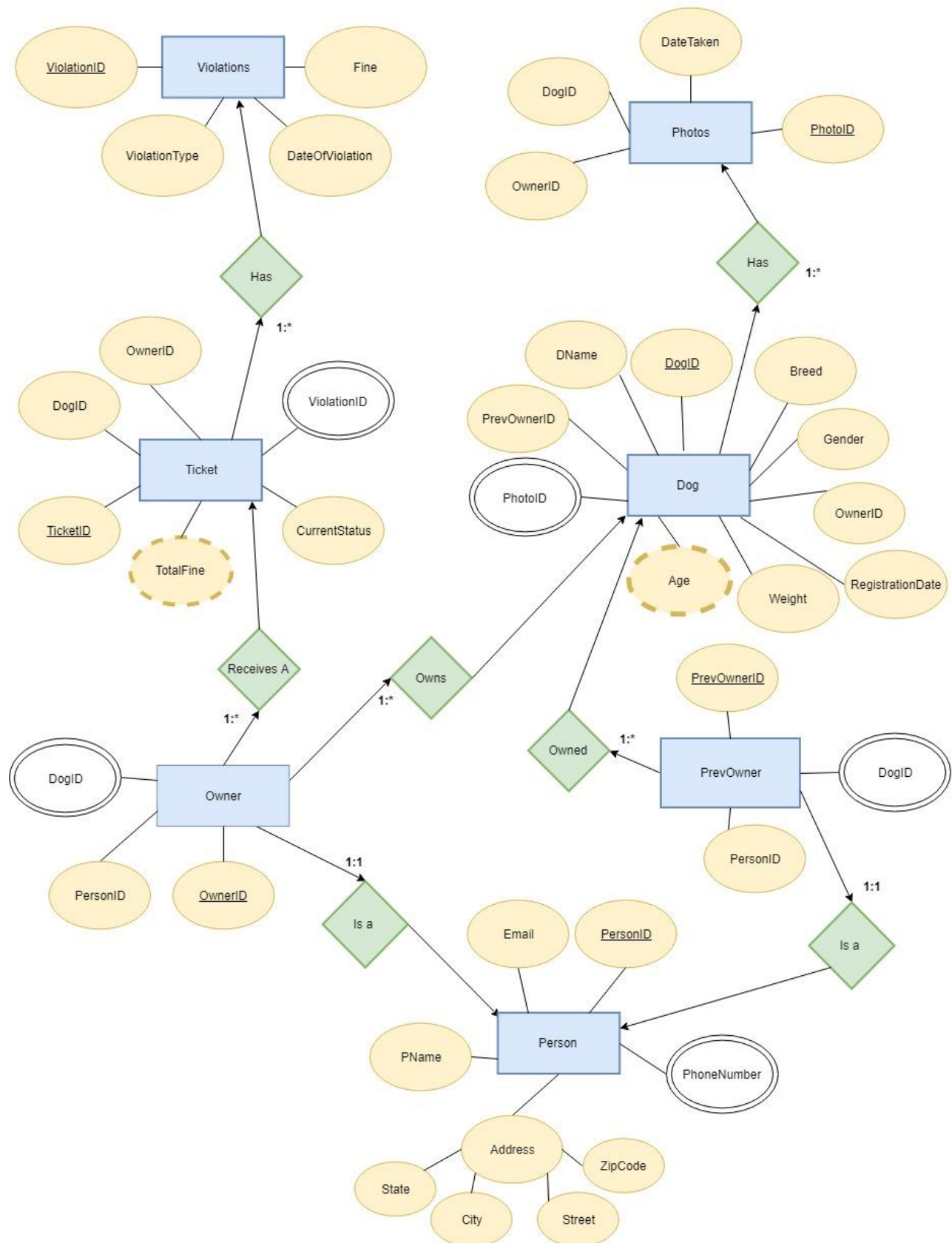


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CSCI 331 Database Systems  
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Project #1  
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Relations:

Person (PersonID, PName, Email, Street, City, State, ZipCode)

Owner (OwnerID, *PersonID*, *DogID*)

PrevOwner (PrevOwnerID, *PersonID*, *DogID*)

Ticket (TicketID, *DogID*, *OwnerID*, *ViolationID*, CurrentStatus, TotalFine)

Violations (ViolationID, ViolationType, DateOfViolation, Fine)

Dog (DogID, *PrevOwnerID*, *OwnerID*, *PhotoID*, DName, Breed, Gender, Weight, Age, RegistrationDate)

Photos (PhotoID, *DogID*, *OwnerID*, DateTaken)

Primary Keys: Underlined

Foreign Keys: *Red italic*.

Domain:

Zipcode: Numbers

Current Status: Resolved/Unresolved

TotalFine, Fine: Monetary value with two decimal places

ViolationType: The type of violation

DateOfViolation, DateTaken, RegistrationDate: Date value

### **Relational Algebra:**

1. Identify dogs without violations in the last 30 days. Display the owner name, dog name, breed and email.

$\text{ViolationsLast30Days} \leftarrow \sigma_{\text{DateOfViolation} \geq \text{"2018-11-02"}}(\text{Violations})$

$\text{DogsWithViolations} \leftarrow \sigma_{\text{Dog.DogID} = \text{ViolationsLast30Days.DogID}}(\text{ViolationsLast30Days} \times \text{Dog})$

$A \leftarrow \pi_{\text{DogID}}(\text{Dog}) - \pi_{\text{DogID}}(\text{DogsWithViolations})$

$B \leftarrow \sigma_{A.\text{DogID} = \text{Owner.OwnerID}}(A \times \text{Owner})$

$C \leftarrow \sigma_{B.\text{OwnerID} = \text{Person.OwnerID}}(B \times \text{Person})$

Answer  $\leftarrow \pi_{C.PName, C.DName, C.Breed, C.Email} (C)$

2. Identify neighborhoods without registered Great Danes in the last month. Display the neighborhood. (Considering the zip code as separate neighborhoods)

$A \leftarrow \sigma_{RegistrationDate \geq '2018-02-01' \wedge RegistrationDate < '2018-03-01'} (Dog)$

$B \leftarrow \sigma_{A.Breed = 'Great Dane'} (A)$

$C \leftarrow \pi_{OwnerID} (Dog) \text{ --- } \pi_{OwnerID} (B)$

$D \leftarrow \sigma_{C.OwnerID = Person.OwnerID} (C \times Person)$

Answer  $\leftarrow \pi_{Zipcode} (D)$

3. Identify owners without any registered dogs in the last year. Display the owner name and email.

$A \leftarrow \sigma_{RegistrationDate \geq '2017-03-13' \wedge RegistrationDate \leq '2018-03-13'} (Dog)$

$B \leftarrow \pi_{OwnerID} (Dog) \text{ --- } \pi_{OwnerID} (A)$

$C \leftarrow \sigma_{B.OwnerID = Person.OwnerID} (C \times Person)$

Answer  $\leftarrow \pi_{PName, Email} (D)$

4. Identify owners who live near Washington Square (zip 10012) with registered dogs in the last month. Display the owner name and email.

$A \leftarrow \sigma_{RegistrationDate \geq '2018-02-01' \wedge RegistrationDate < '2018-03-01'} (Dog)$

$B \leftarrow \sigma_{A.OwnerID = Person.OwnerID \wedge Person.ZipCode = '10012'} (A \times Person)$

Answer  $\leftarrow \pi_{PName, Email} (B)$

5. Identify pictures of male beagles older than three years old. Display the dog name, age, and photo(s).

$A \leftarrow \sigma_{Breed = 'beagle' \wedge Gender = 'M' \wedge Age \geq 3} (Dog)$

$B \leftarrow \sigma_{A.DogID = Photos.DogID} (Photos \times A)$

$C \leftarrow \sigma_{B.Age.DOB - B.DateTaken \geq 3} (B)$

Answer  $\leftarrow \pi_{C.DName, C.Age, C.PhotoID} (C)$

6. Identify dogs owned by John Smith with fines in the last month. Display the owner name, dog name, violation, date of violation and fine.

$A \leftarrow \sigma_{FirstName = 'John' \wedge LastName = 'Smith'} (Person)$

$B \leftarrow \sigma_{A.PersonID = Owner.OwnerID} (A \times Owner)$

$C \leftarrow \sigma_{B.OwnerID = Ticket.TicketID} (B \times Ticket)$

$D \leftarrow \sigma_{C.ViolationID = Violations.ViolationID} (C \times Violations)$

$E \leftarrow \sigma_{DateOfViolation \geq '2018-02-01' \wedge DateOfViolation < '2018-03-01'} (D)$

$Answer \leftarrow \pi_{E.DName, E.PName, E.ViolationType, E.DateofViolation, E.Fine} (C)$

7. Identify the number of male dogs by dog name. Display two columns and one row for each dog name. The two output columns are dog name and number of dogs with that name. Use an aggregate function and grouping operation to answer this question.

$A \leftarrow \sigma_{Gender = 'M'} (Dog)$

$Answer \leftarrow A.DogName \mathfrak{J}_{count} DogID (A)$

8. Identify the number of golden retrievers by neighborhood. Display two columns and one row for each neighborhood. The two output columns are zip code and number of golden retrievers in that zip code. Use an aggregate function and grouping operation to answer this question.

$A \leftarrow \sigma_{Breed = 'Golden Retriever'} (Dog)$

$B \leftarrow \sigma_{A.OwnerID = Owner.OwnerID} (A \times Owner)$

$C \leftarrow \sigma_{B.personID = Person.personID} (B \times Person)$

$Answer \leftarrow C.Zipcode \mathfrak{J}_{count} DogID (C)$

9. Identify the number and total fines by owner. Display three columns and one row for each owner. The three columns are owner, number of violations and total dollar amount of fines. Use an aggregate function and grouping operation to answer this question.

$A \leftarrow \sigma_{Violations.ViolationID = Ticket.ViolationID} (Violations \times Ticket)$

$B \leftarrow \sigma_{A.OwnerID = Owner.OwnerID} (A \times Owner)$

$C \leftarrow \sigma_{B.PersonID = Person.personID} (B \times Person)$

$D \leftarrow C.OwnerID \mathfrak{J}_{count(ViolationID), sum(Fine)} (C)$

$E \leftarrow \sigma_{D.OwnerID = Person.OwnerID} (D \times Person)$

$Answer \leftarrow \pi_{G.PName, G.Count-ViolationID, G.Sum-Fine} (E)$

10. Identify the number of registered male Samoyeds in the database last month. Display one row with the number of registered dogs.

$A \leftarrow \sigma_{RegistrationDate \geq '2018-02-01' \wedge RegistrationDate < '2018-03-01'} (Dog)$

$B \leftarrow \sigma_{A.Breed = 'Samoyed'} (A)$

$Answer \leftarrow \mathfrak{I}_{count(DogID)} B$