabaseHW2 Repository

2 Introduction

Entity-Relation (ER) diagrams are an essential tool for database design, helping transform real-world data relationships into structured schemas. In this assignment, we explore **three ER models** by designing **Chen Notation (Graphviz)** and **Crow's Foot Notation (Mermaid)** diagrams for selected database systems.

The selected systems for this assignment are: 1. **Library Management System** 2. **Restaurant Reservation System** 3. **Real Estate Listing System**

Each section includes: - **Chen ER Diagram** (Graphviz) - **Crow's Foot ER Diagram** (Mermaid) - **Discussion on design choices** - **Relation set schemas**

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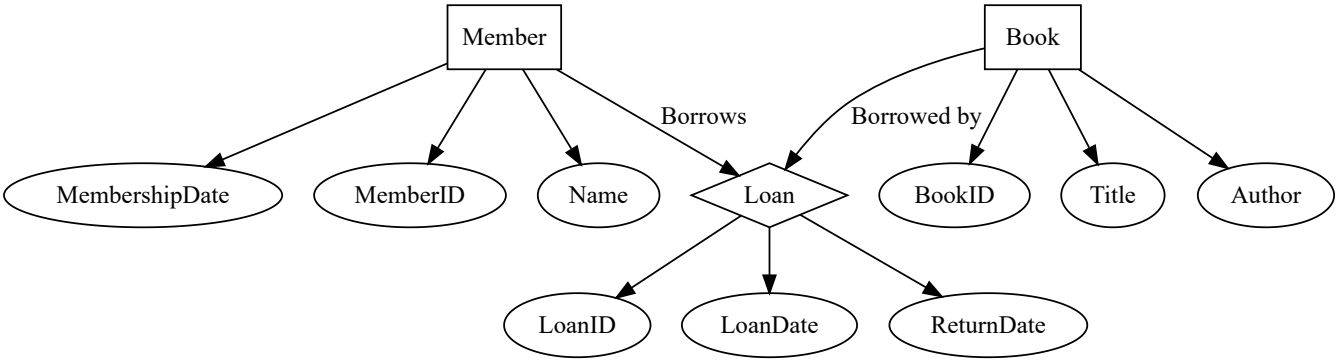
3 1. Library Management System

3.1 Problem Description

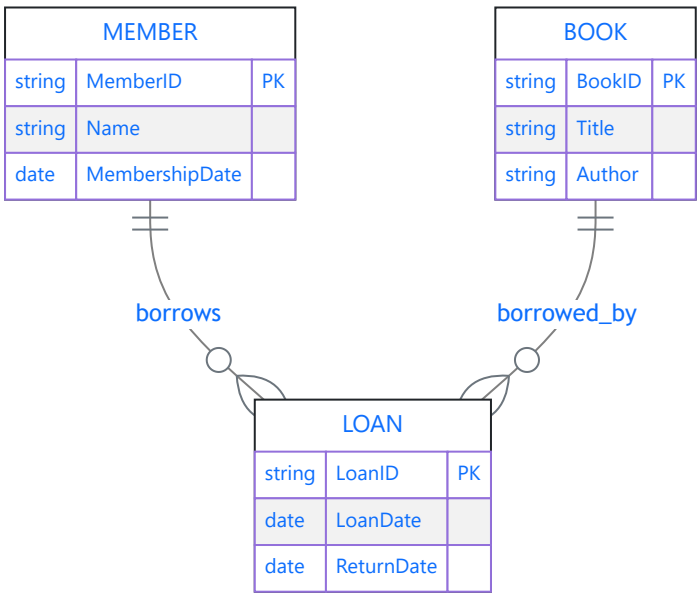
A library system manages books, members, and loans. The system tracks: - **Books** (Book ID, Title, Author) - **Members** (Member ID, Name, Membership Date) - **Loans** (Loan ID, Loan Date, Return Date)

Each member can borrow multiple books over time, and each loan is tied to a single book and a single member.

3.2 Chen ER Diagram (Graphviz)



3.3 **Crow's Foot ER Diagram (Mermaid)**



3.4 **Design Discussion**

- **Weak Entity:** Loans are dependent on both Books and Members.
- **Many-to-Many Relationship:** Members can borrow multiple books over time.

- **Attributes:** Membership Date helps track when a member joined.

3.5 **Relation Set Schema**

- **Book(BookID, Title, Author)**
- **Member(MemberID, Name, MembershipDate)**
- **Loan(LoanID, LoanDate, ReturnDate, BookID, MemberID)**

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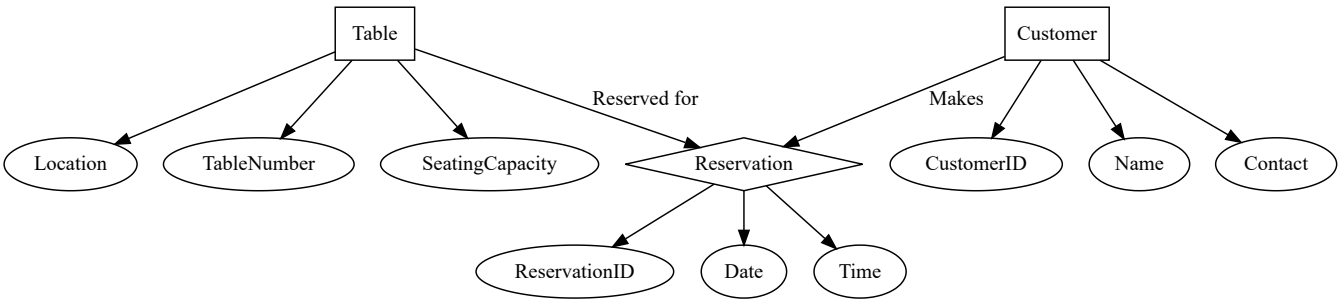
4 2. Restaurant Reservation System

4.1 **Problem Description**

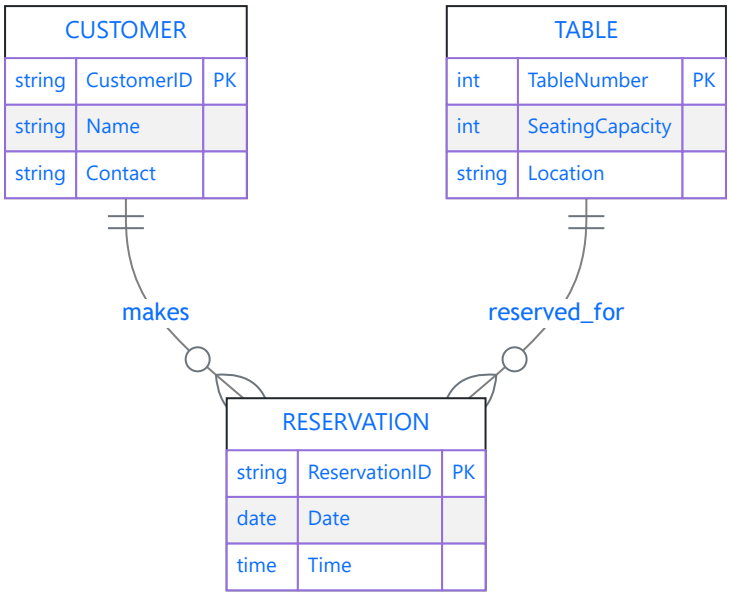
A restaurant manages reservations, customers, and tables. The system tracks: - **Reservations** (Reservation ID, Date, Time) - **Customers** (Customer ID, Name, Contact) - **Tables** (Table Number, Seating Capacity, Location)

Each reservation is made by a single customer for one table, but tables can have multiple reservations over time.

4.2 **Chen ER Diagram (Graphviz)**



4.3 Crow's Foot ER Diagram (Mermaid)



4.4 Design Discussion

- **Many-to-Many Relationship:** A table can be reserved multiple times by different customers.
- **Single Reservation Constraint:** Each reservation is only for one customer.

4.5 Relation Set Schema

- **Customer(CustomerID, Name, Contact)**
- **Table(TableNumber, SeatingCapacity, Location)**
- **Reservation(ReservationID, Date, Time, CustomerID, TableNumber)**

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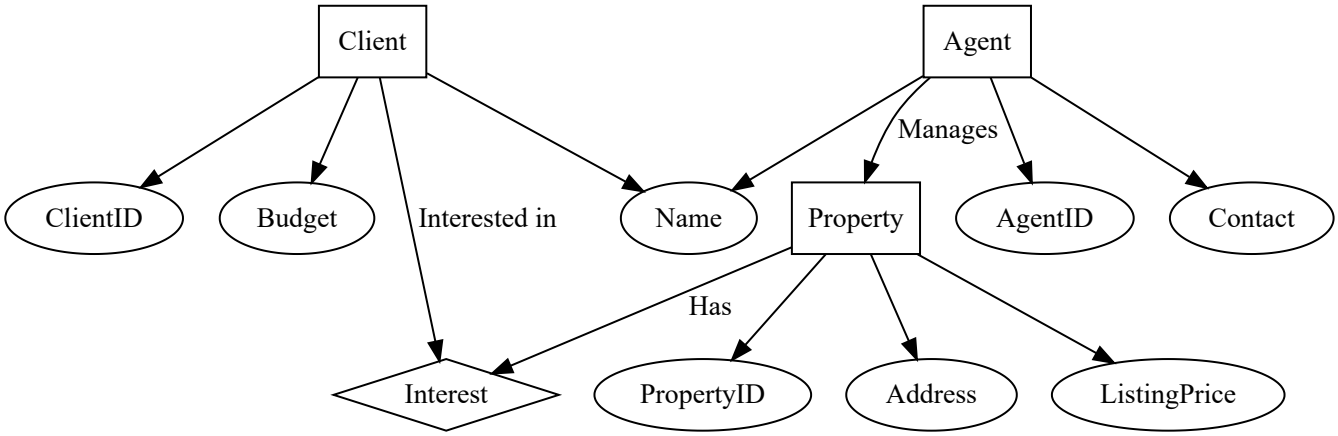
5 3. Real Estate Listing System

5.1 Problem Description

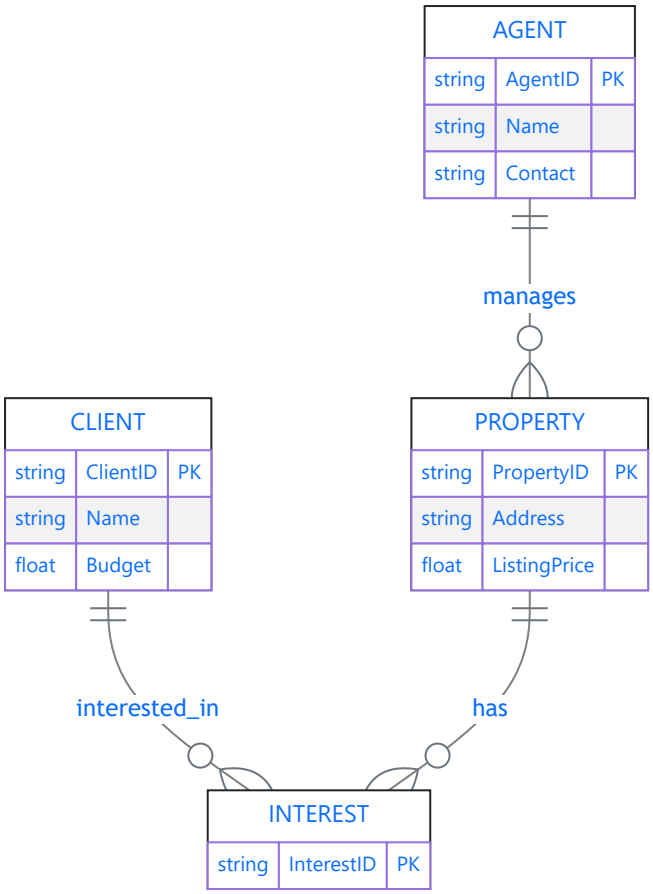
A real estate agency tracks: - **Properties** (Property ID, Address, Listing Price) - **Agents** (Agent ID, Name, Contact) - **Clients** (Client ID, Name, Budget)

Each agent manages multiple properties, and each property can have multiple interested clients.

5.2 Chen ER Diagram (Graphviz)



5.3 **Crow's Foot ER Diagram (Mermaid)**



5.4 **Design Discussion**

- **Many-to-Many Relationship:** Properties can have multiple interested clients.
- **Single Agent Per Property:** Each property is managed by one agent.

5.5 **Relation Set Schema**

- **Property(PropertyID, Address, ListingPrice, AgentID)**
- **Agent(AgentID, Name, Contact)**
- **Client(ClientID, Name, Budget)**
- **Interest(InterestID, ClientID, PropertyID)**

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6 Conclusion

This assignment explored **three ER diagrams** using **Chen and Crow's Foot notations**, analyzing different database systems with their attributes, relationships, and schema designs.
