CSCI 5408

DATA MANAGEMENT AND WAREHOUSING

Database Builder Project

Group No: 4

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SECTION 1: Background Research & Summary

Background Research

NAME OF THE SOURCE	INFORMATION COLLECTED	URL OF THE SOURCE
Hilton Hotel for the Stay [1]	When selecting the Hilton Hotel website, they initially request your destination, check-in and check-out dates, the number of rooms, the number of guests (adults and kids), and whether you have any promotional codes or offers. After entering these details, they provide you with a variety of clubs and resorts based on your destination for you to choose from. Following this, they guide you through the payment procedure.	https://www.hilton.com/en/
Atlantica Hotel Halifax [2]	This website is an all-in-one solution for event planning. It offers a variety of event options, ranging from weddings to corporate conferences, and provides a wide range of venues to choose from. You can customize your event based on the number of guests, the type of event, and even include audio-visual and event planning teams from the hotel community itself if you wish. With multiple cuisine options and an easy inquiry form to obtain more information on the event process, it makes the process convenient and memorable.	https://www.atlanticahotelhalifax.com/venues
Club Mahindra [3]	This hotel management website offers membership plans for people both within India and internationally. These memberships come with various benefits, including exclusive access to hotels and resorts. The unique feature of this website is that it includes reviews from members who share their experiences and the advantages they have gained from their memberships. These reviews also provide insights into the quality of services provided by Club Mahindra, helping potential members make informed decisions.	https://www.clubmahindra.com/memberships
Club Mahindra [4]	This website stands out with an exceptional feature: "Experiences" tailored for different age groups, including children, adults, and senior citizens. These signature experiences encompass a wide range of options, from spiritual and sports-related activities to nature exploration, wellness programs, international adventures, and more. Additionally, the website offers specialized dining experiences and activities for children, making it a well-rounded platform that caters to the diverse interests and preferences of its guests.	https://www.clubmahindra.com/experiences

Hotel Engine Blog [5]	From this blog, we learned about the growing popularity of various amenities in the hospitality industry. These include paid services like pet-friendly accommodations, digital concierge services, in-room beauty and wellness offerings, as well as the convenience of ordering room service from local restaurants, among others.	https://www.hotelengine.com/blog/business-travel-guide/10-hotel-amenities-growing-in-popularity/
International Research Journal of Modernization in Engineering Technology and Science Volume:02/Issue:03/March-2020 HOTEL MANAGEMENT SYSTEM [6]	In this Journal Paper, they have divided the project into 5 parts. In which they have included managers, front desk staff, dining/catering staff, housekeeping staff details and their payrolls, about inventory details too. So, we can add this to our information system for more clarity about staff members and their roles.	https://www.irjmets.com/uploadedfiles/paper/volume2/issue_3_march_2020/276/1628082965.pdf

Summary:

1. Hilton Hotel Website:

    - The Hilton Hotel website allows users to select their destination, check-in and check-out dates, and other details.
    - It provides a range of clubs and resorts based on the destination.
    - Users can proceed with the payment process.

2. Atlantica Hotel Halifax:

    - This website offers event planning solutions for various occasions, from weddings to corporate conferences.
    - Users can choose from a variety of venues and customize their events based on guest numbers and event type.
    - The website also offers audio-visual and event planning teams.
    - Multiple cuisine options are available, and an inquiry form simplifies the process.

3. Club Mahindra Membership:

    - Club Mahindra offers membership plans with exclusive access to hotels and resorts.
    - The website features reviews from members, providing insights into the quality of services.

4. Club Mahindra Experiences:

    - Club Mahindra offers tailored "Experiences" for different age groups, including children, adults, and seniors.
    - These experiences cover a wide range of activities, from sports to wellness programs.
    - Specialized dining and children's activities are also available.

5. Hotel Engine Blog:

    - The Hotel Engine Blog discusses the growing popularity of hotel amenities in the hospitality industry.
    - These amenities include pet-friendly accommodations, digital concierge services, and more.

6. International Research Journal of Modernization in Engineering Technology and Science:
    - A journal paper discusses a hotel management system divided into five parts, including details about managers, staff, and payroll.
    - The paper offers insights into staff roles and responsibilities.

After conducting comprehensive research and visiting various websites and research papers, we have finalized the list of entities and their associated attributes to be integrated into our hotel database management system. These carefully selected entities and attributes are as follows:

Entities and Attributes:

1. **Stay:** Stay ID, landmark, type, address
2. **Reservations:** Reservation ID, Guest ID, Room ID, Check-in date, Check-out date, Number of adults, Number of children.
3. **Events:** Event ID, Event Type, Date and Time, Venue, Catering Options, Audio-Visual Equipment
4. **Memberships:** Membership ID, Membership Type, Benefits, Expiry Date, Points/Rewards, Renewal Status
5. **Experiences (Activities):** Experience ID, Age Group, Activity Type, Location, Duration, Pricing, Availability
6. **Reviews:** Review ID, Guest/Member ID, Rating, Comments, Date
7. **Amenities:** Amenity ID, Amenity name, Amenity Type, Description, Pricing, Availability
8. **Staff Members:** Employee ID, Name, Role/Position, Contact Information, Shift Schedule
9. **Payroll:** Payroll ID, Gross Salary, Bonus
10. **Users:** User ID, Username, Password, Role/Permissions, Contact Information
11. **Offers:** Offer ID, Offer Type, Discount Percentage, description, Validity Dates
12. **Careers:** Job ID, Job Title, Job Description, Qualifications, Application Deadline, Application Status
13. **Payment:** Payment ID, Reservation ID, Amount, Payment Method, Transaction Date, Status
14. **Host:** Host ID, Host Name, Host Contact Information, Agreement Document
15. **Owner:** Owner ID, Owner Name, Ownership Percentage, Property Ownership Details
16. **Inventory Stock:** Inventory ID, Item Name, Item Description, Stock Quantity, Supplier Information, Reorder Threshold
17. **Maintenance (Support):** Maintenance Request ID, Ticket ID, Description of Issue, Priority Level, Assigned Technician, Status
18. **Transportation:** Transport Request ID, User Name, Pick-up/Drop-off Location, Date and Time, Vehicle Type, Driver Information, Status
19. **Parking Services:** Parking Reservation ID, Guest/Member Name, Vehicle Details, Check-in/Check-out Times, Parking Space Number, Pricing, Payment Status
20. **Concierge Services:** Concierge requests, description, local recommendations.
21. **Guest:** name, relationship, age

SECTION 2: Initial model or rough sketch

The rough sketch for hotel management system has been build using the following observations:

- N User makes 1 reservation (group of users makes a booking)
- 1 User pays for 1 reservation (1 person among the group pays rent)
- 1 User pays in N Payments for 1 Booking (pay in installments for long term stay)
- 1 User can bring N guests
- 1 User raises N support tickets
- 1 User makes 1 Review
- 1 User uses N Transportation
- 1 User raises N Support ticket
- 1 User buys N Memberships
- 1 User uses N Amenities
- 1 User is rewarded with N Offer
- N Support services on 1 Stay
- 1 Stay is owned by N Owners
- 1 Stay has N Career openings
- 1 Stay is hosted by 1 Hosts
- 1 Stay has N Concierge service
- 1 Stay retains N inventory stocks
- 1 Stay organizes N events
- 1 Stay Provides N experiences
- 1 Stay has N Staff members
- 1 Staff member gets 1 Payroll
- 1 Stay Provides N Parking space

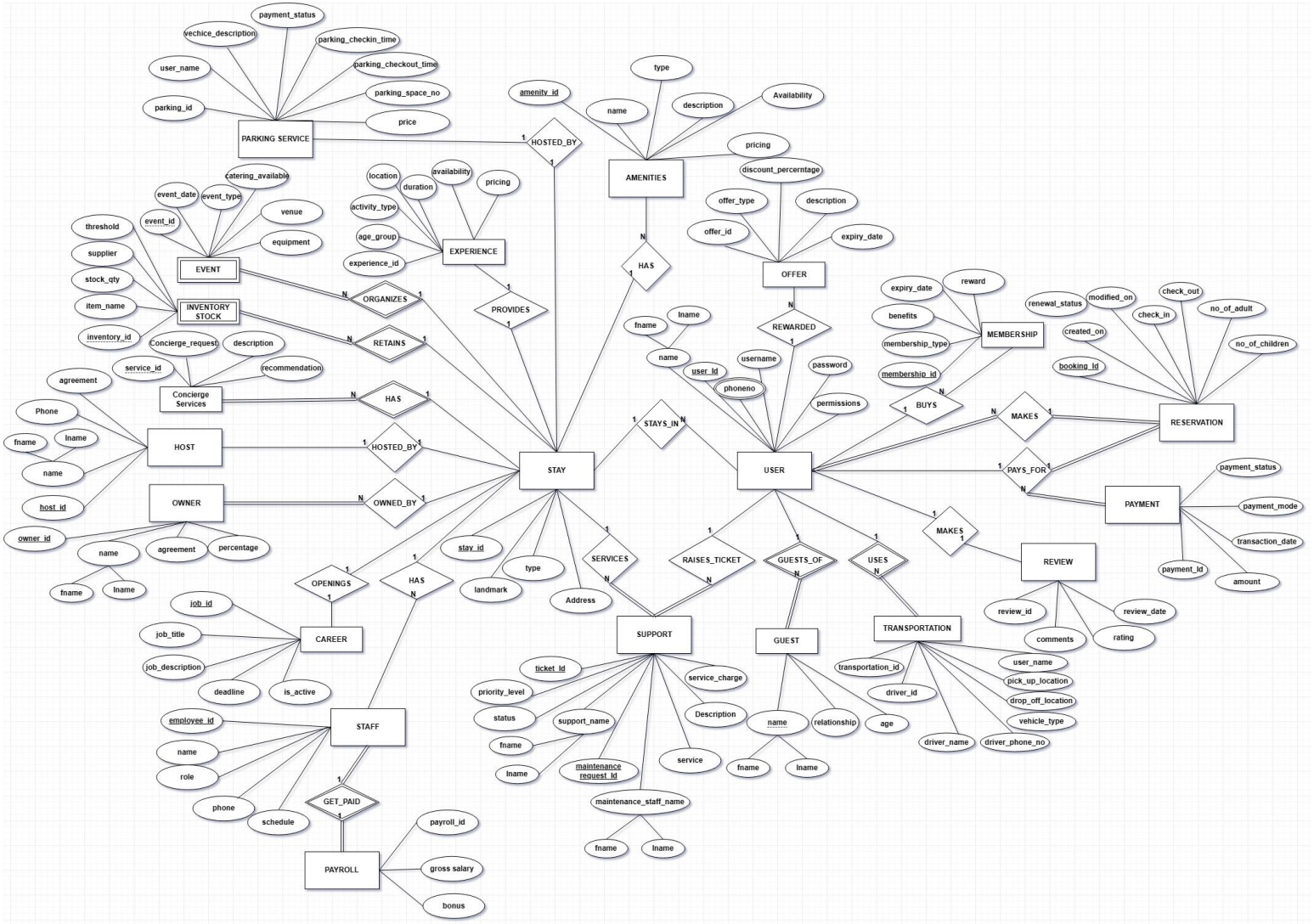

Figure 1: Rough sketch of hotel management system

SECTION 3: Design Issues (If any)

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

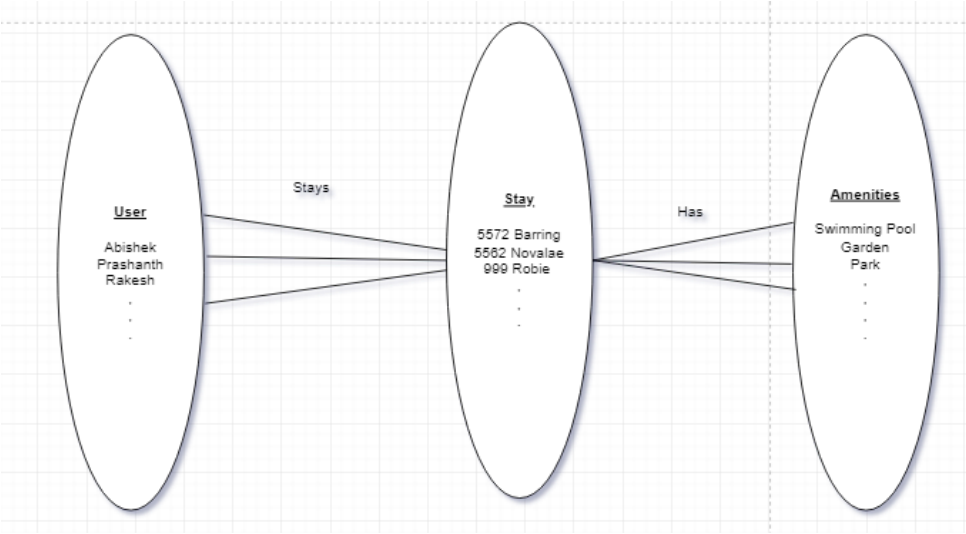

Figure 2: Fan-Trap between user, stay, and amenities.

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

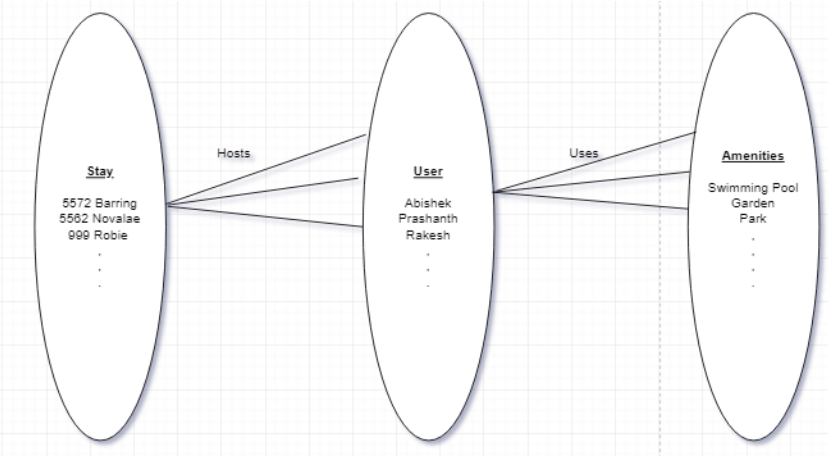

Figure 3: Fan-Trap solution for stay, user and amenities.

2. **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.

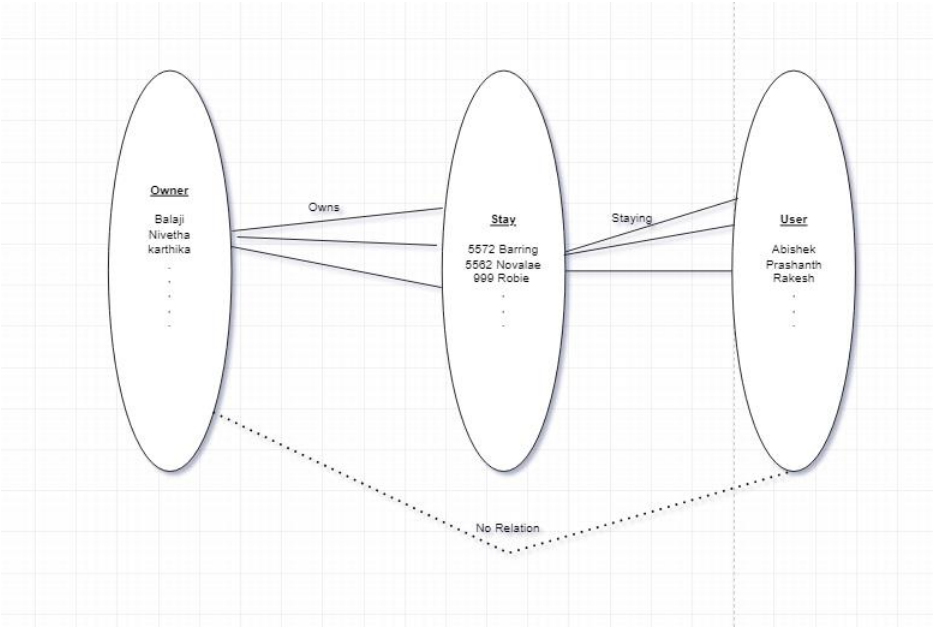

Figure 4: Chasm trap in owner, stay and user

SECTION 4: Final Model (ERD)

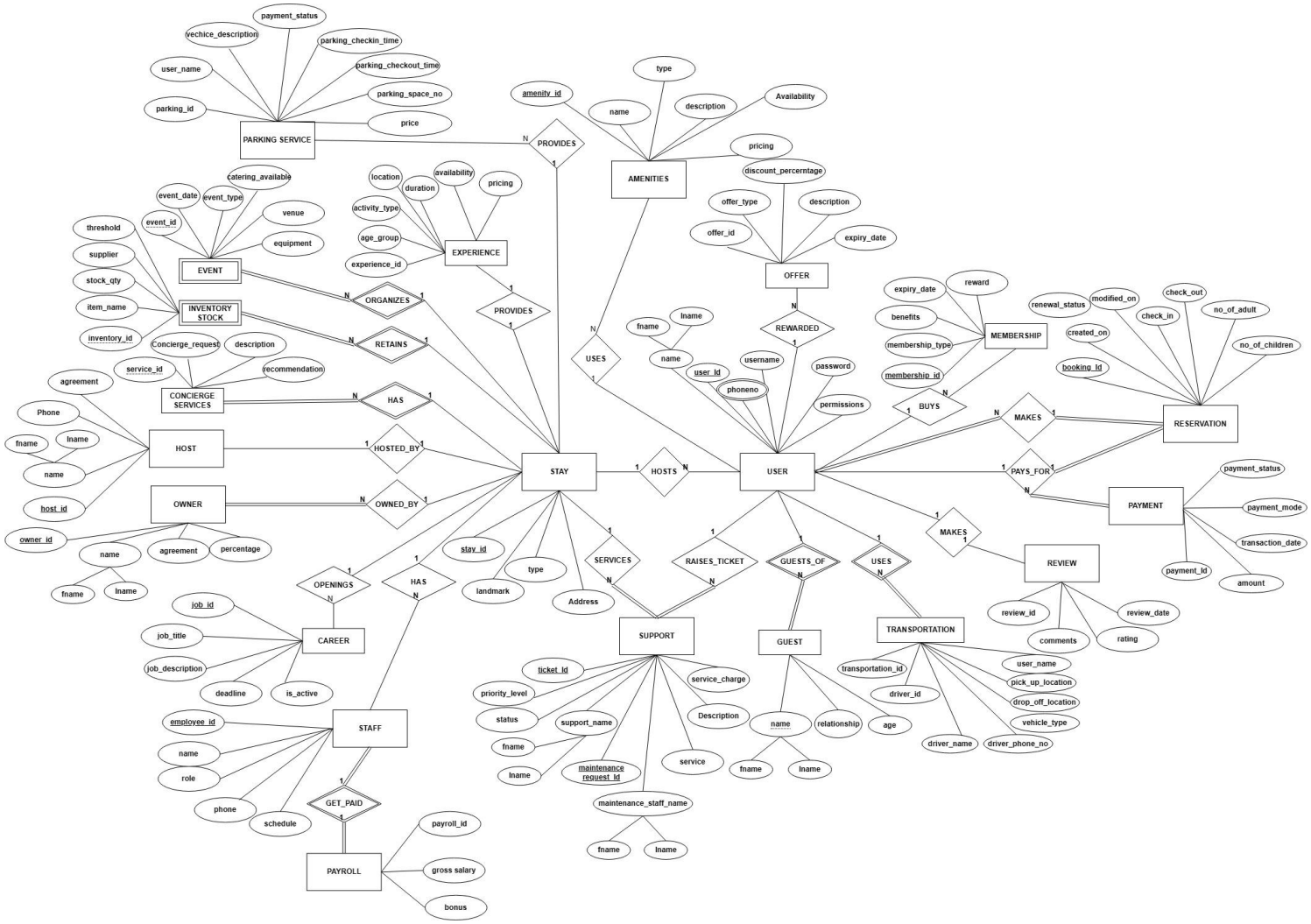

Figure 5: Final model (ERD) hotel management system

SECTION 5: Intermediate Phase OR Logical Phase

To create a logical model, we have to do the Normalization process:

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: Stay, Primary Key {stay_id}

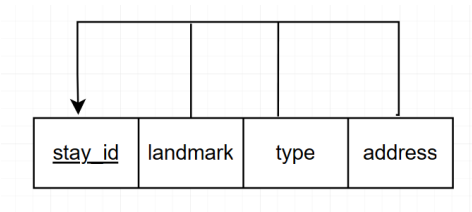

Figure 6: Stay entity

Table 2: Reservation, Primary Key {booking_id}, Foreign Key {stay_id}

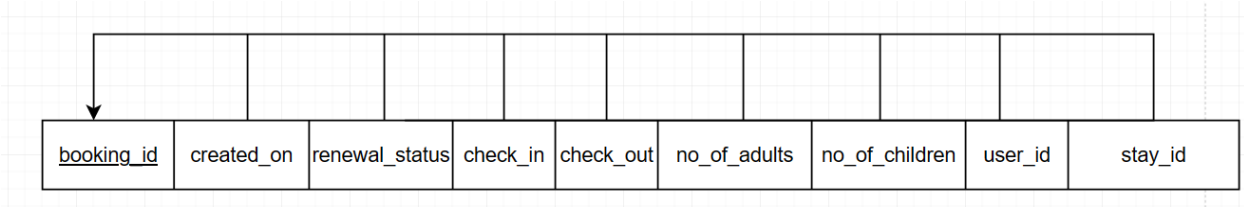

Figure 7: Reservation entity

Table 3: Event, Primary Key { event_id }, Foreign Key {stay_id}

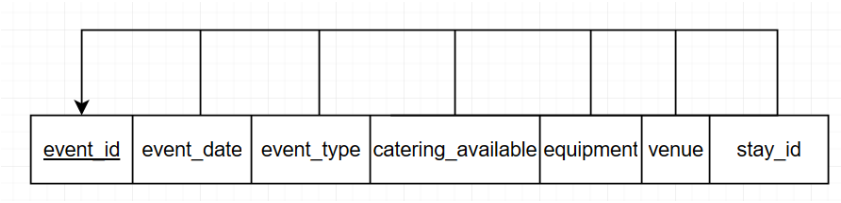

Figure 8: Event entity

Table 4: Membership, Primary Key { membership_id }, Foreign Key {user_id}

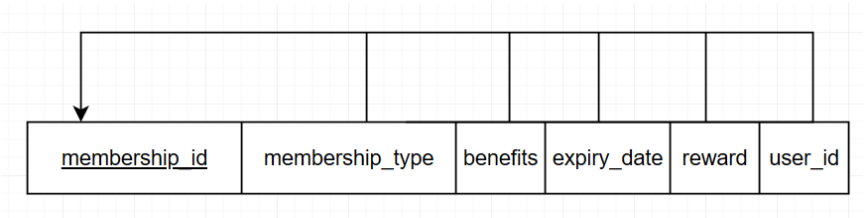

Figure 9: Membership entity

Table 5: Experience, Primary Key { experience_id }, Foreign Key {stay_id}

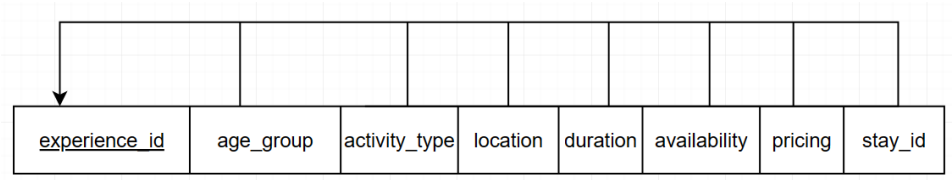

Figure 1: experience entity

Table 6: Review, Primary Key { review_id }, Foreign Key {user_id}

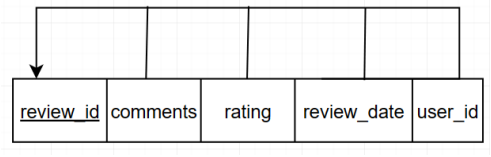

Figure 2: Review entity

Table 7: Amenity, Primary Key { amenity_id }

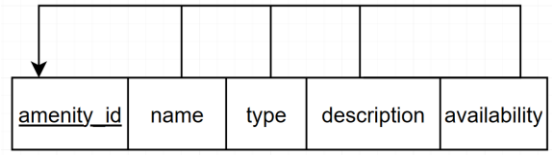

Figure 12: Amenity entity

Table 8: Staff, Primary Key {employee_id} and foreign key {payroll_id}

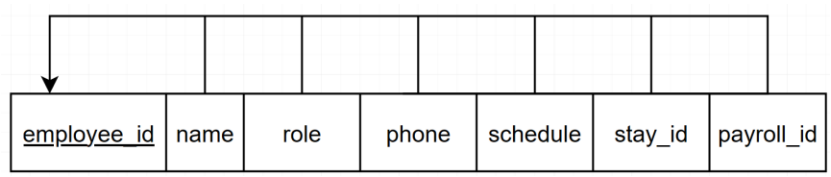

Figure 3: Staff entity

Table 9: Payroll, Primary Key { payroll_id }

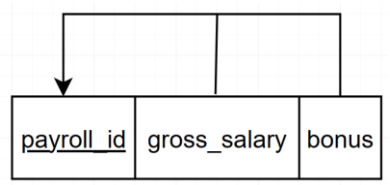

Figure 4: Payroll entity

Table 10: User, Primary Key { user_id } and foreign key { order_id, amenity_id }

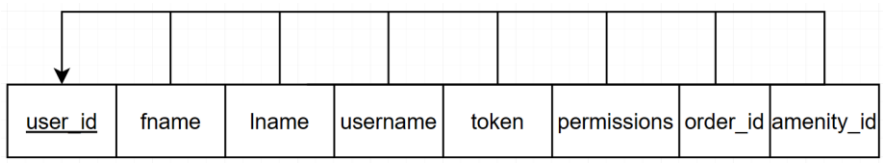

Figure 5: User entity

Table 11: Offer, Primary Key { offer_id }

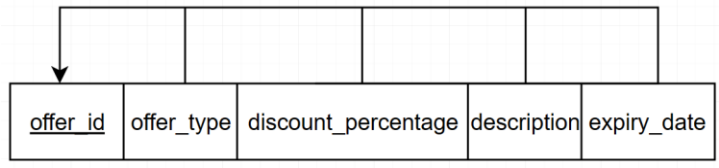

Figure 6: Offer entity

Table 12: Career, Primary Key { job_id } and foreign key { stay_id }

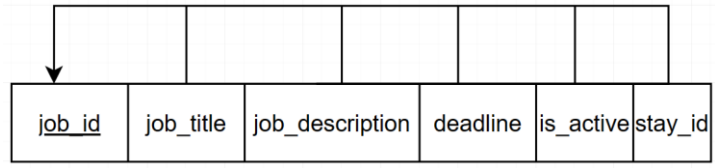

Figure 7: Career entity

Table 13: Payment, Primary Key { payment_id } and foreign key { user_id, booking_id }

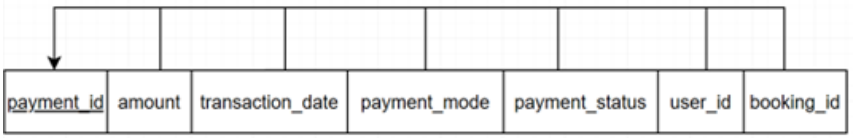

Figure 8: Career entity

Table 14: Host, Primary Key { host_id } and foreign key { stay_id }

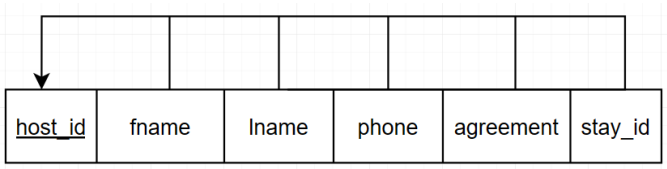

Figure 19: Host entity

Table 15: Owner, Primary Key { Owner_id } and foreign key { stay_id }

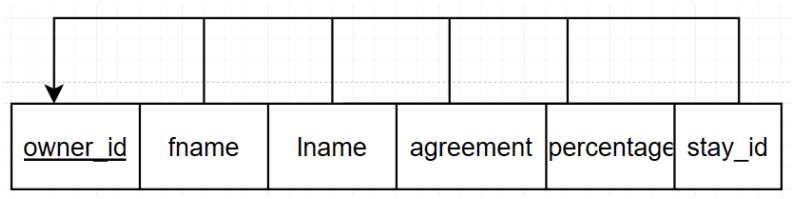

Figure 20: Owner entity

Table 16: Inventory_stock, Primary Key { inventory_id } and foreign key { stay_id }

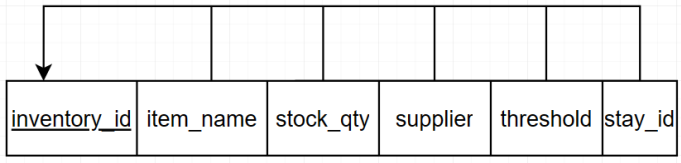

Figure 21: Inventory_stock entity

Table 17: transportation, Primary Key { transportation_id } and foreign key { user_id }

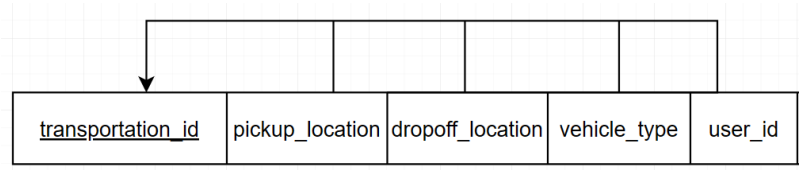

Figure 22: transportation entity

Table 18: parking_service, Primary Key { parking_id } and foreign key { stay_id }

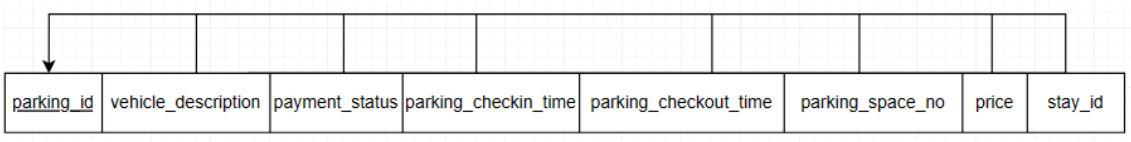

Figure 23: parking_service entity

Table 19: concierge_service, Primary Key { concierge_service_id } and foreign key { stay_id }

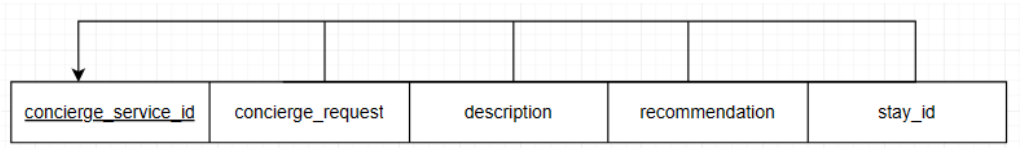

Figure 23: concierge_service entity

Table 20: Support, Primary Key { ticket_id, maintenance_id } and foreign key { stay_id, user_id }

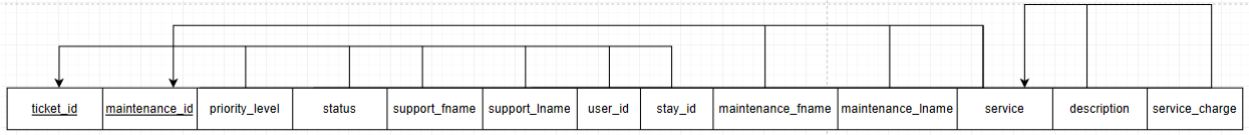

Figure 24: Support entity

Table 21: Guest, Primary Key { guest_id } and foreign key { user_id }

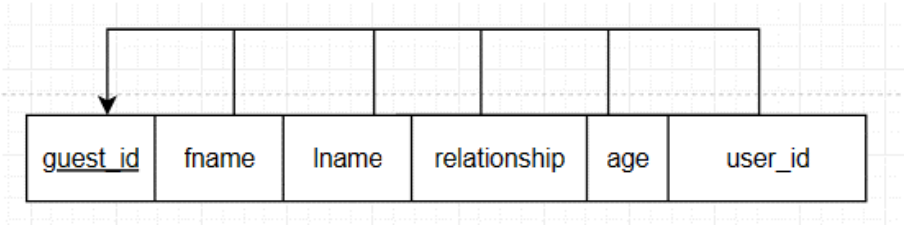

Figure 24: Guest entity

2NF: Table is in 2NF when it:

- Is in 1NF
- Includes no partial dependencies

Partial dependency exists in table Support.

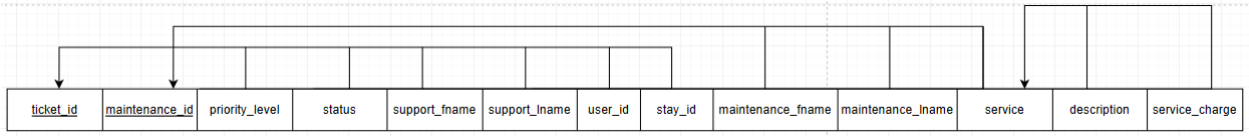

Figure 25: Support entity partial dependency

- support_fname, support_lname, priority_level, status, user_id, stay_id is identified by **ticket_id**
- maintenance_fname, maintenance_lname, service is 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, stay_id, maintenance_id}

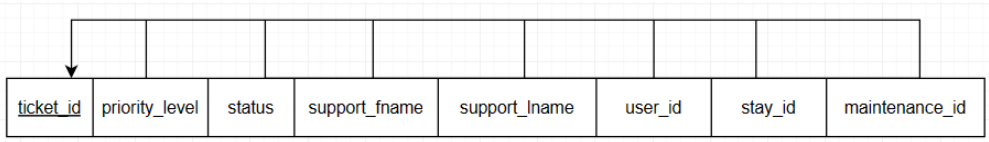

Figure 26: Support entity after eliminating partial dependency

Maintenance table: Primary key {maintenance_id}

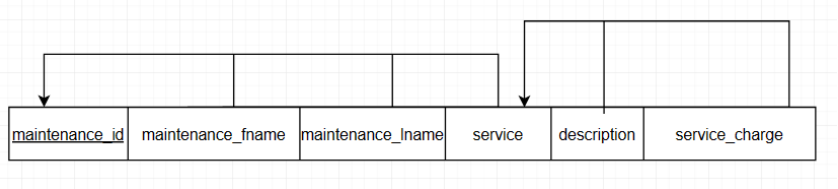

Figure 27: Maintenance entity after eliminating partial dependency

3NF: Table is in 3NF when it:

- Is in 2NF
- Contains no transitive dependencies

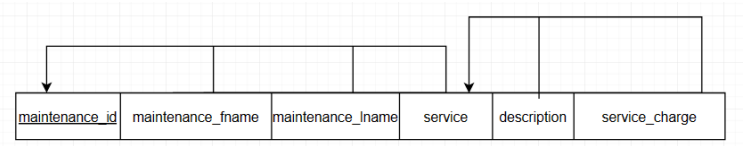

Figure 9: maintenance entity in transitive dependency

3NF can be achieved by transitive dependency, by decoupling maintenance entity into maintenance and services entity

Maintenance table: Primary key {maintenance_id} and Foreign key {service_id}

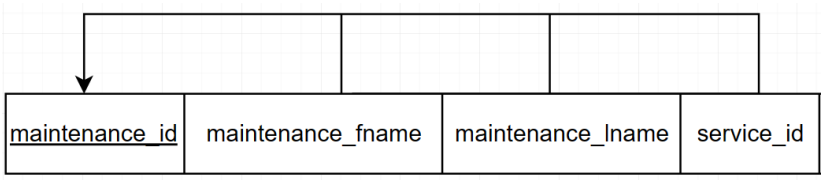

Figure 10: maintenance entity after removing transitive dependency

Service table: Primary key {service_id}

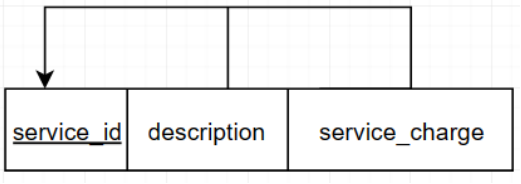

Figure 30: service entity after removing transitive dependency

SECTION 6: DDL (Data Definition Language):

Following are the DDL command for each entity.

Offer:

```
create table offer (
    offer_id int not null,
    offer_type varchar(45) null,
    discount_percentage decimal null,
    description varchar(45) null,
    expiry_date datetime null,
    primary key (offer_id)
    );
```

Amenity:

```
    create table amenity (
    amenity_id int not null,
    name varchar(45) null,
    type varchar(45) null,
    description varchar(45) null,
    availability varchar(45) null,
    primary key (amenity_id)
    );
```

User:

```
    create table user (
    user_id int not null,
    fname varchar(45) null,
    lname varchar(45) null,
    username varchar(45) not null,
    token varchar(45) not null,
    permissions varchar(45) not null,
    order_id int not null,
    amenity_id int not null,
    primary key (user_id),
    foreign key (order_id) references offer (offer_id),
    foreign key (amenity_id) references amenity (amenity_id)
    );
```

Stay:

```
create table stay (
stay_id int not null,
landmark varchar(45) null,
type varchar(45) null,
address varchar(45) null,
primary key (stay_id)
);
```

Reservation:

```
create table reservation (
booking_id int not null,
created_on varchar(45) null,
renewal_status varchar(45) null,
check_in int null,
check_out int null,
no_of_adults int null,
no_of_children int null,
user_id int not null,
stay_id int not null,
primary key (booking_id),
foreign key (stay_id) references stay (stay_id)
);
```

Membership:

```
create table membership (
membership_id int not null,
membership_type varchar(45) null,
benefits varchar(45) null,
expiry_date varchar(45) null,
reward varchar(45) null,
user_id int not null,
primary key (membership_id),
foreign key (user_id) references user (user_id)
);
```

Payment:

```
create table payment (
payment_id int not null,
amount decimal null,
transaction_date datetime null,
payment_mode varchar(45) null,
payment_status varchar(45) null,
user_id int not null,
booking_id int not null,
primary key (payment_id),
foreign key (user_id) references user (user_id),
foreign key (booking_id) references reservation (booking_id)
);
```

Review:

```
create table review (
review_id int not null,
comments varchar(45) null,
rating varchar(45) null,
review_date datetime null,
user_id int not null,
primary key (review_id),
foreign key (user_id) references user (user_id)
);
```

Transportation:

```
create table transportation (
transportation_id int not null,
pickup_location varchar(45) null,
dropoff_location varchar(45) null,
vehicle_type varchar(45) null,
user_id int not null,
primary key (transportation_id),
foreign key (user_id) references user (user_id)
);
```

Guest:

```
create table guest (
fname varchar(45) not null,
lname varchar(45) null,
relationship varchar(45) null,
age varchar(45) null,
user_id int not null,
guest_id int not null,
foreign key (user_id) references user (user_id)
);
```

Service:

```
create table service (
service_id int not null,
service varchar(45) null,
servicecharge varchar(45) null,
primary key (service_id)
);
```

Career:

```
create table career (
job_id int not null,
job_title varchar(45) null,
job_description varchar(45) null,
deadline datetime null,
is_active tinyint null,
stay_id int not null,
primary key (job_id),
foreign key (stay_id) references stay (stay_id)
);
```

Payroll:

```
create table payroll (
payroll_id int not null,
gross_salary decimal null,
bonus  decimal null,
primary key (payroll_id)
);
```

Staff:

```
create table staff (
employee_id int not null,
name varchar(45) null,
role varchar(45) null,
phone varchar(45) null,
schedule varchar(255) null,
stay_id int not null,
payroll_id int not null,
primary key (employee_id),
foreign key (payroll_id) references payroll (payroll_id)
);
```

Owner:

```
create table owner (
owner_id int not null,
fname varchar(45) null,
lname varchar(45) null,
agreement varchar(45) null,
percentage decimal null,
stay_id int not null,
primary key (owner_id),
foreign key (stay_id) references stay (stay_id),
);
```

Host:

```
create table host (
host_id int not null,
fname varchar(45) null,
lname varchar(45) null,
phone varchar(45) null,
agreement varchar(45) null,
stay_id int not null,
primary key (host_id),
foreign key (stay_id) references stay (stay_id)
);
```

Inventory_stock:

```
create table inventory_stock (
inventory_id int not null,
item_name varchar(45) null,
stock_qty int null,
supplier varchar(45) null,
threshold int null,
stay_id int not null,
primary key (inventory_id),
foreign key (stay_id) references stay (stay_id)
);
```

Concierge_service:

```
create table if concierge_service (
concierge_service_id int not null,
concierge_request varchar(45) null,
description varchar(45) null,
recommendation varchar(45) null,
stay_id int not null,
primary key (concierge_service_id),
foreign key (stay_id) references stay (stay_id)
);
```

Event:

```
create table event (
event_id int not null,
event_date datetime null,
event_type varchar(45) null,
catering_available varchar(45) null,
equipment varchar(45) null,
venue varchar(45) null,
stay_id int not null,
primary key (event_id),
foreign key (stay_id) references stay (stay_id)
);
```

parking_service:

```
create table parking_service (
parking_id int not null,
vehicle_description varchar(45) null,
payment_status varchar(45) null,
parking_checkin_time datetime null,
parking_checkout_time datetime null,
parking_space_no varchar(45) null,
price varchar(45) null,
primary key (parking_id),
foreign key (stay_id) references stay (stay_id)
);
```

Experience:

```
create table experience (
experience_id int not null,
age_group varchar(45) null,
activity_type varchar(45) null,
location varchar(45) null,
duration varchar(45) null,
availability varchar(45) null,
pricing decimal null,
stay_id int not null,
primary key (experience_id),
foreign key (stay_id) references stay (stay_id)
);
```

Support:

```
create table support (
ticket_id int not null,
priority_level varchar(45),
status varchar(45),
support_fname varchar(45),
support_lname varchar(45),
user_id int,
stay_id int,
maintenance_id int,
primary key (ticket_id),
foreign key (user_id) references user(user_id),
foreign key (stay_id) references stay(stay_id),
foreign key (maintenance_id) references maintenance(maintenance_id)
);
```

Maintenance:

```
create table maintenance (
maintenance_id int not null,
maintenance_staff_fname varchar(45),
maintenance_staff_lname varchar(45),
service_id int not null,
primary key (ticket_id),
foreign key (maintenance_id) references user(service_id)
);
```

Service:

```
create table service (
service_id int not null,
description varchar(45),
service_charge decimal,
primary key (service_id)
);
```

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