Design of a Relational Database

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1. Construction of Conceptual Data Model

The following case study provides the basis for the design, development, and implementation of the necessary relational database. It is copied here from the project specifications for convenience and clarity purposes.

A company called Pawsome Pets runs multiple clinics. The company would like for their data to be stored in a database. The following description was obtained during the analysis phase:

"Each of the Pawsome Pets clinics has several staff members and a member of staff manages at most one clinic (not all staff manage clinics). Each clinic has a unique clinic number (clinicNo) and each member of staff has a unique staff number (staffNo). Additionally, the company would like to store each clinic's name, address and telephone number, as well as the staff's name, address, telephone number, DOB, position and salary.

When a pet owner contacts a clinic, the owner's pet is registered with the clinic. An owner can own one or more pets, but a pet can only be registered at one clinic. Each owner has a unique owner number (ownerNo), a name, an address and a telephone number. Each pet has a unique pet number (petNo), name, DOB, animal species, breed and color.

When the pet comes to the clinic, it undergoes an examination by a member of the consulting staff. The database should store the following information for each examination: chief complaint (i.e., the main cause for the visit), description (i.e., what was done during the examination), date seen and actions taken (e.g., a treatment was prescribed, tests were ordered). A unique examination number (examNo) is assigned to each examination."

1.1. Identification of Main Entity Types

Based on the case study, the main entity types are:

- Clinic
- Staff
- Owner
- Pet
- Examination

1.2. Identification of Relationship Types, Multiplicity Constraints

The following relationship types between entities were identified using the case study. Assumptions made are provided, in addition to any relevant comments or information.

- Clinic has Staff
    - We assume that a clinic may have zero members of staff. This may seem incorrect, as there would be no way for the clinic to conduct business if this were the case.
    - However, one could imagine a scenario where temporary staff is brought in until full-time hires are made, or where staff from other clinics temporarily moves to a new clinic until full-time staff is hired.
    - We assume that these scenarios can and do happen, and that as a consequence clinics do not need to record staff data until said hires are made.
- Staff manages Clinic
- Owner registers Pet
    - We assume that an owner must register at least one pet in order to be entered into the broader system.
    - In other words, there should be no rows in the Owner entity that do not directly correspond to at least one row in Pet, and vice versa.
- Pet belongs to Clinic
- Pet undergoes Examination
- Staff performs Examination
    - We assume that some staff may not be involved in caregiving and may instead handle recordkeeping, billing, or other non-medical functions.
    - Additionally, staff may be involved in the gathering of relevant medical data prior to the examination itself, similarly to how a nurse may record such information for human patients before the patient is seen by a doctor. We assume that this sort of data collection is not part of the examination.

Multiplicities exist between the relationships described and are presented here in a table.

Entity 1	**Multiplicity**	**Relationship**	**Multiplicity**	**Entity 2**	**Relationship Type**
Clinic	1..1	Has	0..*	Staff	1:*
Staff	1..1	Manages	0..1	Clinic	1:1
Owner	1..1	Registers	1..*	Pet	1:*
Pet	1..*	Belongs to	1..1	Clinic	1:*
Pet	1..1	Undergoes	1..*	Examination	1:*
Staff	1..1	Performs	0..*	Examination	1:*

1.3. Identification and Association of Attributes

Each entity has several attributes to account for. These are as follows:

- **Clinic**
  - clinicNo
  - name
  - address
  - telephone
- **Staff**
  - staffNo
  - name
  - address
  - telephone
  - DOB
  - position
  - salary
- **Owner**
  - ownerNo
  - name
  - address
  - telephone
- **Pet**
  - petNo
  - name
  - DOB
  - species
  - breed
  - color
- **Examination**
  - examNo
  - chiefComplaint
  - description
  - dateSeen
  - actionsTaken

1.4. Candidate Keys, Primary Key Attributes For Each Entity

For each strong entity type, candidate keys must be identified in order to determine a suitable primary key.

Clinic, Staff, and Owner are all strong entities, as these entities do not depend on the existence of any others.

Pet and Examination are both weak entities. Pet is a weak entity because its entries rely upon existing corresponding entries in Owner. Similarly, Examination relies upon two other entities: Staff and Pet.

While this case study calls for a unique key for each entity, this should not be confused as a declaration of each type as a strong entity. For each of the two weak entities, we will use the unique key as the primary key.

Both the primary key and candidate key(s) for the strong entities are given below.

- **Clinic**
    - Primary Key:
        - clinicNo
    - Candidate Keys:
        - clinicNo
        - name, assuming clinic names are unique
        - address, assuming clinic locations are unique
        - telephone, assuming telephone numbers are unique between clinics
- **Staff**
    - Primary Key:
        - staffNo
    - Candidate Keys:
        - staffNo
        - (name,DOB), assuming this combination uniquely identifies a staff member
        - telephone, assuming no two staff members share the same phone number
- **Owner**
    - Primary Key:
        - ownerNo
    - Candidate Keys:
        - ownerNo
        - (name, address), assuming this combination uniquely identifies an owner
        - telephone, assuming no two owners share the same phone number

1.5. Entity-Relationship Diagram

The following entity-relationship diagram was created using the information derived from the above sections. This diagram does not include any foreign keys.