



CSCI5408

ASSIGNMENT 1 – PROBLEM 1

Building a Data Model for Nova Scotia on its
Provincial Parks

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Problem #1: Building a Data Model for Nova Scotia on its Provincial Parks

Table 1 consists of a list of entities that captures information on Nova Scotia parks. Entities and attributes naming follows a naming convention for standardization. They are in lowercase and singular, with an underscore(_) used for separating multiple words. For example, "Parks" is "park" and "Amusement Rides" is "amusement_ride".

Table 1 – List of selected entities and their selection reason

No.	Entity Name	Selection Reason
1.	park	The park entity is responsible for persisting all the provincial parks in Nova Scotia.
2.	department	The department entity is responsible for storing all the departments that can exist in multiple parks.
3.	staff_member	The staff_member entity lists down all the staff members associated with the department and the park.
4.	dependent	The dependent entity persists all the dependents related to the staff members.
5.	visitor	The visitor entity keeps track of visitor-related information like name, address, mobile, gender etc...
6.	event	The event entity carries the information related to the various events organized in parks.
7.	facility	The facility entity lists down all the facilities pertaining to multiple parks.
8.	hotel	The hotel entity keeps a record of various hotels and their association with respective parks.
9.	adventure_sport	The adventure_sport entity is responsible for storing adventure sports associated with multiple parks.
10.	amusement_ride	The amusement_ride entity keeps a list of the various amusement rides involved in multiple parks.
11.	supplier	The supplier entity is responsible for storing information like name, address, contract date etc... of various suppliers.
12.	product	The product entity stores a list of all the products offered by the supplier to multiple parks.

Initial ERD diagram

The link to the image view file of the initial ERD diagram is

https://dalu-my.sharepoint.com/:i:/g/personal/dh416386_dal_ca/EWWWKt0kZ3pDr4DA8mct2kBRNSq2IryVWHa-Tln8LjZ6g?e=ZWYW9W

The link to the draw.io file of the initial ERD diagram is

https://dalu-my.sharepoint.com/:u:/g/personal/dh416386_dal_ca/EaZaH8UHznIOI_4Hqnr85HEBvxBML-h5UimbpzKnBdJxzA?e=xQfkxJ

This file can be open in the draw.io tool – <https://app.diagrams.net/>

Figure 1 shows the initial ERD diagram of Nova Scotia Provincial Parks.

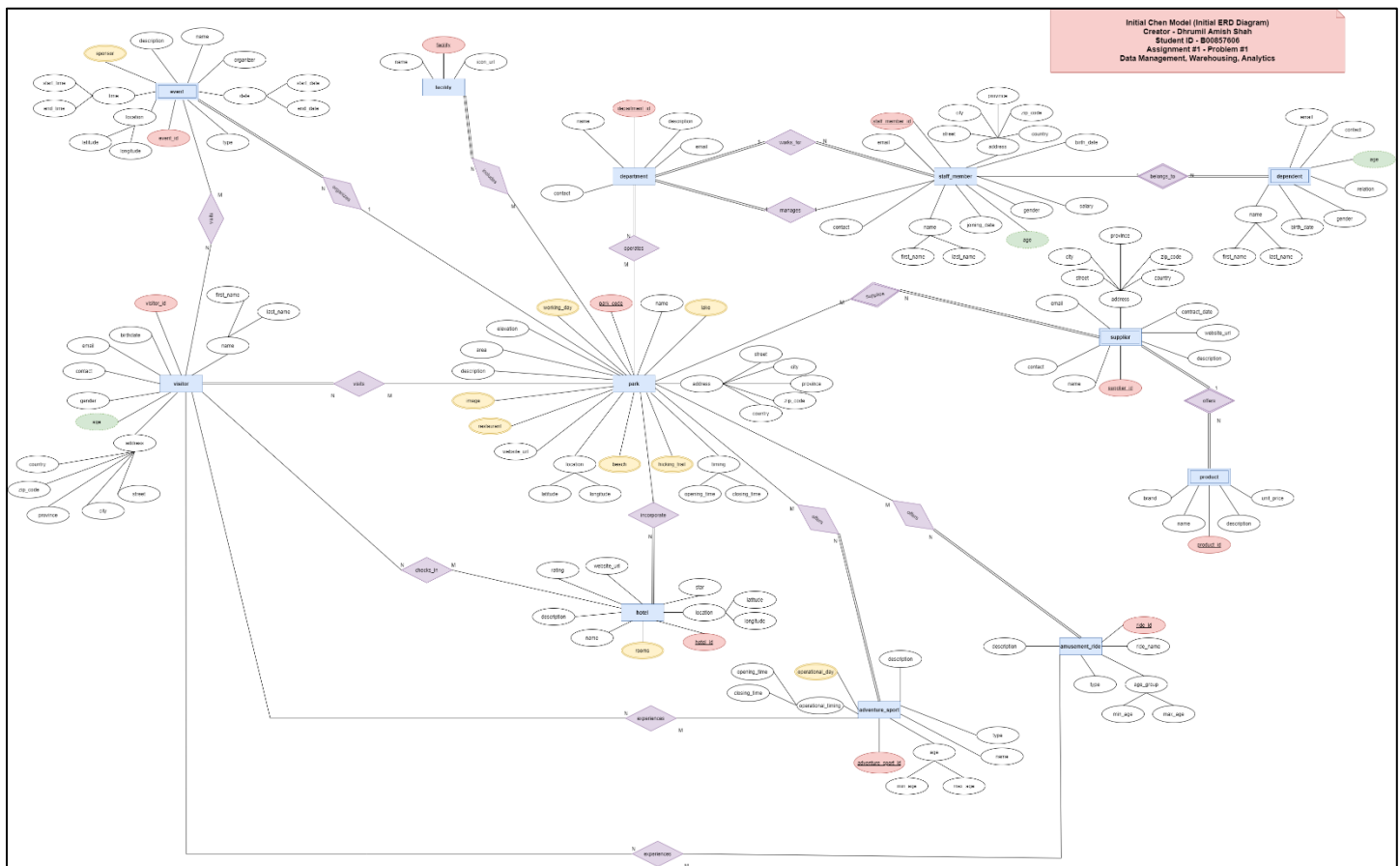


Figure 1 - Initial ERD Diagram of Nova Scotia Provincial Parks

All relationships

In the above ER diagram:

1. The **park** entity and the **department** entity are in a many-to-many relationship. A park **operates** multiple departments and, a department is operated in multiple parks.
2. The **park** entity and the **visitor** entity are in a many-to-many relationship. A park has multiple visitors and, a visitor **visits** multiple parks.
3. The **park** entity and the **event** entity are in a one-to-many relationship. A park **organizes** multiple events but, an event is organized by one park.
4. The **park** entity and the **facility** entity are in a many-to-many relationship. A park **includes** multiple facilities and, a facility is included in multiple parks.
5. The **park** entity and the **hotel** entity are in a one-to-many relationship. A park **incorporates** multiple hotels but, a hotel is only incorporated by one park.
6. The **park** entity and the **adventure_sport** entity are in a many-to-many relationship. A park **offers** multiple adventure sports and, an adventure sport is offered in multiple parks.
7. The **park** entity and the **amusement_ride** entity are in a many-to-many relationship. A park **offers** multiple amusement rides and, an amusement ride is offered in multiple parks.
8. The **park** entity and the **supplier** entity are in a many-to-many relationship. A park **get supplies** from multiple suppliers and, a supplier supply to multiple parks.
9. The **department** entity and the **staff_member** entity are in a one-to-many relationship. A department has multiple staff members **working** for it but, a staff member works in one department. Also, a department is **managed** by one staff member and a staff member only manages one department.

10. The **staff_member** entity and the **dependent** entity are in a one-to-many relationship. A staff member has multiple dependents **belonging** to them but, a dependent belongs to one staff member.
11. The **visitor** entity and the **event** entity are in a many-to-many relationship. A visitor **visits** multiple events and, an event is visited by multiple visitors.
12. The **visitor** entity and the **hotel** entity are in a many-to-many relationship. A visitor **checks in** multiple hotels and, a hotel has multiple visitors check-in.
13. The **visitor** entity and the **adventure_sport** entity are in a many-to-many relationship. A visitor **experiences** multiple adventure sports and, an adventure sport is experienced by multiple visitors.
14. The **visitor** entity and the **amusement_ride** entity are in a many-to-many relationship. A visitor **experiences** multiple amusement rides and, an amusement ride is experienced by multiple visitors.
15. The **supplier** entity and the **product** entity are in a one-to-many relationship. A supplier offers multiple products but, a product is offered by one supplier.

Problems with initial ERD diagram and solution

1. The **park** entity has many multi-value attributes. Some of them can have multiple attributes associated with them. Therefore attributes lake, beach, hiking trail, restaurant, and image are changed to entities. The park entity is in a one-to-many relationship with the below entities:
 - **lake** {lake_id, name, description, type, depth, surface_elevation, area, location(latitude, longitude)}
 - **beach** {beach_id, name, description, season, working_time(opening_time, closing_time), stretch, area, location(latitude, longitude)}
 - **hiking_trail** {hiking_trail_id, name, description, distance, elevation, season, status, difficulty_level, working_time(opening_time, closing_time), start_point_location(latitude, longitude), age_group_allowed(min_age, max_age)}
 - **restaurant** {restaurant_id, name, description, type, drinking_area, smoking_area, cuisines, timing(opening_time, closing_time), location(latitude, longitude)}
 - **image** {image_id, image_url, title, description, capture_date}
2. The **hotel** entity has **room** as a multi-value attribute which is moved to a separate entity. The hotel entity and the room entity are in a one-to-many relationship.
 - **Room** {room_id, name, description, floor_number, available, floor_type, capacity, rate, smoking_allowed, drinking_allowed, bed_type, pet_friendly, room_type}
3. A park has many departments and a department has many staff members. But, there is no direct relationship between the park entity and the staff_member entity. So for a question like “How many staff members work in department d1 which is in park p1?”. We’ll first join the park entity and the department on p1 and then the department entity and staff_member entity on d1. But, the problem here is we’ll get all the staff members who are not working in park p1 but are in department d1. This is clearly a **fan trap**.
 - To resolve this, we’ll create a one-to-many relationship between the park entity and the staff_member entity. A park can have multiple staff members but a staff member can only belong to one park.
4. A staff member supervises other staff members. The staff_member entity is in a one-to-many relationship with itself. This relationship is added to the staff_member table.
5. The visitor entity and the hotel entity are in a many-to-many relationship. From the relationship, we can identify which hotels were checked in by a visitor. Further, we can store more information like check-in/ check-out date and time and room id.
6. The park entity and the facility entity are in a many-to-many relationship. This relationship can have attributes like facility_status which indicates available or unavailable at the current moment and facility_description.

Figure 2 - Final ERD Diagram of Nova Scotia Provincial Parks