Sistemas de Informação e Bases de Dados 2019/2020

Project Assignment - Part 1

In this Part 1 of the project assignment you will design a database model to answer the information requirements of an application whose domain is presented below. Your job is to deliver a concise and clean data model using the Entity-Association model graphic notation taught in class and along with it identify and specify the appropriate Integrity Constraints.

Domain Description

You have been asked to design an information system to manage a Power Grid.

In power grids, we can find three main elements: power lines, bus bars and power transformers. Every element has a unique id. For each of these elements we must store specific data: for lines their impedance, for bus bars their operating voltage and, for transformers, the two operating voltages.

Each line connects two different bus bars. Each Transformer must be connected to two different bus bars. The voltages of these bus bars match the voltages of the transformer. Information regarding these connection points must be recorded in the database.

Each of these connections requires a breaker, which will only be used for a specific connection at any time. Like the other elements the breaker has a unique id; unlike the others the maximum voltage and the maximum current it can handle must be recorded.

The place where each transformer along its two connected bus bars is located, is called a substation. For substations, we must store the GPS coordinates, along with the name of the substation, that is usually the name of the locality, but not necessarily so. Substations are supervised by supervisors, each supervisor may supervise several substations but each substation must always have one, and only one, supervisor. Supervisors are often afraid of getting too near high voltage equipment.

Grid elements may have incidents, that is, an unforeseen occurrence that needs to be analysed. For each incident, the instant of occurrence, a short description and the severity must be recorded. For incidents with lines, we must record also the point of the line where the incident occurred. This point is a decimal number with 3 integer digits and 2 decimals.

To help with the analysis the system must keep the history of voltage readings at each connection point (line-bus bar, bus bar-transformer), and record the current and the voltage at a certain date and time.

The analysis of each incident is carried out by an analyst. Each incident may be analysed only once. When the analysis is concluded, the analyst must record the cause and fill in a report detailing the reasons.

No person can analyse incidents respecting elements of the substation he/she supervises.

Finally, it is necessary to keep, for each person in the system, their name, the address, phone contact and Tax Payer ID number. Persons are identified by their name and address. Phone and Tax ID numbers are unique.

Work to be developed

1. Design an **Entity-Association model diagram** for the problem domain presented in the previous section.
2. Identify those situations that are inconsistent in the problem domain but that are allowed in the presented Entity-Association model, and **define a set of Integrity Constraints** that complete the proposed model in order to prohibit situations that are invalid.

Aspects to keep in mind

Please keep in mind the following aspects while developing your work:

- The Entity-Association model must be **expressed** in **the notation taught in class**;
- The Integrity Constraints to the Entity-Association model must be written as **assertions expressed in terms of the concepts Entity-Association model**, that is, in terms of attributes, entities, and relationships between them;
- The **cleanliness** and **conciseness** of the model will be **evaluated.**

Report format and submission

The project assignment will be evaluated based on a report submitted by the students. The report must contain responses to the items requested above.

The following table shows the value of each part of the work to be carried out.

Item	**Relative Maximum Grading**
Entity Association Model	16/20
Integrity Constraints	4/20

The report should start with a cover page with the title "**SIBD Project - Part 1**", with the **name and number of students**, the **relative percent of each student's contribution**, together with the **total effort (in hours) that each element of the group dedicated to the project**, the **number of the group**, the **shift to which the group belongs**, and **the name of the laboratory teacher.**

Length: In addition to the cover sheet, the report shall have a **maximum** of **2 pages**.

The report will have to be submitted in two versions:

- Digital version, in PDF format, with name `delivery-01-GG.pdf` (where `GG` is the group number), to be submitted via Fénix System until the delivery date.
- Paper printed version, to be handed to the teacher in the next laboratory shift.