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CSC 423 Project 1 Part 1

1. Develop a conceptual data model reflecting the following requirements: (11/05/24)

    a. Identify the main entity types.

- Clinic
- Staff
- Owner
- Pet
- Examination

    b. Identify the main relationship types between the entity types identified in "a".

- A clinic is managed by at most one staff member.
- An owner is registered to one clinic.
- An owner can own one or more pets.
- A pet can only be registered at one clinic.
- A pet undergoes one or more examinations.
- An examination is performed by one staff member on one pet.

    c. Determine the multiplicity constraints for each relationship identified in "b".

- Clinic-Staff: one-to-one (a staff member manages at most one clinic)
- Clinic-Owner: one-to-one (an owner is registered at one clinic)
- Owner-Pet: one-to-many (an owner can own one or more pets)
- Clinic-Pet: one-to-many (a pet can only be registered at one clinic)
- Examination-Pet: many-to-one (a pet can undergo one or more examinations)
- Examination-Staff: many-to-one (an examination is performed by one staff member)

    d. Identify attributes and associate them with entity or relationship types.

- Clinic: clinicNo, name, address, phone
- Staff: staffNo, name, address, phone, DOB, position, salary
- Owner: ownerNo, name, address, phone
- Pet: petNo, name, DOB, species, breed, color
- Examination: examNo, chief_complaint, description, date_seen, actions_taken

    e. Determine candidate and primary key attributes for each (strong) entity type.

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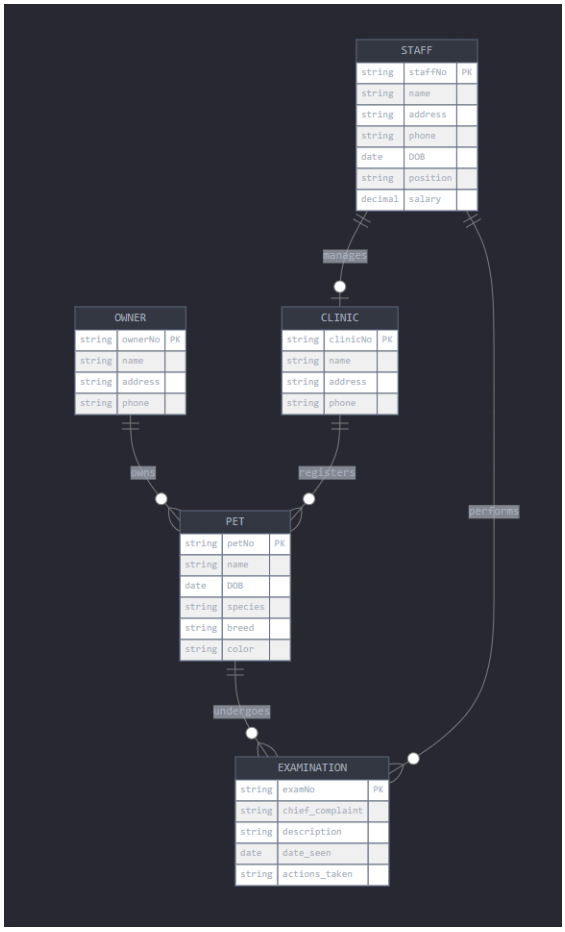
- Clinic: clinicNo (primary key)
- Staff: staffNo (primary key)
- Owner: ownerNo (primary key)
- Pet: petNo (primary key)
- Examination: examNo (primary key)

f. Generate the E-R diagram for the conceptual level (no FKs as attributes).



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CSC 423 Project 1 Part 2

1. Develop a logical data model based on the following requirements:

a. Derive relations from the conceptual model.

1. CLINIC (
    - clinicNo (PK)
    - clinicName
    - address
    - phoneNumber
    - managerStaffNo (FK to STAFF, nullable))
2. STAFF (
    - staffNo (PK)
    - firstName
    - lastName
    - address
    - phoneNumber
    - DOB
    - position
    - salary)
3. OWNER (
    - ownerNo (PK)
    - firstName
    - lastName
    - address
    - phoneNumber)
4. PET (
    - petNo (PK)
    - name
    - DOB
    - species
    - breed
    - color
    - ownerNo (FK to OWNER)
    - clinicNo (FK to CLINIC))
5. EXAMINATION (
    - examNo (PK)
    - dateSeen
    - chiefComplaint
    - description
    - actionsTaken
    - petNo (FK to PET)

- staffNo (FK to STAFF))

b. Validate the logical model using normalization to 3NF.

All relations are already in 3NF because:

1. They are in 1NF:
   - All attributes are atomic
   - No repeating groups
   - Primary key identified
2. They are in 2NF:
   - All non-key attributes are fully functionally dependent on the primary key
   - No partial dependencies exist
3. They are in 3NF:
   - No transitive dependencies exist
   - All non-key attributes are directly dependent on the primary key

c. Validate the logical model against 5 user transactions.

Register a new pet with an existing owner and clinic

INSERT INTO PET (petNo, name, DOB, species, breed, color, ownerNo, clinicNo)

VALUES (1, Holley, '2020-05-15', 'Dog', 'Golden Retriever', 'Golden', 101, 10); VALUES (1, 'Buddy', '2020-05-15', 'Dog',

'Golden Retriever', 'Golden', 101, 10);

Schedule an examination for a pet with a staff member

INSERT INTO EXAMINATION (examNo, dateSeen, chiefComplaint, description, actionsTaken, petNo, staffNo)

VALUES (1, '2024-11-24', 'Routine Checkup', 'Annual health checkup for Buddy', 'Vaccination and general examination', 1,

201);

Update clinic manager

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```
UPDATE CLINIC

SET managerStaffNo = 202

WHERE clinicNo = 10;
```

Retrieve all examinations for a specific pet

```
SELECT *

FROM EXAMINATION

WHERE petNo = 1;
```

Find all pets registered at a specific clinic

```
SELECT *

FROM PET

WHERE clinicNo = 10;
```

d. Define integrity constraints:

i. Primary key constraints.

- CLINIC: clinicNo
- STAFF: staffNo
- OWNER: ownerNo
- PET: petNo
- EXAMINATION: examNo

ii. Referential integrity/Foreign key constraints.

- CLINIC.managerStaffNo references STAFF.staffNo
- PET.ownerNo references OWNER.ownerNo
- PET.clinicNo references CLINIC.clinicNo
- EXAMINATION.petNo references PET.petNo

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- EXAMINATION.staffNo references STAFF.staffNo

iii. Alternate key constraints (if any).

None identified based on current requirements

iv. Required data.

- All primary keys are required (NOT NULL)
- STAFF: firstName, lastName, position
- PET: name, species
- EXAMINATION: dateSeen, chiefComplaint
- OWNER: firstName, lastName
- CLINIC: clinicName

v. Attribute domain constraints.

- All phone numbers must follow a standard format
- DOB must be a valid date and not in the future
- Salary must be positive
- dateSeen must not be in the future

vi. General constraints (if any).

- A staff member can manage at most one clinic
- A pet can only be registered at one clinic
- Examination date must be after pet's DOB

e. Generate the E-R diagram for the logical level (contains FKs as attributes).

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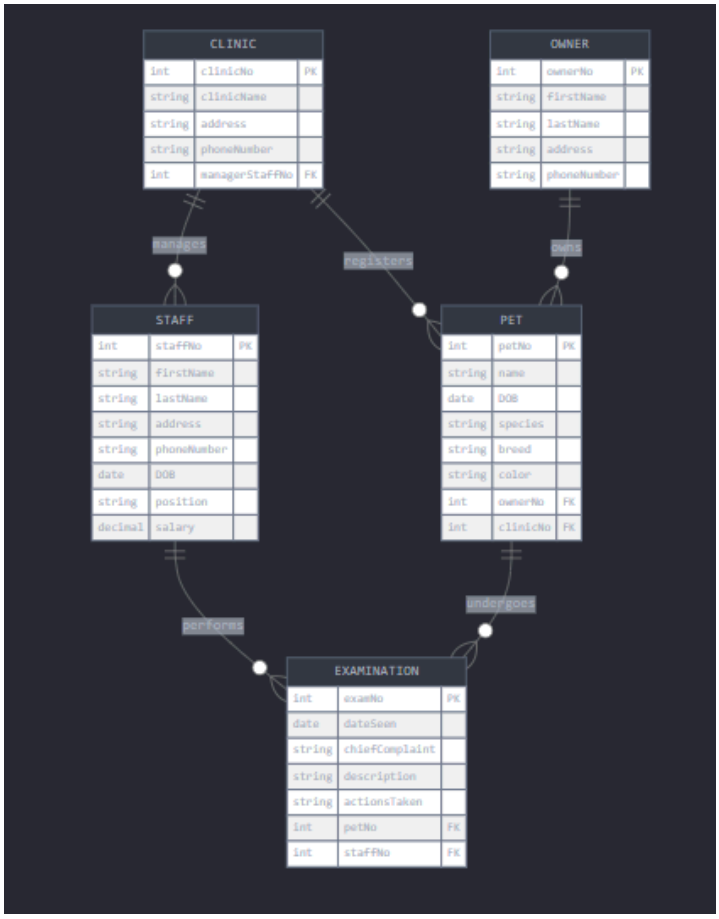

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CSC 423 Project 1 Part 3

```
Tables after tuples inserted:

Clinic Table:
(1, 'Vet Clinic', '123 Main St, Miami, FL', '305-123-4567', None)
(2, 'Pet Care', '456 1st St, Miami, FL', '305-987-6543', None)
(3, 'Animal Center', '789 2st St, Miami, FL', '305-123-1234', None)
(4, 'Pet Clinic', '111 3rd St, Miami, FL', '305-987-9876', None)
(5, 'Veterinary Hospital', '222 4th St, Miami, FL', '305-999-9999', None)

Staff Table:
(101, 'Alice Johnson', '987 Oak St, Miami, FL', '305-111-2233', '1985-05-14', 'Veterinarian', '85000.0', 1.0)
(102, 'Bob Smith', '321 Pine St, Miami, FL', '305-444-5566', '1978-11-23', 'Manager', '60000.0', 2.0)
(103, 'Eve Adams', '654 Cedar St, Miami, FL', '305-777-8899', '1990-02-18', 'Vet Tech', '45000.0', 1.0)
(104, 'Danielle Green', '123 Birch St, Miami, FL', '305-333-3333', '1982-04-10', 'Receptionist', '30000.0', 3.0)
(105, 'Frank White', '456 Spruce St, Miami, FL', '305-888-8888', '1975-09-01', 'Veterinary Assistant', '35000.0', 4.0)

Owner Table:
(201, 'John', 'Doe', '890 Birch St, Miami, FL', '305-222-3333')
(202, 'Jane', 'Smith', '567 Maple St, Miami, FL', '305-555-6666')
(203, 'Sam', 'Taylor', '345 Pine St, Miami, FL', '305-444-1111')
(204, 'Emily', 'Brown', '678 Elm St, Miami, FL', '305-333-4444')
(205, 'Chris', 'Green', '789 Oak St, Miami, FL', '305-777-9999')

Pet Table:
(301, 'Buddy', '2020-04-05', 'Dog', 'Golden Retriever', 'Golden', 201, 1)
(302, 'Whiskers', '2018-09-15', 'Cat', 'Siamese', 'Gray', 202, 2)
(303, 'Daisy', '2019-06-10', 'Dog', 'Labrador', 'Black', 203, 3)
(304, 'Coco', '2021-02-11', 'Bird', 'Parrot', 'Green', 204, 4)
(305, 'Max', '2017-07-07', 'Dog', 'Bulldog', 'Brown', 205, 5)

Examination Table:
(401, 'Limping', 'Checked for injuries, X-ray taken', '2024-11-01', 'Prescribed medication', 301, 101)
(402, 'Vomiting', 'Physical exam and blood tests', '2024-11-02', 'Dietary changes', 302, 103)
(403, 'Coughing', 'Examined lungs, prescribed antibiotics', '2024-11-03', 'Antibiotics prescribed', 303, 104)
(404, 'Feather loss', 'Skin exam, tested for mites', '2024-11-04', 'Mite treatment given', 304, 105)
(405, 'Ear infection', 'Ear cleaning, drops administered', '2024-11-05', 'Medication prescribed', 305, 101)
```

```
Tables after queries executed:

Clinic Table:
(1, 'Vet Clinic', '123 Main St, Miami, FL', '305-123-4567', None)
(2, 'Pet Care', '456 1st St, Miami, FL', '305-987-6543', None)
(3, 'Animal Center', '789 2st St, Miami, FL', '305-123-1234', None)
(4, 'Pet Clinic', '111 3rd St, Miami, FL', '305-987-9876', None)
(5, 'Veterinary Hospital', '222 4th St, Miami, FL', '305-999-9999', None)

Staff Table:
(101, 'Alice Johnson', '987 Oak St, Miami, FL', '305-111-2233', '1985-05-14', 'Veterinarian', '85000.0', 1.0)
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(304, 'Coco', '2021-02-11', 'Bird', 'Parrot', 'Green', 204, 4)
(305, 'Max', '2017-07-07', 'Dog', 'Bulldog', 'Brown', 205, 5)
(306, 'Buddy', '2024-10-06', 'Dog', 'Labrador Retriever', 'Black', 101, 10)

Examination Table:
(401, 'Limping', 'Checked for injuries, X-ray taken', '2024-11-01', 'Prescribed medication', 301, 101)
(402, 'Vomiting', 'Physical exam and blood tests', '2024-11-02', 'Dietary changes', 302, 103)
(403, 'Coughing', 'Examined lungs, prescribed antibiotics', '2024-11-03', 'Antibiotics prescribed', 303, 104)
(404, 'Feather loss', 'Skin exam, tested for mites', '2024-11-04', 'Mite treatment given', 304, 105)
(405, 'Ear infection', 'Ear cleaning, drops administered', '2024-11-05', 'Medication prescribed', 305, 101)
(406, 'Routine Checkup', 'Annual health checkup for Buddy', '2024-11-24', 'Vaccination and general examination', 1, 201)
```