Data Management, Warehousing, And Analytics
(Summer 2023)

Assignment 1

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GitLab repo:

https://git.cs.dal.ca/dugar/csci5408_s23_b00917961_arihant_dugar/tree/main/Assignment1

Problem 1:

Information Gathering:

Table1: Highlighting the gathered information for Bed & Breakfast in Halifax

Website URL	Information Gathered
SeaWatch Bed and Breakfast (https://seawatch.ca/)	- Location - Suite details - Rates/Pricing - Contact Information - Photos of room, exterior and food - Local events - Check in & check out times - Breakfast times
Blue Forest Lane Bed and Breakfast (https://www.blueforest.ca/)	- Different types of suites - Breakfast options - Amenities - Restaurants & Café - Testimonial - Photo Gallery - Location - Contact details - Check in & check out times - Breakfast times
Star of the Sea Bed and Breakfast (https://www.staroftheseabandb.ca/)	- Venue details - Services offered - Suite details - Amenities - Pricing/ Rates - Contact Information - Staff contact - Manager
The inn at Fisherman's cove (https://theinnatfishermanscove.com/)	- Pricing based on time of year - Video link of the quick tour

	- Photo Gallery - Accepted Payment Methods - Not pet friendly - Suite details - Cancellation policy - Location - Contact Information
Sal's Bed and Breakfast by the sea (http://www.salsbythesea.com/)	- Venue details - Suite details - Photo Gallery - Testimonial - Local Attraction Links - Contact Information - Location - Weather details link - Halifax Transit Link - Check in & check out times - Breakfast times
The Novel Stay (https://thenovelstay.com/)	- Contact details - Photo Gallery - Testimonials - Services - Office Hours - Monthly Special - Location - Accepted Payment Methods - Cancellation policy - Check in & check out times - Breakfast times
Commons Inn (https://commonsinn.ca/)	- Rooms - Services - Attractions - News - FAQ - Policies - Photo Gallery - Social Media Links - Contact Information - Location
The Pebble (https://thepebble.ca/)	- Suite Information - Rate/Pricing - Directions/Location - Photo Gallery - Local Attractions - Testimonials

	- Contact Information - Social Media Links - Check in & check out times - Breakfast times

Identifying Entities:

1. BedAndBreakfast
   This represents the lodging facility that is offering the services. This contains details like name, location, check in & checkout times, directions, contact information.
2. Guest
   Represents an individual or a group of individuals (guests) who will be staying at the B&B. This contains information like name, phone number, email.
3. Rooms
   It represents the room details for the B&B. There could be different types of room in a B&B. The details include room type, room number, number of beds, price, availability, description, room image.
4. Reservation
   Reservation is the place to manage all the booking details for a guest. It contains details like reservation id, room number, checkin date, checkout data, guest id, reservation status, reservation date, total amount.
5. BreakfastMenu
   Represents the breakfast menu for a lodge. The key details include menu id, Dish name, description, dietary restrictions, price, start time, end time, nutritional information.
6. Employee
   Represents the employee working for the lodge. The details include employee id, name, email, phone number, address, designation, salary.
7. Reviews
   Contains the feedback or reviews provided by the guests who stayed at B&B. The key details include rating, experience, review date, customer name.
8. Payments
   Represents the financial transactions and payment methods used by guests to settle their bills for the B&B services. The attributes for this could be payment id, reservation id, guest name, payment date, payment amount, payment method, transaction id, billing status, billing address.
9. FacilitiesCoupons
   Since there is no swimming pool or gym facilities, there are coupons for guests to access the facilities outside. The key details include coupon id, coupon code, discount type, discount value, usage limit, vendor, valid until, redemption status.
10. External links
   Contains the external links local attractions, weather reports, social media links etc for a lodge. The key details include id, link, title, description, link type, link image.

Weak entities

Reservation: A Reservation entity is typically considered a weak entity because its existence is dependent on the existence of the B&B entity. A reservation cannot exist without being associated with a specific B&B.

Payments: Similarly, a Payment entity can be considered a weak entity as it relies on the existence of a Reservation entity. A payment is typically made in relation to a specific reservation, and without a reservation, there would be no payment.

Both Reservation and Payment entities are dependent on the existence of other entities and cannot stand alone. They require a strong entity, such as a B&B or a Guest, to provide the necessary context for their existence.
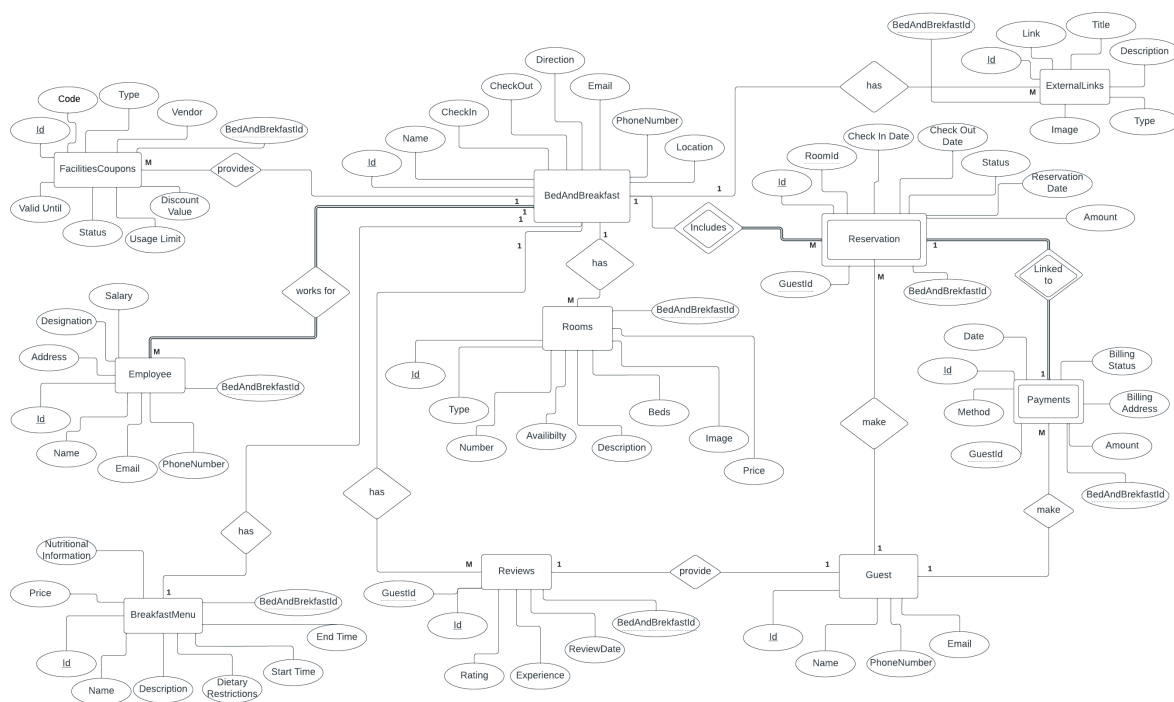
Conceptual Model (Chen's Model):

Figure 1: Conceptual model design for Bed & Breakfast Model considering the information gathered (ChenModel_Bed&Breakfast.png)

Design Issues and Analysis:

No such design issues, the design of the attributes and entities in the system has been carefully refined to align with the specific business needs and requirements. Through a thorough analysis of the business processes and considerations, the attributes have been thoughtfully selected to capture the relevant information necessary for the system's functionality and operations. This ensures that the design is tailored to meet the specific needs of the bed and breakfast, optimizing the storage and management of data while effectively supporting the business processes.
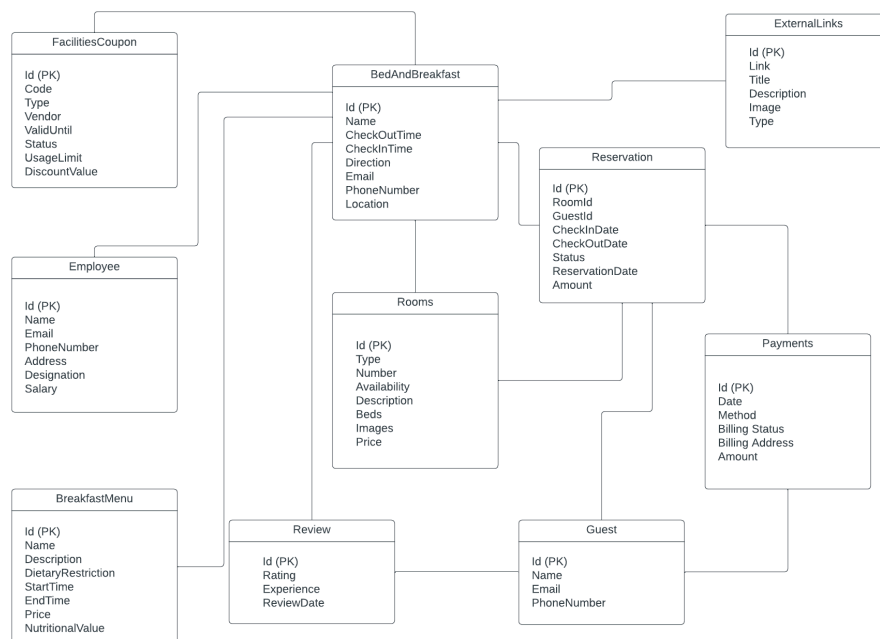
Logical Model:

Figure 2: Logical model design for Bed & Breakfast Model considering the information gathered (Logical_Bed&Breakfast.png)

1. BedAndBreakfast:
   i. Id (Primary Key): Unique identifier for the B&B
   ii. Name: Name of the B&B
   iii. Location: Location of the B&B
   iv. CheckInTime: The standard check in time for the guests at B&B
   v. CheckOutTime: The standard check out time for the guests at B&B
   vi. Direction: The directions details to the B&B
   vii. Email: Contact email for the manager or point of contact
   viii. PhoneNumber: Contact phone number for the B&B

   Dependencies:
   - The Reservation entity depends on the B&B entity to associate reservations with a specific B&B.
   - The B&B has dependencies with the Rooms as well since the rooms belong to the B&B
   - The reviews belongs to the particular B&B
   - Employees work for a B&B
   - The B&B provides facilitiesCoupons for the amenities that are not available to the guests.
   - The B&B has external links such as social media links, nearby attractions etc.

2. Room:
   i. Id (Primary Key) : Unique identifier for the room
   ii. Type: The room type for the B&B

   iii. Number: Room Number for the B&B
   iv. Availability: Status of the room, if it is available or occupied
   v. Description: The room description
   vi. Beds: Total number of beds in the room
   vii. Image: Images for the room
   viii. Price: Price of the room per day
  Dependencies:

- The Reservation entity depends on the Room entity to link reservations with specific rooms.
- The B&B entity depends on the Room entity to define and manage the rooms within a B&B.

3. Reservation:
   i. Id(Primary Key) : Unique identifier for the reservation
   ii. RoomId (Foreign Key) : This is the primary key for the room
   iii. GuestId(Foreign Key): This is the primary key for the guest
   iv. CheckInDate: The check-in date for which the reservation is made
   v. CheckOutDate: The check-out date for which the reservation is made
   vi. Status: The status of the reservation
   vii. ReservationDate : The date when the reservation was made
   viii. Amount: The total amount of the reservation
  Dependencies:

- The Reservation entity depends on both the Guest and Room entities to associate reservations with specific guests and rooms.

4. Guest:
   i. Id (Primary Key) : Unique identifier for the guest
   ii. Name: Guest's name, who made the reservation
   iii. Email: Guest's contact email
   iv. PhoneNumber: Guest's contact phone number
  Dependencies:

- The Reservation entity depends on the Guest entity to associate reservations with specific guests.
- Payments are made by the guests.
- Reviews are provided by the guests.

5. BreakFastMenu:
   i. Id (Primary Key) : Breakfast Item Unique identifier
   ii. Name: The name of the dish
   iii. Description : The description for the dish
   iv. DietaryRestriction : Mentions the dietary restrictions for the dish
   v. StartTime : The start time of the day when the dish is available
   vi. EndTime : The start time of the day when the dish is last available
   vii. Price : The price of the dish
   viii. NutritionalValue : The nutritional value of the dish
  Dependencies:

- The Breakfast Menu entity depends on the B&B entity to associate the menu with a specific bed and breakfast.

6. Employee:
   i. Id (Primary Key) : Unique identifier for the employee

       ii.   Name: the name of the employee

      iii.   Email : contact email for the employee

      iv.   PhoneNumber : contact phone number for the employee

       v.   Address: address for the employee

      vi.   Designation : employee's designation

     vii.   Salary: current salary for the employee

Dependencies:

- The Employee entity depends on the B&B entity to associate employees with a specific bed and breakfast.

7. Reviews:

       i.   Id (Primary Key) : Unique identifier for the provided review

      ii.   Rating: The rating provided by the guest for the B&B

      iii.   Experience : The guest's experience at the B&B

      iv.   ReviewDate : The date when the review was submitted

Dependencies:

- The Review entity depends on both the B&B and Guest entities to associate reviews with a specific bed and breakfast and the corresponding guest.
- The B&B entity can have a dependency on the Review entity to track and display guest reviews for a particular B&B.

8. Payments:

       i.   Id (Primary Key): Unique identifier or transaction id for the payment

      ii.   Date: payment when the date was made

      iii.   Method: the method used for payment

      iv.   Billing Status: the status of the payment, if it was successful or failed

       v.   Billing Address : the billing address for the guest

      vi.   Amount: the total billing amount

Dependencies:

- The Payments entity depends on the Reservation entity to link payments with specific reservations.
- The Reservation entity can have a dependency on the Payments entity to track and manage payment details associated with each reservation.
- The Payments entity also depends on the guest as the payment is made by the guest for a reservation.

9. FacilitiesCoupons:

       i.   Id (Primary Key) : The unique identifier for the coupon

      ii.   Code: The coupon code that can be used for the facility

      iii.   Type : The coupon code type

      iv.   Vendor : The vendor name for the coupon

       v.   ValidUntil : The validity or expiry date for the coupon

      vi.   Status : The status of the coupon, that is if it is valid, expired or used

     vii.   UsageLimit : The limit to the number of times the coupon can be used

    viii.   DiscountValue : The value that the coupon provides to the guest

Dependencies:

- The Facilities Coupons entity depends on the B&B entity to associate the coupons with a specific bed and breakfast.

- The Reservation entity can have a dependency on the Facilities Coupons entity if guests can apply or use the facilities coupons during their stay.
10. ExternalLinks:
    i. Id (Primary Key) : The unique identifier for the link
    ii. Link : The link for the social media, nearby attractions etc.
    iii. Title: The display title for the link
    iv. Description: The description for the link.
    v. Image: The image for the link, if it displays on the website as a thumbnail.
    vi. Type : The link type.
    Dependencies:
    - The External Links entity depends on the B&B entity to associate the links with a specific bed and breakfast.

Normalization:

Normalization is not necessary in this case as all the attributes and entities in the data model have been refined and aligned with the business needs. The data model exhibits a high level of organization and avoids redundancy, ensuring efficient storage and retrieval of data. The attributes have been carefully selected and structured to meet the requirements of the bed and breakfast system without the need for further normalization.
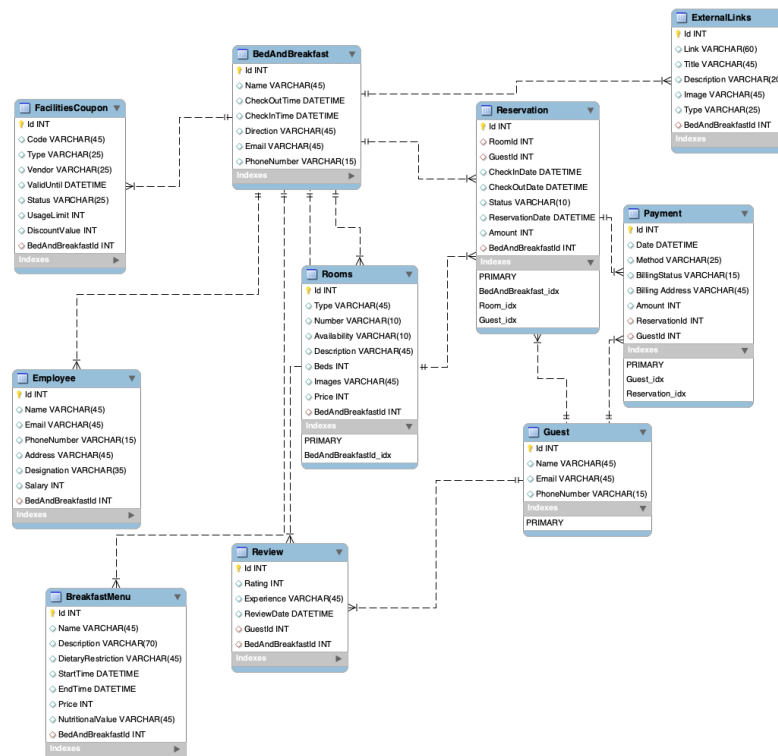
Physical Model:

Figure 3: Physical model design for Bed & Breakfast Model considering the information gathered (ERD_BedAndBreakfast.png)

SQL Dump:

The dump for the SQL statements is attached as **BedAndBreakfast.sql** along with the submission.

Problem 2:

Identifying Entities:

1. Parks
    This is the core requirement and it represents the park details such as Id, Name, Description, Image, Opening Time, Closing Time, Location, Contact.
2. Sites
    Each Park has multiple sites that can be visited by people. The details of sites include : Id, Name, Status, Capacity, Size (Small or Large or Medium), FirePit(Yes/No), Barbeque (Yes/No), park Id.
3. Equipment
    When making a reservation the individuals can book equipment's as well. The details include id and description.
4. Events
    Every parks has upcoming or planned events during the time of the year that the users can attend. The attributes are: id, title, description, park id.
5. Reservation
    This represents the reservation made by the user for the particular park or site. The key details include: Id, park Id, site Id, equipment Id, arrival date, departure date, party size(Number of people).
6. Payment
    The payment made for the reservation by a user is stored here. The key attributes are : Id, user id, reservation id, status, amount, reservation date.
7. User
    This represents the user entity, and has attributes : id, name, email, phone number.
8. Map
    There are maps available for trails or parks. The key details include: Id, link, park id, type(Trail Map or Park Map).
9. Departments
    When we scroll through the careers or employments page, we can see that the managing entity has different departments present in it. The attributes are: Id and name.
10. Employment
    The parks have employments available for people, the key details include: id, title, description, department id, location, deadline, park id.
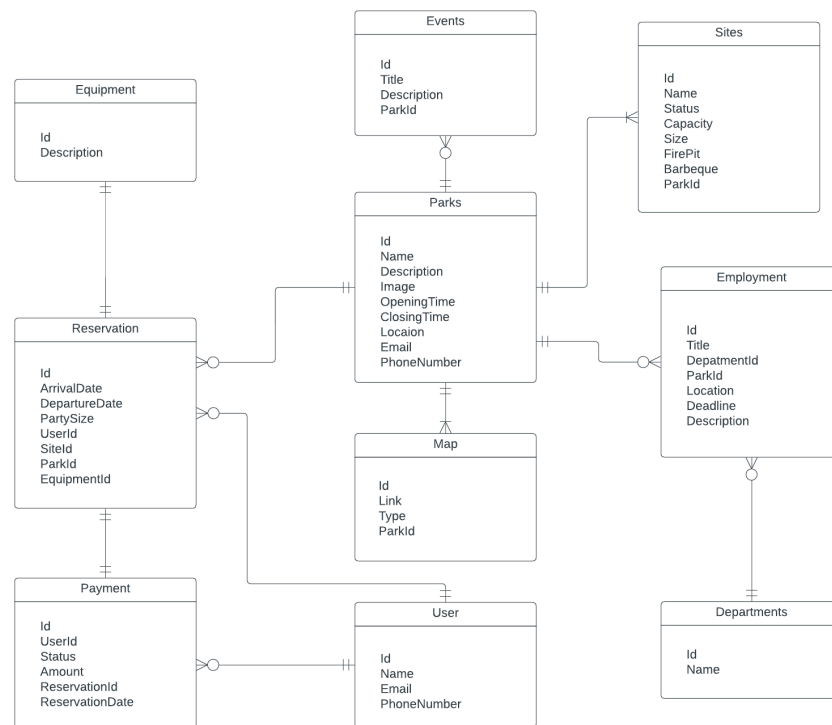
Conceptual Model (Crow's foot model):

Figure 4: Conceptual model design for Parks in Nova Scotia considering the information gathered (CrowFoot_ParksOfNS.png)

Design Analysis And Improvement:

The Payment entity has been enhanced in the logical model to include the payment date, ensuring that this important piece of information is captured. Additionally, the Reservation entity has been updated to include the reservation date, providing a comprehensive view of the reservation details. These improvements in the logical model guarantee that all the necessary attributes are present and prevent any mismatches or missing information. The logical model has been carefully refined to ensure accuracy and completeness, aligning it closely with the requirements and specifications of the system.
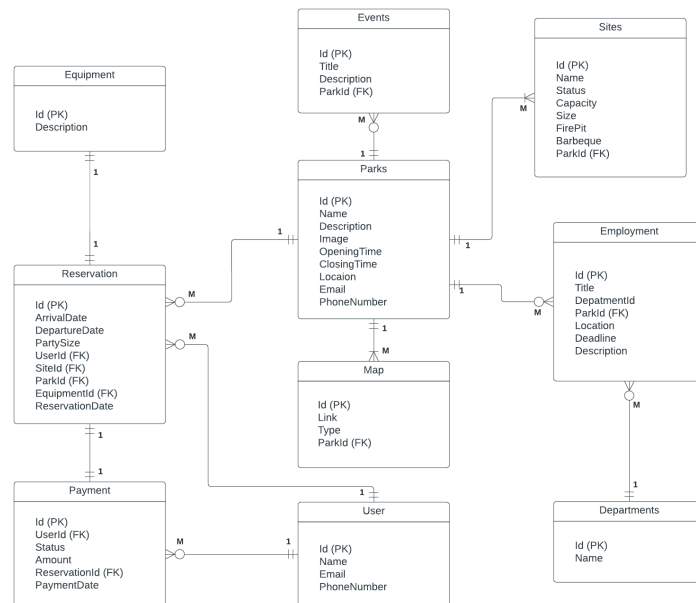
Logical Model:

Figure 5: Logical model design for Parks in Nova Scotia considering the information gathered (LogicalModel_ParksOfNS.png)
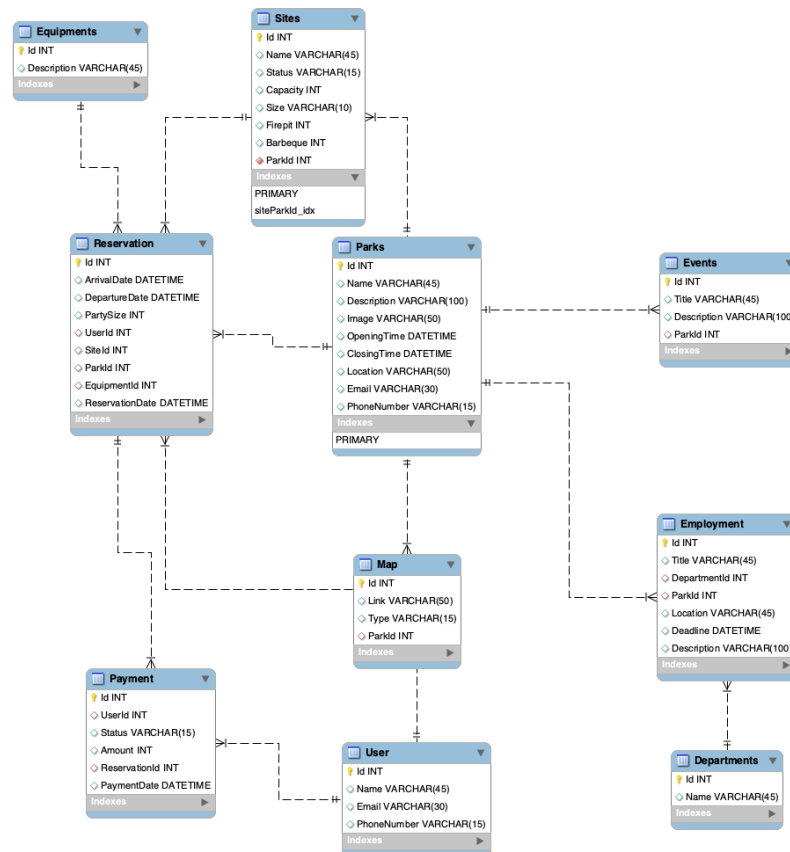
Physical Model:

Figure 6: Physical model design for Parks in NS (ERD_ParksOfNS.png)

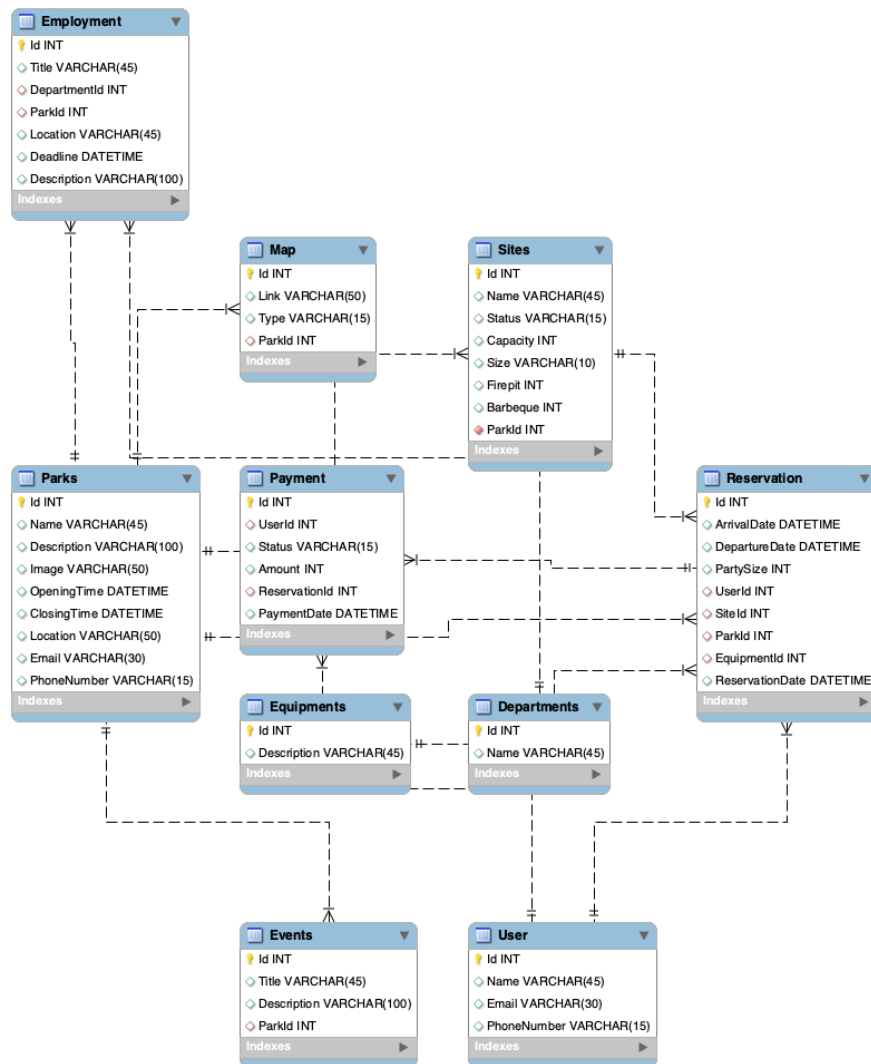# Generation of ERD using forward engineering:

Figure 7: ERD generated using Reverse Engineering

Similarities:

i.   **Entity Names:** The entity names used by the manual and automatic ERDs to represent the same database entities are similar.

ii.   **Relationship sorts:** Both ERDs include the same sorts of relationships (one-to-one, one-to-many, and many-to-many) between entities.

iii.   **Cardinality:** In both ERDs, the cardinality indications that show the relationship between entities (such as "1" or "N") are similar.

iv.   **Attribute Names:** The attribute names used by different entities often refer to the same data items.

Differences:

i.   **Diagram Layout:** The arrangement and layout of the entities and relationships differ between the manual and automatic ERDs due to different rendering styles or preferences.

ii.   **Indexing**: The usage of indexes, including primary and secondary indexes. The automatic generation by MySQL Workbench determine the index usage based on the database engine's default behaviour or specified configuration.

SQL Dump:

The dump for the SQL statements is attached as **ParksOfNS.sql** along with the submission.

Note:

Please refer to the images in the folder for better clarity. The file name is mentioned below the figures. Example : **Figure 6:** Physical model design for Parks in NS (ERD_ParksOfNS.png)

ERD_ParksOfNS.png is the file name for the figure.