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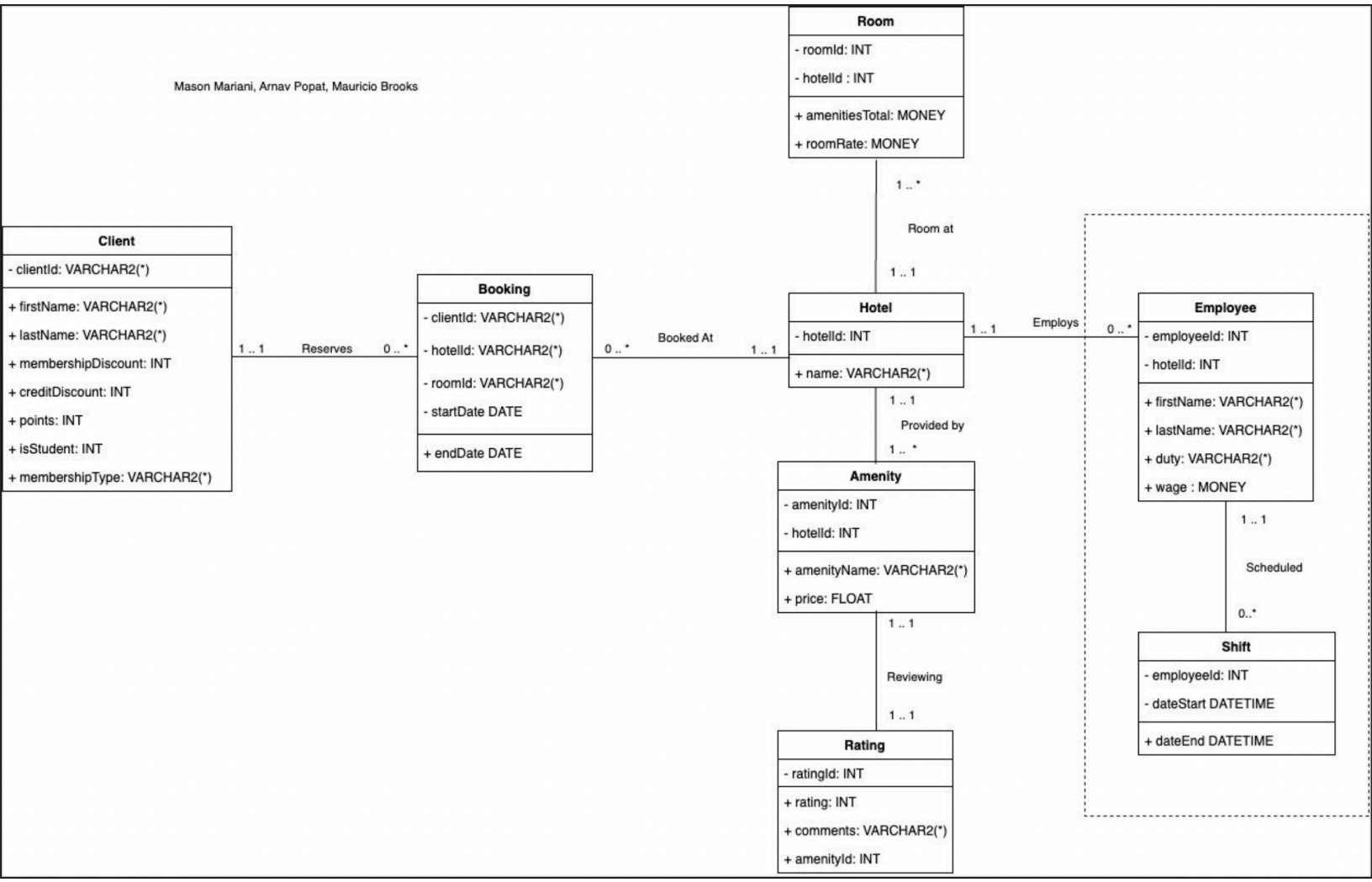
Conceptual database design:



Logical database design

HotelClient:
- clientId (VARCHAR2(50), PRIMARY KEY)
- firstName (VARCHAR2(50))
- lastName (VARCHAR2(50))
- membershipDiscount (INT)
- creditDiscount (INT)
- points (INT)
- isStudent (INT)
- membershipType (VARCHAR2(10))

HotelBooking:
- clientId (VARCHAR2(50), PRIMARY KEY)
- hotelId (VARCHAR2(50), PRIMARY KEY)
- roomId (VARCHAR2(50), PRIMARY KEY)
- startDate (DATE, PRIMARY KEY)
- endDate (DATE)

HotelHotel:
- hotelId (VARCHAR2(50), PRIMARY KEY)
- name (VARCHAR2(75))

HotelRoom:
- roomId (VARCHAR2(50), PRIMARY KEY)
- hotelId (VARCHAR2(50), PRIMARY KEY)
- amenitiesTotal (FLOAT)
- roomRate (FLOAT)

HotelAmenity:
- amenityId (VARCHAR2(50), PRIMARY KEY)
- hotelId (VARCHAR2(50), PRIMARY KEY)
- amenityName (VARCHAR2(50))
- price (FLOAT)

HotelRating:
- ratingId (VARCHAR2(50), PRIMARY KEY)
- rating (INT)
- comments (VARCHAR2(250))
- amenityId (VARCHAR2(50))

HotelEmployee:
- employeeId (VARCHAR2(50), PRIMARY KEY)
- hotelId (VARCHAR2(50), PRIMARY KEY)
- firstName (VARCHAR2(50))
- lastName (VARCHAR2(50))
- duty (VARCHAR2(50))
- wage (FLOAT)

HotelShift:
- employeeId (VARCHAR2(50), PRIMARY KEY)
- dateStart (DATE, PRIMARY KEY)
- dateEnd (DATE)

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Normalization Analysis

1st Normal Form
Because there are no multivalued column values (i.e. not Set-valued column)

2nd Normal Form
Because all non-prime attributes are fully functionally dependent on EVERY CK (for all tables) - i.e. any attribute that doesn't appear in CK is Fully Functionally Dependent on CK

3rd Normal Form
The tables in the schema are 3NF because there are no transitive dependencies between non-prime attributes. Since all of the tables are already in 2NF, they are in 3NF.

4th Normal Form
The tables in the schema don't have any multivalued dependencies. All tables store a single value for each attribute in relation to the primary key, and there are no attributes that would require storing multiple independent values. Since there are no non-trivial multivalued dependencies (none at all, trivial or not), and each table satisfies the conditions for 1NF, 2NF, and 3NF, the database is in 4NF.

4th Normal Form (alternate explanation)
To be in 4NF, each of the MVDs must be trivial or the LHS of the FD must be a superkey. Each table has 0 MVDs, thus the statement holds true and the Relations must be in 4NF.

5th Normal Form
Since there are tables with composite candidate keys, the schema does not satisfy the condition that every candidate key ONLY has a single attribute. Therefore, **we cannot prove that the database is in 5NF.**

Functional Dependencies

Shift Table FDs: (employeeId, dateStart) -> dateEnd

Employee Table FDs: (employeeId, hotelId) -> firstName, lastName, duty, wage

Amenity Table FDs: (amenityId, hotelId) -> amenityName, price

Client Table FDs: **(clientID) ->** firstName, lastName, membershipDiscount, points, isStudent, membershipType

Booking Table FDs: (clientId, hotelId, roomId, startDate) -> endDate

Room Table FDs: (roomId,hotelId) -> amenitiesTotal, roomRate

Hotel FDs: hotelId -> name

Room Table FDs: roomId, hotelId -> amenitiesTotal, roomRate

Query Description

The query we designed tells us the total revenue generated by a specific hotel between two dates provided by the user. This can allow a user to compare the revenues generated by multiple different hotels. The total revenue is broken down into 2 parts: the room revenue and the amenity revenue. This is beneficial for understanding the different sources of income for the hotel and help identify the areas that are performing well or may need improvement.