CSI2132 - Databases Deliverable 1

Students: Student#:

Nicolas Paré   7084451
Jonathan Popowick-Bastien   8432984

ER Model Part 1 - Justification

Based on the constraints provided in the descriptions we found that there are six entities, five which are related, and one that is not connected by any relationships. The five connected entities are the Hotel_Chain, Hotel, Room, Booking, and Employee entities.

- Because of the requirement that a Room entity must belong to a Hotel entity, we inferred that Room is a weak entity set who is related to the Hotel through the "has a" relationship.
- Because of the requirement that a Hotel entity must belong to a Hotel_Chain entity, we inferred that Hotel is a weak entity set who is related to the Hotel_Chain through the "Parent_Chain" relationship.
- The "works for" relationship is representing all other non-manager employees and their relationship with the hotel.
- Given the requirement that a hotel must have a manager, we created a secondary unary relationship "manages a" between Employee and Hotel to represent this.
- Because we wanted a hotel to be able to lookup all of its current bookings we added the "owns a" relation between the Booking and Hotel entities.
- Because a Booking needs to be for a specific room we added the belongs to relation between Booking and Room.

The sole unconnected entity is the archive.
- Archive has no relationships to other entities because it needs to retain the information even after all other entities are removed.

Part 2: Relational Model

- Hotel_Chain (<u>Hotel_Chain_ID</u>, Central_Office, Number_of_Hotels, Contact_Email)
- HotelChain_PhoneNumbers (<u>Hotel_Chain_ID</u>, <u>Phone_Number</u>)
- Parent_Chain (<u>Hotel_Chain_ID</u>, <u>Hotel_ID</u>)
- Hotel (<u>Hotel_Chain_ID</u>, <u>Hotel_ID</u>, Hotel_Address, Contact_Email, Number_of_Rooms, Rating)
- Hotel_PhoneNumbers (<u>Hotel_ID</u>, <u>Phone_Number</u>)
- WorksFor (<u>Hotel_ID</u>, <u>SSN/SIN</u>)
- ManagesA (<u>Hotel_ID</u>, <u>SSN/SIN</u>)
- Employee (<u>SSN/SIN</u>, Name, Address)
- Room (<u>Hotel_Chain_ID</u>, <u>Hotel_ID</u>, <u>Room_Number</u>, Can_be_Extended, has_Sea_View, has_Mountain_View, Room_Capacity, Price)
- Room_Amenities (<u>Room_Number</u>, <u>Amenity</u>)
- Room_List_of_Problems (<u>Room_Number</u>, <u>Problem</u>)
- HasA (<u>Hotel_Chain_ID</u>, <u>Hotel_ID</u>, <u>Room_Number</u>)
- Booking (<u>Booking_ID</u>, Time_Created, Renting_Time, Is_Renting, Customer_Name, Is_Paid)
- OwnsA (<u>Hotel_ID</u>, <u>Booking_ID</u>)
- Archive (<u>Booking_ID</u>, Time_Created, Renting_Time, Is_Renting, Customer_Name, Is_Paid, Room_Number, Hotel_Address, Hotel_Chain_ID)

Relational Model Justification, And Primary Key/Referential Integrity Constraints:

Hotel_Chain:
- Hotel_Chain_ID: is the primary key.

HotelChain_PhoneNumbers:
- Hotel_Chain_ID is a foreign key from the Hotel_Chain relation.
- Hotel_Chain_ID and Phone_Number together make up the primary key.
- The HotelChain_PhoneNumbers relation exists to represent the ER models multivalued "Phone Numbers" attribute.

Parent_Chain:
- Hotel_Chain_ID is a foreign key from the Hotel_Chain relation.
- Hotel_ID is a foreign key from the Hotel relation.
- Hotel_Chain_ID and Hotel_ID together make up the primary key.

Hotel:
- Hotel_Chain_ID is a foreign key from the Hotel_Chain relation.

- Hotel_Chain_ID and Hotel_ID together make up the primary key.

Hotel_PhoneNumbers:
- Hotel_ID is a foreign key from the Hotel relation.
- Hotel_ID and Phone_Number together make up the primary key.
- The Hotel_PhoneNumbers relation exists to represent the ER models multivalued "Phone Numbers" attribute.

WorksFor:
- Hotel_ID is a foreign key from the Hotel relation.
- SSN/SIN is a foreign key from the Employee relation.
- Hotel_ID and SSN/SIN together make up the primary key.

ManagesA:
- Hotel_ID is a foreign key from the Hotel relation.
- SSN/SIN is a foreign key from the Employee relation.
- Hotel_ID and SSN/SIN together make up the primary key.

Employee:
- SSN/SIN is a primary key.

Room:
- Hotel_Chain_ID is a foreign key from the Hotel_Chain relation.
- Hotel_ID is a foreign key from the Hotel relation.
- Hotel_Chain_ID, Hotel_ID and Room_Number together make up the primary key.

Room_Amenities:
- Room_Number is a foreign key from the Room relation.
- Room_Number and Amenity together make up the primary key.
- The Room_Amenities relation exists to represent the ER model's multivalued "Amenities" attribute.

Room_List_of_Problems:
- Room_Number is a foreign key from the Room relation.
- Room_Numer and Problem together make up the primary key.
- The Room_List_of_Problems relation exists to represent the ER model's multivalued "List of Problems" attribute.

HasA:
- Hotel_Chain_ID is a foreign key from the Hotel_Chain relation.
- Hotel_ID is a foreign key from the Hotel relation.
- Room_Number is a foreign key from the Room relation.
- Hotel_Chain_ID, Hotel_ID and Room_Number together make up the primary key.

Booking:
- Booking_ID is a primary key.

OwnsA:
- Hotel_ID is a foreign key from the Hotel relation.
- Hotel_ID and Booking_ID together make up the primary key.

Archive:
- Booking_ID is a foreign key from the Booking relation.
- Booking_ID is the primary key of the Archive relation.

Part 3: Constraints

Domain Constraints

Hotel_Chain:
1. Hotel Chain ID must be a unique positive integer.
2. Central offices must be a string.
3. Number of hotels must be a positive integer.
4. Contact email must be a string that includes alphanumeric characters.
5. Phone numbers is a multivalued attribute that contains multiple phone numbers of the hotel.
6. A phone number must be a positive integer.

Hotel:
1. Hotel Address must be a unique composite attribute.
2. Hotel Address is made up of the following strings: Country, province/state, city, postal code, street name, and the integer street number.
3. Contact email must be a string that includes alphanumeric characters.
4. Number of rooms must be a positive integer.
5. Rating is a positive integer from 1 to 5 (inclusive).
6. Phone numbers is a multivalued attribute that contains multiple phone numbers of the hotel.
7. A phone number must be a positive integer.
8. A Hotel is a weak entity set to a Hotel_Chain

Room:
1. Room Number is a positive integer.
2. Can be extended is a boolean value.
3. Has Sea View is a boolean.
4. Has Mountain View is a boolean.
5. Room Capacity is a positive integer.
6. Price is a positive integer.
7. Amenities is a multivalued attribute, consisting of strings.
8. List of problems is a multivalued attribute, consisting of strings.
9. A room is a weak entity to a Hotel.

Employee:
1. SSN/SIN is a unique sequence of numbers.
2. Name must be a string.
3. Role is a string representing the role of the employee. Employee's can only have one role.
4. Address must be a composite attribute.

5. Address is made up of the following strings: Country, province/state, city, postal code, street name, and the integer street number.

Booking:
1. Booking ID is an unique integer.
2. Time Created is a formatted string in the format that includes: year, month, day, hour and minutes (YYYY-MM-DD:HH-MM).
3. Renting Time is a formatted string in the format that includes: year, month, day, hour and minutes (YYYY-MM-DD:HH-MM).
4. Is Renting is a boolean.
5. When is Renting is true, the customer has checked in for their booking and is therefore converted to a renting.
6. Customer Name is a string.
7. Is_Paid is a boolean that represents if the customer has paid for their booking.

Archive:
1. Booking ID is a unique positive integer.
2. Time Created is a formatted string in the format that includes: year, month, day, hour and minutes (YYYY-MM-DD:HH-MM).
3. Renting Time is a formatted string in the format that includes: year, month, day, hour and minutes (YYYY-MM-DD:HH-MM).
4. Is Renting is a boolean.
5. When is Renting is true, the customer has checked in for their booking and is therefore converted to a renting.
6. Customer Name is a string.
7. Is_Paid is a boolean that represents if the customer has paid for their booking.
8. Room Number is a positive integer.
9. Hotel Address must be a composite attribute.
10. Hotel Address is made up of the following strings: Country, province/state, city, postal code, street name, and the integer street number.
11. Hotel Chain ID must be a unique positive integer.

User Constraints

Global:
- It must be possible to delete an instance of Hotel_Chain, Hotel, and Room from the database.

Hotel:
- Each hotel must always have exactly one manager.
- A customer must be able to physically approach a hotel without a booking, and in turn create a booking on the spot for a room, which will then become a renting once the booking date has begun.

- There can only be one Hotel that exists with a given address.
- A Rating must be a positive integer between 1 and 5 inclusively.

Booking:
- When customer's check in the booking is converted to renting and they can pay for this renting.
- A booking must know if it has been paid for or not.
- A booking can only be for a single room.
- The Time_Created attribute cannot be changed.

Archives:
- The history of bookings and rentings must be stored as archives.
- Archives must continue to exist even after a room and/or Hotel has been removed from the database.