Sistemas de Informação e Bases de Dados
Assignment 1 - Database Modeling

October 2019

1 Problem Domain

The SIBD course project concerns the development of an information system supporting a large veterinary hospital specialized on companion animals. The database associated to this information system aims not only to offer an all-purpose archive and organization tool for the different types of data generated during the veterinary practice, but also to provide a complete online platform for veterinary research.

The database should store information regarding clients (e.g., pet owners), veterinary physicians (i.e., veterinarians working for the hospital) and veterinary assistants. For all three cases, we can use the VAT/NIF number as a unique identifier, and we require storing the name, address (including street name, city, and zip code), and phone number(s). For veterinary physicians we require additional information, including the specialization (e.g., surgery, dermatology, internal medicine, etc.) and a small biographic description.

Each client can own different animals, and each animal has one specific client that is the owner. Animals are described by their name, species/breed, weight, color, gender and age, noting that the species is defined in terms of a taxonomic hierarchy, and that the weight may change over time (i.e., when an animal visits the veterinary hospital, the information on the weight is updated). At any moment, it should be possible to access the current age of the animal, and the most recent measurement for the weight. The veterinary hospital also assumes that owners give unique names to their pets.

The database should be flexible on what regards the storage of taxonomic information on animal species/breeds, considering a general and extensible approach where each broad category (e.g., animal groups such as fish, birds, reptiles or mammals) can specialize into a more refined category, which in turn can be further specialized (e.g., mammals can specialize into different types of companion animals, such as cats or dogs, which in turn specialize into species and, subsequently, into different breeds). Animals can be associated to either the general or the more specialized species/breeds. For each species and/or breed, the database should store a name and a brief description.

Animals may be associated to veterinary consults (i.e., encounters with a veterinary physician at the hospital), and each consult is linked to a single animal, a single veterinary physician, and a single client (not necessarily the owner of the animal). Veterinary assistants may also be involved in consults.

Consults occur at specific dates, and they are described through 4 textual attributes corresponding to SOAP notes (i.e, an acronym for subjective, objective, assessment, and plan). The inclusion of SOAP notes is not mandatory, although strongly recommended for each encounter with a veterinary physician.

- Subjective observation: textual summary of client observations, concerns and insights, as well as opinions and hunches from the physician;

- Objective observation: textual summary of the relevant history, and results from any physical examination;

- Assessment: textual summary containing a differential diagnosis list and a prognosis;

- Plan: textual summary of substantive actions and activities, including future diagnostic tests, therapy actions, home care or in-patient care recommendations, and plans for future appointments and follow-up care.

Animals can visit the veterinary hospital at different dates, and each of these encounters corresponds to a consult that is summarized in the database.

As hinted by the inclusion of SOAP notes, each encounter may result in a particular diagnosis list (i.e., when specific diseases, disorders or injuries are detected on the animal, the consult can be associated to one or more diagnostic codes). The diagnostic codes should be standardized (e.g., restricted to a controlled vocabulary such as the AAHA Problem and Diagnosis Terms) and stored in the database, through the actual unique code together with a corresponding short description (i.e., the name associated to the code).

When a consult is associated to a diagnosis list, the consult can be optionally associated with a prescription. The prescription consists of a set of medications, each described by a name, a laboratory, and a dosage. Each medication prescribed within a consult should be associated to a small description for the dosage regime (i.e., the schedule of doses, including the time between doses, the duration of treatment and the amount to be taken each time).

A consult might also involve one or more procedures (e.g., radiography exams, blood tests, urinalysis tests, surgical procedures, or others), each associated to one and only one consult. For all procedures, the database should store a small textual description summarizing the actual procedure and/or its outcome. If the procedure was performed by an assistant (or assistants) working for the hospital, the corresponding assistant(s) should also be stored in the database.

Procedures of the type *radiography exams* are additionally associated to a set of resulting images, and the database should indicate the path for a file containing the images for each test.

In the case of urinalysis and blood testing procedures, the database should store a set of indicators measured through the test, together with the observed

values, and the units of measurement associated to those values (e.g., in the case of blood tests, we can have measurements corresponding to the number of neutrophils, lymphocytes or monocytes, in all three cases reported as a percentage of the white blood cells present in the sample). For each indicator, the database should also store a reference value (e.g., the measurement of a value significantly different from the reference can indicate a problem with the animal), together with a textual description detailing the reference value.

2   Expected Results

A project report for the 1st assignment should be submitted to Fénix as a single PDF file, readable with a standard program such as Adobe Reader. The report of your group must include two main results:

- An E-R model describing your proposed database design. Every design decision that can be captured in the E-R model should be represented in the diagram. The E-R notation should be the same as in the slides for the course. You may use a diagram editor, such as Dia, to draw the final E-R model to be included in the report.

- The relational model that is obtained by converting the E-R diagram into a set of tables. Please follow the notation and the conversion rules given in the slides for the course, and do not forget to include integrity constraints such as candidate/primary keys, and foreign keys.

The document cover page should mention the names, student numbers, and group number of its authors. If possible, the E-R diagram should be presented on a single page, and the relational model also on a single separate page. Do not forget to include additional integrity constraints, not captured in the E-R or relational models, separately for each case. Provide notes explaining the rationale behind non-trivial design decisions.