Pet Adoption & Supply Commerce Database

Database Specification: Purpose, Business Problems Addressed, Business Rules, and Design Decisions

Database Purpose:

The purpose of this database is to operate a unified platform for a pet-adoption shelter with an integrated pet-supply commerce store. It maintains data for animals (species, breed, medical/vaccination history, adoption applications), people (users, addresses), and commerce (products, categories, orders). The database supports day-to-day operations and reporting for shelter staff, volunteers, and store operators.

Business Problems Addressed:

- Provide end-to-end tracking of animals from intake to adoption, including breed/species classification and medical/vaccination history.
- Streamline the adoption pipeline: accept applications, capture detailed screening answers, and track review/decision status.
- Manage customer accounts and addresses for both adoption and store checkout.
- Run the commerce workflow: product catalog, order placement, order line items, and fulfillment status.
- Generate descriptive/operational reports such as time-to-adoption, vaccination compliance, product sales by category, order conversion, and repeat-buyer metrics.
- Enforce data integrity (unique identifiers, referential integrity) and retain historical facts (e.g., unit price at sale) for auditable records.

Business Rules:

- Each Species may have zero or more Breeds.
- Each Breed will belong to exactly one Species.
- Each Pet will belong to exactly one Breed.
- Each Pet may have zero or more PetVaccination records.
- Each PetVaccination will reference exactly one Pet.
- Each PetVaccination will reference exactly one Vaccine.
- Each User will have exactly one Address.
- Each User may submit zero or more AdoptionApplications.
- Each AdoptionApplication will target exactly one Pet.
- Each AdoptionApplication will have exactly one ApplicationDetail.

- Each Category may have zero or more Products.
- Each Product will belong to exactly one Category.
- Each User may place zero or more Orders.
- Each Order will be placed by exactly one User.
- Each Order will have one or more LineItems.
- Each LineItem will reference exactly one Product.
- Each Product may appear in zero or more LineItems.
- Each LineItem will record the quantity at the time of sale.

Design Requirements (Credit to Professor Simon Wang):

- Use Crow's Foot Notation.
- Specify the primary key fields in each table by specifying PK beside the fields.
- Draw a line between the fields of each table to show the relationships between each table. These lines should be pointed directly to the fields in each table that are used to form the relationship.
- Specify which table is on the one side of the relationship by placing a one next to the field where the line starts.
- Specify which table is on the many side of the relationship by placing a crow's foot symbol next to the field where the line ends.
- Consistent naming conventions were applied across all entities and attributes — upper camel case for fields and singular table names — to improve maintainability and readability.
- The model follows the third normal form (3NF) to eliminate redundancy and ensure data consistency across all entities.

Design Decisions:

Entity Name	**Why Entity Included**	**How Entity is Related to Other Entities**
Species	Normalizes high-level animal classification to avoid duplicating cross-breed attributes.	As a parent classification entity, the Species table's primary key SpeciesID relates to the Breed entity through a one-to-many relationship. Each species can include several breeds, forming the foundation for breed and pet data consistency across the system.

Breed	Captures breed-specific traits (lifespan, size, diet, care level) used in matching and education.	The breed entity's primary key BreedID connects it to the Species and Pet entities. Each breed belongs to one species through the foreign key SpeciesID and can include multiple pets, establishing a one-to-many relationship between breed and pet.
Pet	Core adoption entity with health and status fields (spay/neuter, adoption status, timestamps).	As a core adoption entity, the Pet table's primary key PetID relates to Breed, PetVaccination, and AdoptionApplication. Each pet belongs to one breed (BreedID FK) and can appear in multiple vaccination and adoption application records, forming several one-to-many and many-to-many relationships managed through associative tables.
PetVaccination	Fact table recording a pet's vaccine events (date given, next due, clinic).	The PetVaccination table acts as an associative entity between Pet and Vaccine. It contains the foreign keys PetID and VaccineID, which together form a composite primary key ensuring unique vaccination records and enforcing referential integrity across both parent tables.
Vaccine	Master data for immunizations (name, manufacturer, recommended age).	The Vaccine entity maintains a many-to-many relationship with Pet. Its primary key VaccineID relates to pets through the associative table PetVaccination, which records each vaccination event for auditing and medical tracking purposes.
User	Single identity for customers/applicants/reviewers/ admins with contact and audit fields.	The User entity's primary key UserID connects to several dependent entities, including Address, AdoptionApplication, and Order. Each

		user may have multiple adoption applications and orders, but only one address, creating both one-to-many and one-to-one relationships within the database.
Address	Supports shipping and home-visit logistics.	The Address entity is directly linked to User through a one-to-one relationship. It uses UserID as both its primary key and foreign key, ensuring that each user has one unique address record associated with their account.
AdoptionApplication	Tracks who applied for which pet and review lifecycle (dates, status, decision notes).	The AdoptionApplication entity links User and Pet through the foreign keys ApplicantID and PetID, and references ApplicationDetail using ApplicationDetailID. This structure captures the many-to-many relationship between users and pets by representing each adoption request as a separate record.
ApplicationDetail	Structured questionnaire (dwelling, pets in home, lifestyle, costs) to support review scoring.	The ApplicationDetail entity connects to AdoptionApplication through the foreign key ApplicationDetailID. Each detail record corresponds to exactly one adoption application, forming a one-to-one relationship that enriches the application data with detailed questionnaire responses.
Category	Product grouping for navigation, pricing strategy, and reporting with audit fields.	The Category entity's primary key CategoryID relates to the Product table in a one-to-many relationship. Each category can include multiple products, supporting product classification and organized reporting.

Product	Sellable items (price, status, descriptions, audit fields).	The Product entity's primary key ProductID connects it to Category and LineItem. Each product belongs to one category (CategoryID FK) and may appear in multiple line items associated with orders, creating indirect many-to-many links between products and orders.
Order	Order header with payment method/status, times, amount, and remarks.	The Order entity's primary key OrderID relates to User and LineItem. Each order belongs to one user (UserID FK) and includes one or more line items, forming a one-to-many relationship with LineItem and an indirect many-to-many relationship with Product through that table.
LineItem	Item-level quantities and unit price supporting multi-product orders.	The LineItem table functions as an associative entity linking Order and Product. Its composite primary key (OrderID, ProductID) establishes a many-to-many relationship between orders and products while capturing quantities and unit prices for each transaction.