CSCI 5408

DATA MANAGEMENT AND  
WAREHOUSING

LAB ASSIGNMENT - 2

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Git Assignment Link : https://git.cs.dal.ca/sukumaran/csci5408\_f23\_b00948977\_balaji\_sukumaran/-/tree/main/Lab2

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**Problem Statement 1: Design an ERD/ EERD for Airbnb hotel**

**1.1: Identify the entities and attributes (Minimum 8 entities):** Following are the main entities and attributes for the Airbnb hotel.

Note: relationship between tables will be established in further steps.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
|  | **USER** |  | **STAY** |  |
|  | + user\_id : **PK** |  | + stay\_id: **PK** |  |
|  | + fname |  | + landmark |  |
|  | + lname |  | + type |  |
|  | + phoneno |  | + address |  |
|  | + aboutme |  |  |  |
|  |  |  |  |  |
|  | **BOOKING** |  | **OWNER** |  |
|  | + booking\_id : **PK** |  | + ssn : **PK** |  |
|  | + created\_on |  | + fname |  |
|  | + modified\_on |  | + lname |  |
|  | + from\_date |  | + address |  |
|  | + to\_date |  |  |  |
|  |  |  |  |  |
|  | **PAYMENT** |  | **HOST** |  |
|  | + payment\_id : **PK** |  | + ssn : **PK** |  |
|  | + payment\_mode |  | + fname |  |
|  | + rent |  | + lname |  |
|  |  |  | + address |  |
|  | **GUEST** |  | + salary  s |  |
|  | + fname |  |  |  |
|  | + lname |  | **AMENITIES** |  |
|  | + relationship |  | + amenity\_id : **PK** |  |
|  | + age |  | + name |  |
|  |  |  | + charges |  |
|  | **SUPPORT** |  | + age\_limit |  |
|  | + ticket\_id: **PK** |  |  |  |
|  | + maintenance\_id: **PK** |  |  |  |
|  | + support\_fname |  | **MAINTENANCE** |  |
|  | + support\_lname |  | + amenity\_id : **PK** |  |
|  | + maintenance\_staff\_fname |  | + name |  |
|  | + maintenance\_staff\_lname |  | + charges |  |
|  | + service |  | + age\_limit |  |
|  | + service\_charge |  |  |  |
|  |  |  |  |  |

**Problem Statement 2: Design a basic conceptual, logical, physical model**

**2.1: Conceptual Model :** The conceptual model for Airbnb has been build using the following assumptions:

* N User makes 1 Booking (group of users makes a booking)
* 1 User pays for 1 booking (1 person among the group pays rent)
* 1 User pays in N Payments for 1 Booking (pay in installments for long term stay)
* Each User can bring N guests
* 1 User raises N support tickets
* N Support services on 1 Stay
* 1 Stay is owned by N Owners
* 1 Stay is hosted by 1 host
* 1 stay has N Amenities

**Chen-Model:**

**A diagram of a company

Description automatically generated**

Figure : Chen-Model Airbnb

**Crow-Foot Model:**

**A diagram of a computer program

Description automatically generated with medium confidence**

Figure : Crow-model Airbnb

**Design Issues:**

1. **Fan Trap:** Here the Fan Trap issue exists between User, Stay and Amenities, as Stay is in multiple 1:M relationship and is not consistent with real world

**A diagram of a diagram

Description automatically generated**

Figure : Fan-Trap between user, stay, and amenities

This situation can be solved by establishing 1:M relationship between Stay and User, and 1:M relationship between User and Amenities.

A diagram of a user

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Figure : Fan-Trap solution for stay, user and amenities

1. **Chasm Trap:** Model suggest there’s a relationship between the owner and user. But it’s not the case, because it is the host’s responsibility to host the user. Owner and user is NOT related.

**A diagram of a network

Description automatically generated**

Figure : Chasm trap in owner, stay and user

**Updated conceptual model after fixing design issue:** Nowrelationship exists between user and amenities

**Chen-Model**

**A diagram of a company

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Figure : Chen-Model Airbnb post fixing design issues

**Crow-Foot Model:**

**A diagram of a computer

Description automatically generated**

Figure : Crow-foot model Airbnb post fixing design issue

**2.2: Logical Model :** To create a logical model, we have to do the Normalization process:

**2.2.1. Normalization**

**1NF:** 1NF is completed when the following achieved:

* All key attributes are defined
* There are no repeating groups in the table
* All attributes are dependent on the primary key

In our model, the following are the key attributes.

**Table 1:** **User**, Primary Key {user\_id}, Foreign Key {booking\_id, stay\_id}

A screen shot of a computer

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Figure : User entity

**Table 2:** **Booking**, Primary Key {booking\_id}, Foreign Key {payment\_id}

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Figure : Booking entity

**Table 3:** **Payment**, Primary Key { payment\_id }, Foreign Key {booking\_id, user\_id}

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Figure : Payment entity

**Table 4:** **Guest**, Primary Key { user\_id, fname, lname }, Foreign Key {user\_id}

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Figure : Guest entity

**Table 5:** **Support**, Primary Key { ticket\_id, maintenance\_id, user\_id}, Foreign Key {user\_id, stay\_id}

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Figure : Support entity

**Table 6:** **Owner**, Primary Key { ssn, stay\_id}, Foreign Key {stay\_id}

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Figure : Owner entity

**Table 7: Host**, Primary Key { ssn }, Foreign Key {stay\_id}

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Figure : Host entity

**Table 8: Amenities**, Primary Key {Amenity\_id}

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Figure : Amenities entity

**Table 9:** **Stay,** Primary Key {stay\_id, user\_id}, Foreign key {user\_id}

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Figure : Stay entity

**2NF:** Partial dependency exists in table Support.

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Figure : Support entity partial dependency

* support\_fname, support\_lname identified by ticket\_id
* maintenance\_staff\_fname, maintenance\_staff\_lname identified by maintenance\_id

**2 NF can be achieved by, removing partial dependency by spitting the support table in to support and maintenance**

Support table: Primary key {ticket\_id }, Foreign key {user\_id}

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Figure : Support entity after eliminating partial dependency

Maintenance table: Primary key {maintenance\_id }, Foreign key {ticket\_id, stay\_id}

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Figure : Maintenance entity after eliminating partial dependency

**3NF:** Transitive dependency exists in table support, because service charge is dependent on the service.

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Figure : Support entity in transitive dependency

**3NF** can be achieved by transitive dependency, by decoupling support entity into support and services table

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Figure : Support entities after removing transitive dependency

A close-up of a service

Description automatically generated

Figure : service entities after removing transitive dependency

**Crow-Foot model of Airbnb after normalizing**

A computer screen shot of a computer

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Figure : Crow-foot model of Airbnb after normalization

**Problem Statement 3: Create an ERD in MySQL workbench using forward engineering**

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Figure : ERD for Airbnb in MySql workbench

**Forward-Engineered Query**

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