CS 5600
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Requirements and Conceptual Document
CATabase: A Cat Adoption Database Management System

I. Requirements

a. Problem Description

There are approximately 50-70 million feral cats in the United States, with some figures estimating at least 100 million without a home. Cats are natural predators and thus pose a serious threat to the local wildlife while also being at risk of being attacked by other cats, aggressive animals, or seriously injured by fast-moving vehicles. And yet, there are only about 2 million cats being adopted each year in the US. As such, a comprehensive cat adoption database will help people more easily connect with owners and shelters to adopt and reduce the number of vulnerable cats out in the elements.

b. Summarized Nouns and Verbs

i. Nouns

1. Cats (*Note: cats available for adoption)*
   (1) cat_id: unsigned integer
   (2) cat_name: string
   (3) cat_birthday: mm/dd/yy
   (4) cat_weight_lb: float
      (a) Note: Weight in pounds
2. Breeds
   (1) breed_id: integer
   (2) breed_name: {“Siamese”, “Bengal”, “American Shorthair”, “Russian Blue”, …}
3. Personality
   (1) personality_id: integer
   (2) personality_name: {“Friendly”, “Shy”, “Energetic”, “Moody”,...}
4. Shelters
   (1) shelter_id: unsigned integer
   (2) shelter_name: string
   (3) shelter_location: string
   (4) shelter_email: string
   (5) shelter_phone: 10-digit integer
   (6) shelter_population: integer
5. Users:
   (1) user_id: unsigned integer

(2) user_first_name: string
(3) user_last_name: string
(4) user_address: string
(5) user_email: string
(6) user_phone: 10-digit integer

ii. Verbs
1. House
2. Adopt
3. Rate
4. Approve

c. Narratives
i. Cats
1. Each cat is housed by one shelter only
2. Each cat has only one breed
3. Each cat has only one personality
4. Each cat can be applied for by zero or more users

ii. Breeds
1. Each breed is of one or more cats

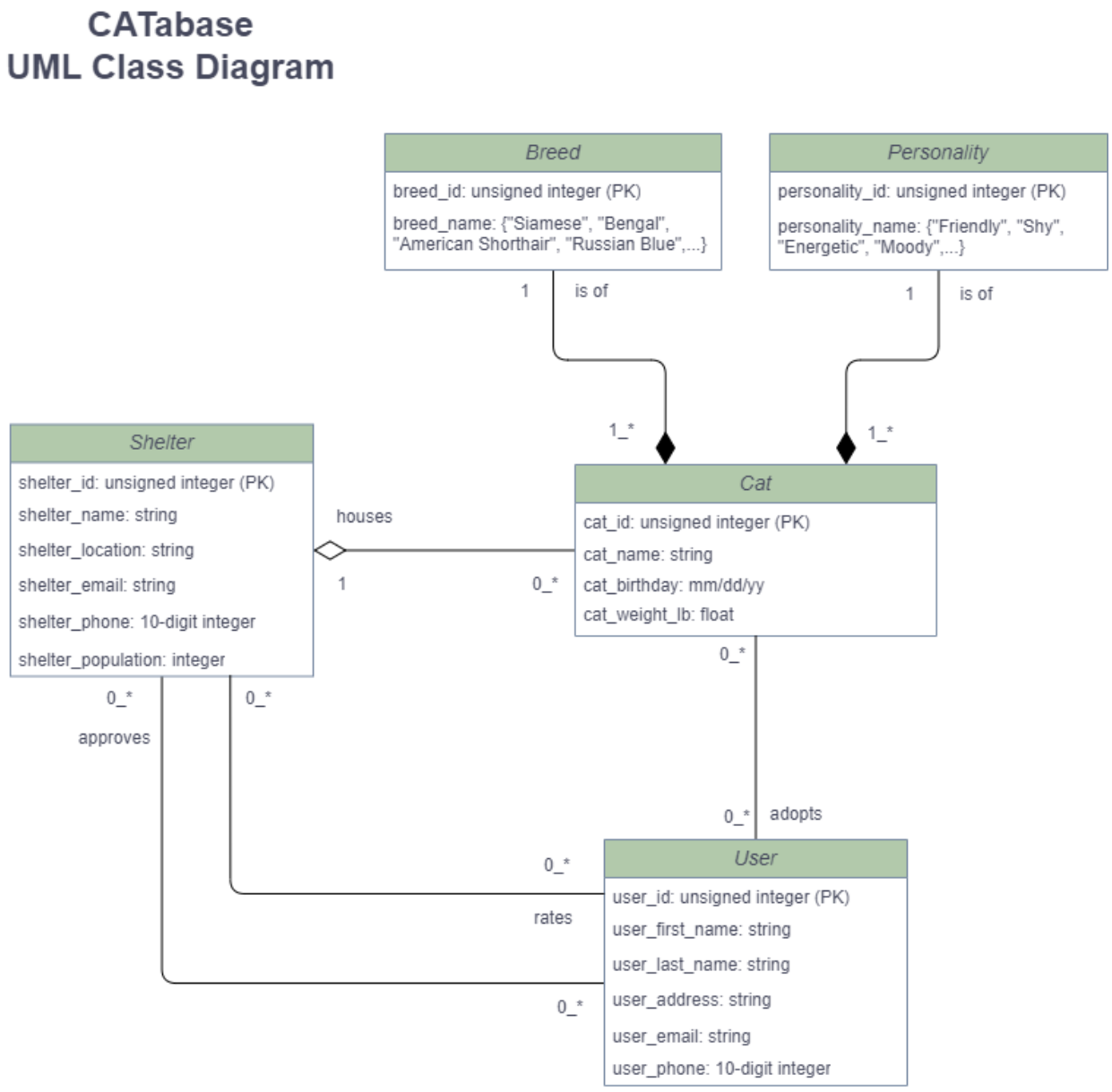
iii. Personality
1. Each personality is of one or more cats

iv. Shelters
1. A shelter can house zero or more cats
2. A shelter can approve zero or more users for adoption
3. A shelter can be rated by zero or more users

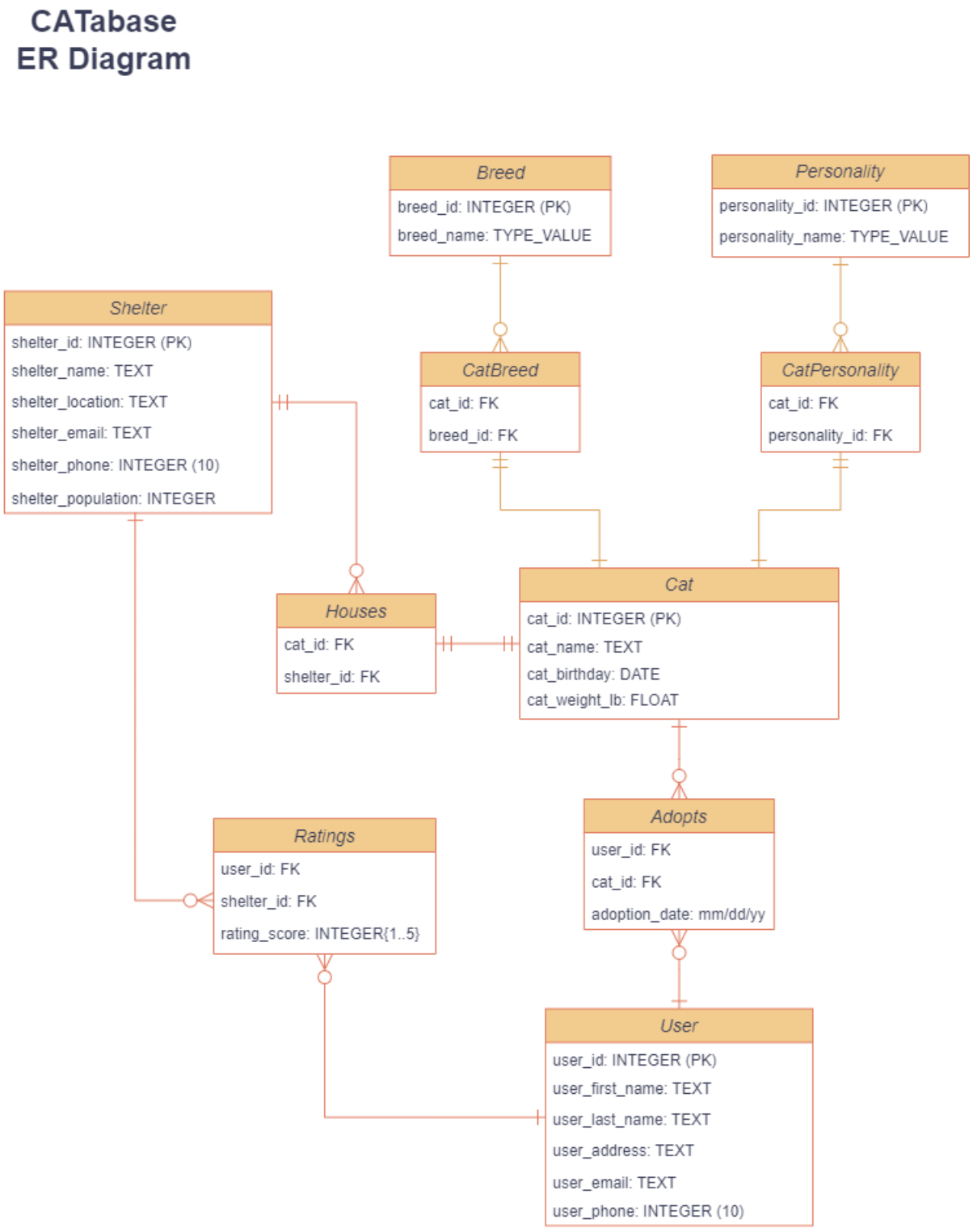
v. Users
1. A user can apply to adopt one or more existing cats
2. A user can rate zero or more existing shelters on the scale of 1 to 5
3. A user can be approved by zero or more shelters

d. Challenges
i. Should a cat have multiple personalities?
ii. Should there be a separate owner class?

II. Conceptual Model (UML)



III. Entity-Relationship Model (ERD)



IV. Relational Schema in BCNF

a. Schema with Functional Dependencies

i. Cat(<u>cat_id</u>, cat_name, cat_breed, cat_birthday, cat_weight_lb)
   1. cat_id → {cat_name, cat_breed, cat_birthday, cat_weight_lb}
   2. Candidate key: cat_id

ii. Breed(<u>breed_id</u>, breed_name)
   1. breed_id → breed_name
   2. Candidate key: breed_id

iii. Personality(<u>personality_id</u>, breed_name)
   1. personality_id → breed_name
   2. Candidate key: personality_id

iv. Shelter(<u>shelter_id</u>, shelter_name, shelter_location, shelter_email, shelter_phone, shelter_population)
   1. shelter_id → {shelter_name, shelter_location, shelter_email, shelter_phone, shelter_population}
   2. Candidate key: shelter_id

v. User(<u>user_id</u>, user_first_name, user_last_name, user_address, user_email, user_phone)
   1. user_id → {user_first_name, user_last_name, user_address, user_email, user_phone}
   2. Candidate key: user_id

vi. CatBreed(*cat_id, breed_id)*
   1. Candidate key: {*cat_id, breed_id*}

vii. CatPersonality(*cat_id, personality_id)*
   1. Candidate key: {*cat_id, personality_id*}

viii. Houses(*cat_id, shelter_id*).
   1. Candidate key: {*cat_id, shelter_id*}

ix. Ratings(*user_id, shelter_id,* rating_score)
   1. {*user_id, shelter_id*} → rating_score
   2. *Note:* each attribute of the composite key are themselves keys in different tables

x. Adopts(*user_id, cat_id,* adoption_date*)*
   1. {*user_id, cat_id*} → adoption_date
   2. Candidate key: {*user_id, cat_id*}

b. BCNF Analysis

i. Schema is in 1NF:

1. No multi-valued attributes

ii. Schema is in 2NF:

1. Schema is in 1NF
2. No partial functional dependencies: in all tables, all proper subsets of the candidate key give non-key attributes

iii. Schema is in 3NF:

1. Schema is in 2NF
2. No transitive dependency: no tables exhibit any transitive dependency

iv. Schema is in BCNF

1. Schema is in 3NF
2. For every dependency A → B in the schema, A is either a candidate key or a super key. Therefore, the Relational Schema is in BCNF