Implementation of a Relational Database

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1. Logical Data Model Implementation Using Oracle Enterprise DBMS

Now that a logical data model has been developed and refined, it is possible to implement the database using a database management system.

1.1. SQL Code for Creating Database Schema

In line with the outlined project specifications, we have used SQLite and Python to perform the implementation.

The Python file for this project runs as a single script, designed to be run once. Command-line output is provided to the user such that the script's actions may be understood without investigating the source code. Output is printed for all tables once populated, as well as for the transactions performed on the database and for checkpoints throughout the script's runtime (e.g. notifications that certain steps have been completed).

The reader is encouraged to explore the GitHub repository for this project in order to read the full-length SQL code. A link to that repository can be found in section 1.4. However, screenshots of the script's output have been provided in the following sections, allowing the reader to verify the accuracy and completeness of the database implementation without running the script on their computer.

1.2. Generated Data/Tuples for Database Relations

In this section, we present the relevant screenshots showing each table and its contents. A full detail of the SQL commands issued to create the tables will not be provided here, as it would be redundant; interested parties are directed to the source code available on GitHub.

1.2.1. Clinic

```
================================================================================================
Clinic relation successfully populated.
Showing contents of Clinic...

CLINIC NUMBER / NAME / STREET / BUILDING INFO / CITY / STATE / ZIP / TELEPHONE / MANAGER NUMBER
(10001, 'University Clinic', '123 Corniche Ave', 'Suite 101', 'Miami', 'FL', '33101', '3051234567', None)
(10002, 'Miami Beach Pet Clinic', '23 Ocean Dr', 'Suite 201', 'Miami Beach', 'FL', '33139', '3059876543', None)
(10003, 'Miller Vet', '234 Miller Dr', 'Suite 300', 'Coral Gables', 'FL', '33146', '3052345678', None)
(10004, 'Pet Clinic', '5000 San Amaro Dr', 'Suite 100', 'Miami', 'FL', '33125', '3058765432', None)
(10005, 'Miami Vet', '1527 Albenga Ave', 'Suite 1', 'Miami', 'FL', '33010', '3056543210', None)
------------------------------------------------------------------------------------------------
```

1.2.2. Staff

```
--------------------------------------------------------------------------------------------
Staff relation successfully populated.
Showing contents of Staff...

STAFF NUMBER / FIRST NAME / LAST NAME / STREET / BUILDING INFO / CITY / STATE / ZIP / TELEPHONE / DOB / POSITION / SALARY / CLINIC NUMBER
(1000001, 'John', 'Doe', '123 Biscayne Blvd', 'Building 1', 'Miami', 'FL', '33131', '3055551234', '1985-06-15', 'Veterinarian', 75000.0, 10001)
(1000002, 'Jane', 'Allen', '456 Brickell Ave', 'Suite 2A', 'Miami', 'FL', '33129', '3055555678', '1990-02-25', 'Assistant', 45000.0, 10002)
(1000003, 'Alex', 'Smith', '789 Flagler St', 'Unit 3B', 'Miami', 'FL', '33130', '3055551212', '1988-09-10', 'Technician', 40000.0, 10003)
(1000004, 'Emil', 'Lee', '101 Coral Way', 'Apt 4C', 'Miami', 'FL', '33145', '3055551313', '1995-12-20', 'Receptionist', 35000.0, 10004)
(1000005, 'Sally', 'Jones', '202 Little Havana Blvd', 'Floor 5', 'Miami', 'FL', '33135', '3055551414', '1980-04-30', 'Veterinarian', 80000.0, 10005)
--------------------------------------------------------------------------------------------
```

1.2.3. Owner

```
-----------------------------------------------------------------------------------------------
Owner relation successfully populated.
Showing contents of Owner...

OWNER NUMBER / FIRST NAME / LAST NAME / STREET / BUILDINGINFO / CITY / STATE / ZIP / TELEPHONE
(440000001, 'Jeremy', 'Brown', '789 Ponce De Leon', 'Apt 2', 'Miami', 'FL', '33133', '7863334444')
(440000002, 'Bob', 'White', '456 Animal St', 'House', 'Miami', 'FL', '33132', '7865556666')
(440000003, 'Stephen', 'Green', '123 Palm Rd', 'Apt 3', 'Miami', 'FL', '33156', '7867778888')
(440000004, 'Daisy', 'Blue', '456 Juniper Cv', 'Unit 5', 'Miami', 'FL', '33176', '7869990000')
(440000005, 'Andrew', 'Red', '789 Cedar Ct', 'House', 'Miami', 'FL', '33186', '7861122233')
-----------------------------------------------------------------------------------------------
```

1.2.4. Pet

```
-------------------------------------------------------------------------------------------------
Pet relation successfully populated.
Showing contents of Pet...

PET NUMBER / NAME / DOB / SPECIES / BREED / COLOR / OWNER NUMBER / CLINIC NUMBER
(1000000001, 'Bo', '2020-05-01', 'Cat', 'Persian', 'White', 440000001, 10001)
(1000000002, 'Ruby', '2018-09-12', 'Dog', 'Golden Retriever', 'Golden', 440000002, 10002)
(1000000003, 'Max', '2019-06-15', 'Dog', 'Beagle', 'Tricolor', 440000003, 10003)
(1000000004, 'Bella', '2021-07-21', 'Cat', 'Siamese', 'Brown', 440000004, 10004)
(1000000005, 'Duke', '2017-11-11', 'Dog', 'Labrador', 'Fawn', 440000005, 10005)
-------------------------------------------------------------------------------------------------
```

1.2.5. Examination

```
-------------------------------------------------------------------------------------------------
Examination relation successfully populated.
Showing contents of Examination...

EXAM NUMBER / CHIEF COMPLAINT / DESCRIPTION / DATE SEEN / ACTIONS TAKEN / PET NUMBER / STAFF NUMBER
(10000000001, 'Fever', 'Physical exam', '2024-01-01', 'Prescribed meds', 1000000001, 1000001)
(10000000002, 'Checkup', 'Routine exam', '2024-01-15', 'All clear', 1000000002, 1000002)
(10000000003, 'Coughing', 'Chest X-ray', '2024-02-01', 'Prescribed meds', 1000000003, 1000003)
(10000000004, 'Vomiting', 'Stomach exam', '2024-02-10', 'Dietary advice', 1000000004, 1000004)
(10000000005, 'Limping', 'Leg X-ray', '2024-02-15', 'Bandage applied', 1000000005, 1000005)
=================================================================================================
```

1.3. SQL Queries From 2.2.2 Using Embedded SQL

This section contains screenshots showing output from each of the transactions outlined in the logical data model design (part 2 of the project). Again, full details on the syntax and structure of the transactions can be obtained by perusing the source code on GitHub.

1.3.1. Registering a New Pet and Owner

```
================================================================================================
Transaction 1: Register a new owner and their pet.

After transaction 1... (showing contents of Owner)

OWNER NUMBER / FIRST NAME / LAST NAME / STREET / BUILDINGINFO / CITY / STATE / ZIP / TELEPHONE
(440000001, 'Jeremy', 'Brown', '789 Ponce De Leon', 'Apt 2', 'Miami', 'FL', '33133', '7863334444')
(440000002, 'Bob', 'White', '456 Animal St', 'House', 'Miami', 'FL', '33132', '7865556666')
(440000003, 'Stephen', 'Green', '123 Palm Rd', 'Apt 3', 'Miami', 'FL', '33156', '7867778888')
(440000004, 'Daisy', 'Blue', '456 Juniper Cv', 'Unit 5', 'Miami', 'FL', '33176', '7869990000')
(440000005, 'Andrew', 'Red', '789 Cedar Ct', 'House', 'Miami', 'FL', '33186', '7861122233')
(440000006, 'Emma', 'Black', '400 Old Town Rd', 'House', 'Miami', 'FL', '33146', '3053339999')

After transaction 1... (showing contents of Pet)

PET NUMBER / NAME / DOB SPECIES / BREED / COLOR / OWNER NUMBER / CLINIC NUMBER
(1000000001, 'Bo', '2020-05-01', 'Cat', 'Persian', 'White', 440000001, 10001)
(1000000002, 'Ruby', '2018-09-12', 'Dog', 'Golden Retriever', 'Golden', 440000002, 10002)
(1000000003, 'Max', '2019-06-15', 'Dog', 'Beagle', 'Tricolor', 440000003, 10003)
(1000000004, 'Bella', '2021-07-21', 'Cat', 'Siamese', 'Brown', 440000004, 10004)
(1000000005, 'Duke', '2017-11-11', 'Dog', 'Labrador', 'Fawn', 440000005, 10005)
(1000000006, 'Rosie', '2020-12-12', 'Dog', 'Labrador', 'White', 440000006, 10001)
------------------------------------------------------------------------------------------------
```

1.3.2. Assigning a Staff Member to Manage the Clinic

```
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Transaction 2: Assign a staff member to manage a clinic.

After transaction 2... (showing contents of Clinic)

CLINIC NUMBER / NAME / STREET / BUILDING INFO / CITY / STATE / ZIP / TELEPHONE / MANAGER NUMBER
(10001, 'University Clinic', '123 Corniche Ave', 'Suite 101', 'Miami', 'FL', '33101', '3051234567', 1000001)
(10002, 'Miami Beach Pet Clinic', '23 Ocean Dr', 'Suite 201', 'Miami Beach', 'FL', '33139', '3059876543', None)
(10003, 'Miller Vet', '234 Miller Dr', 'Suite 300', 'Coral Gables', 'FL', '33146', '3052345678', None)
(10004, 'Pet Clinic', '5000 San Amaro Dr', 'Suite 100', 'Miami', 'FL', '33125', '3058765432', None)
(10005, 'Miami Vet', '1527 Albenga Ave', 'Suite 1', 'Miami', 'FL', '33010', '3056543210', None)
------------------------------------------------------------------------------------------------
```

1.3.3. Logging an Examination

```
------------------------------------------------------------------------------------------------
Transaction 3: Log a pet's examination.

After transaction 2... (showing contents of Examination)

EXAM NUMBER / CHIEF COMPLAINT / DESCRIPTION / DATE SEEN / ACTIONS TAKEN / PET NUMBER / STAFF NUMBER
(10000000001, 'Fever', 'Physical exam', '2024-01-01', 'Prescribed meds', 1000000001, 1000001)
(10000000002, 'Checkup', 'Routine exam', '2024-01-15', 'All clear', 1000000002, 1000002)
(10000000003, 'Coughing', 'Chest X-ray', '2024-02-01', 'Prescribed meds', 1000000003, 1000003)
(10000000004, 'Vomiting', 'Stomach exam', '2024-02-10', 'Dietary advice', 1000000004, 1000004)
(10000000005, 'Limping', 'Leg X-ray', '2024-02-15', 'Bandage applied', 1000000005, 1000005)
(10000000006, 'Stomach Infection', 'Ear cleaning', '2024-03-01', 'Prescribed antibiotics', 1000000006, 1000001)
------------------------------------------------------------------------------------------------
```

1.3.4. Retrieving a Pet's Examination History

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Transaction 4: Retrieve all examinations for a specific pet. (petID = 1000000001)

After query... (showing results obtained from transaction on Examination)

EXAM NUMBER / CHIEF COMPLAINT / DESCRIPTION / DATE SEEN / ACTIONS TAKEN / PET NUMBER / STAFF NUMBER
(10000000001, 'Fever', 'Physical exam', '2024-01-01', 'Prescribed meds', 1000000001, 1000001)
--------------------------------------------------------------------------------------------
```

1.3.5. Obtaining a List of All Staff Working at a Clinic

```
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Transaction 5: List all staff working at a specific clinic. (clinicID = 10001)

After query... (showing results obtained from transaction on Staff)

STAFF NUMBER / FIRST NAME / LAST NAME / STREET / BUILDING INFO / CITY / STATE / ZIP / TELEPHONE / DOB / POSITION / SALARY / CLINIC NUMBER
(1000001, 'John', 'Doe', '123 Biscayne Blvd', 'Building 1', 'Miami', 'FL', '33131', '3055551234', '1985-06-15', 'Veterinarian', 75000.0, 10001)
================================================================================
```

1.4. GitHub Repository and Documentation

As mentioned throughout, the SQL code has been made available via a GitHub repository, which is located here. This repository also includes the documentation for the previous stages of this project, where the conceptual and logical data models were devised.