Degree in Computer Engineering

Databases – Supervised assignment: E/R

Academic year 2022/2023

1. Description of the work

This work consists of designing a database, including the **conceptual** (E/R diagram) and **logical** (relational schema) design. The steps to complete this work, and that guide the preparation of the documentation that must be submitted, are the following:

1.1. Step 1: Selection of the domain to model

Later, we present two possible topics, from which you must select one.

Each proposed domain is accompanied by a description - at a high level -. The description is divided into a series of **points**, numbered correlatively, and each point describes one or more aspects of the domain to be modeled.

The steps to develop at this stage of the work are:

a. Choose the domain you will use in the work. **You must choose only one of the two proposed domains: do not mix them.**
b. Many details of the domain description we provide are deliberately generic and/or ambiguous. **Write a document (approximately half a page)** that lists **all the assumptions you consider** in order to make specific the description of your work.

1.1.1 Rules for selecting the domain

The purpose of this work is to learn how to model a **real-world** process. Therefore, your work must meet minimum requirements, which have been set to ensure a sufficient degree of complexity. The minimum requirements are as follows:

- **You must implement ALL the points of the selected domain.**
- **There is not a minimum number of entity types that your E/R model must include. Yet it MUST have the necessary dimension to answer all the questions associated to each corresponding domain.**

If you do not fulfill these requirements, then your FINAL QUALIFICATION OF THE WORK will be very low or even zero.

1.1.2 Proposed domains

Option 1 – FIC Symphony Orchestra

The FIC symphony orchestra is known worldwide for the virtuosity of its members. They are experts in playing wind instruments (especially on exam dates), as well as percussion (especially on the dates when grades are published). The orchestra has decided to create a database to manage its activity. During the requirement analysis they have told us the following information needs:

a) They need to store the musical pieces that the orchestra has played throughout its history. For each piece they need to know at least its title, genre, era, and the name of its author (or authors). They also need to know whether a piece is a version of a previous piece, and, in that case, of which.
b) They need to know the types of instruments that are used in the orchestra. Each type (piano, flute, violin…) belongs to a specific category (wind, strings, percussion…). For each type they need to know how many units they have available for the musicians. All units must be kept in an inventory, and they must keep record, among other things, of the acquisition date and conservation state of each instrument.
c) Since information will be stored about pieces and instruments, they also want to store the number of units of each type of instrument (if it is the case) that are necessary to play a given piece (for instance, the religious piece "The gospel according to Lazarus" requires 4 violins, 2 pianos and 1 saxophone).
d) Of course, they need to know which musicians have been members of the orchestra at some point. For each musician they want to store their basic contact information, the type (or types) of instrument that they are able to play, and whether they are currently a member of the orchestra or not (that is, if they are available right now and can play in upcoming events).
e) The instruments in the inventory can be assigned to musicians (for instance, if they do not have their own instrument to play). A detailed record is required in the database, keeping track of all the musicians to which a given instrument has been assigned (or which instruments have been assigned to a musician), in what time periods (start and end date), keeping in mind that the same instrument could have been assigned to the same musician more than once.
f) They also need to keep track of all the concerts of the orchestra. For each concert they need to store at least the date, the location/venue and the pieces that will be played (and in what order).
g) Finally, for each concert they need to know the called musicians (among those that are available), and the type of instrument used by each of them in that concert.

Questions to answer about the domain:

1. What pieces are in the orchestra's repertoire? What is their basic information? How many authors do they have, and what are their names? Given a piece X: Is it a version of another older piece? In that case, of what piece is it a version?
2. Given piece X: What types of instruments does it require to be played? How many do we need, as a minimum, of each type?

3. Inventory: What types of instruments does the orchestra have? What is their category? How many instruments do we have of each type? What is the conservation state of each one?
4. What is the name of the musicians that are currently members? What is their contact information? What is the name of the musicians that have been but are no longer members?
5. How many types of instruments can play each musician? What are those types?
6. To what musician was the violin with serial number X assigned on 1/1/2021? How many times (that is, in how many different time periods) was that violin assigned to them? What are those periods?
7. In the concert scheduled in the FIC conference hall on date X: What pieces will be played? In what order?
8. Who are the musicians that will play violins during the concert mentioned in question 7?

Option 2 – Agency

The agency "Otra vez la han *liao parda*", an expert in managing friendly neighborhood associations (communities) such as the always exemplary "Comunidad de Montepinar" has asked us to design a database that helps them with daily work operations, taking into account that the following requirements must be fulfilled:

a) They need to keep a record of all the communities managed over time, and know which of them are communities that they are currently managing. For a community, it is necessary to know, among other things, the address where it is located and a name assigned by the agency itself.
b) Each community is made up of a set of apartments, of which, in addition to storing basic information such as their cadastral reference, surface area and participation fee, it is necessary to maintain a detailed record of owners. Thus, they want to store information about the owner (or owners) that an apartment may have had at different time moments, knowing, at each period, the percentage of ownership corresponding to each of the owners and which of them was the contact person. For each owner, it is interesting to know, among others, basic data such as his/her ID, name, address, email, and telephone number (or telephone numbers). In the same way, the information on the bank account, applicable at any time, must also be available (used to charge the community bills of each apartment).
c) Obviously, the agency must record all the meetings of a community. For each meeting they need to keep, among others, the day/time and place of celebration, and the final minutes that results once it finishes.
d) All the apartments of a community will be asked to attend each of its meetings. An apartment may or may not attend a meeting, and it may even also delegate the attendance to another apartment. In that case, they want to know which apartment was the one representing it.
e) At each meeting a sorted list of items will be dealt with. For each item they want to store a basic description, as well as any other additional data of interest that may be relevant when being explained to the audience. Some of these items will be put to a vote by the different attending apartments. If so, it will be necessary to keep the vote submitted by each of them and possible comments made in this regard.
f) An important part of the work carried out by the agency is to gather information on calls for grants that allow obtaining financing to execute possible improvements/works in the communities. For each grant is required to store at least a name, the official document of the call where it is explained, and the category (or categories) for which it offers financing

(e.g. accessibility, energy efficiency, insulation, etc.). A grant may consist of several phases of evaluation. For each phase, a description of the evaluation criteria must be recorded, as well as the minimum score necessary for an application to keep on being evaluated on successive phases of the grant, up to achieve its awarding.

g) Of course, the communities will be able to apply for the different grants, by presenting an application that must be kept. For each application, they want to record, among others, the application document itself, and the submission date. Each application will be evaluated in the different phases of the grant (either in just some or in all of them, depending on whether or not the score achieved by the application in one phase exceeds the minimum of the phase). The score received in each phase and possible associated comments must be stored. The agency also wishes to know the current status of an application (not processed, in process, or resolved), as well as the final result achieved and the total score received (if it has already been resolved).

Questions to answer about the domain:

1. Given an apartment X: Who were the owners on date Y, and what percentage of ownership corresponded to each one? Who of them was the contact person, at that moment, and what was the bank account to charge the community bills?
2. Is community C a community currently managed by the agency? Where was the meeting of community C, that took place on date Y, held? What were the items of the meeting and in what order were they discussed?
3. Which apartments attended the meeting of question 2?
4. Which of the apartments attending the meeting of question 2 delegated their vote to another apartment? By which apartment was each of them represented?
5. What was the vote submitted by each apartment for item P, that was put to a vote during the meeting of question 2?
6. What grants are registered in the database and what phases does each one have? What is the minimum score of each phase? What categories does the grant S provide funding for?
7. What grants has community C applied for?
8. For each of the already resolved applications of community C: What was the score obtained by the community in the different phases of each of those grants? Which of those grants were finally awarded to the community, and what was the total score obtained in each of them?

1.2. Step 2: Conceptual design – E/R diagram

Design a conceptual model for the domain you have chosen and draw the resulting **E/R diagram**. You should clearly specify all types of entity (indicating whether they are strong or weak) with their attributes, as well as the types of relationship between them. Remember to include the cardinality of the relationship types, and the (total, partial) participation of the participating entity types. To do this, **you must use the notation that was used in theory classes**. The characteristics of entity types, relationship types, and attributes should be explained if their name is not self-descriptive.

1.3. Step 3: Logical model design – Relational schema

Transform the previous E/R diagram into the corresponding **relational scheme**. You should clearly specify **the primary** and **foreign keys** for each resulting relationship. **The notation used in theory classes must be used.**

2. Submission rules and evaluation criteria

This work must be carried out **individually**.

At the end of the semester, the practice must **be defended** (in online mode, through Teams platform) with the teachers, who may formulate any question and comment about the work that they consider pertinent. The defense will be held, preferably, in the usual lab hours. Appointments for defenses will be announced in the page of the subject at UDC Virtual Campus. If the practice is not defended, it will not be evaluated (and therefore not graded).

2.1 Submission rules

The work must be submitted through the UDC Virtual Campus, with a limit on **April 28, 2023, at 11:55 pm.** Practices delivered after that date / time, or by any other means (in paper, by email, etc.) will not be accepted.

The work must be submitted using a single file **in ZIP or similar format**, which must include:

- Report of the work, **in PDF format**, with the following sections:
  1. Domain Description: signal the **chosen domain.** Make any clarifications that you consider appropriate for further correction of the work. In particular, indicate any particular assumptions you made about the domain.
  2. **E/R diagram.**
  3. **Relational scheme.**

2.2 Evaluation criteria

To assess the quality and completeness of the E / R diagram, each point of the proposed statements is accompanied by a list of queries that the conceptual model design should answer. **Every query that cannot be answered (due to errors or omissions in the model) will significantly reduce the assignment qualification.**

- **IMPORTANT NOTIFICATION:**
  - Those works done **jointly** by two or more persons will not be evaluated.
  - Those works where **copy and/or plagiarism** are detected will not be evaluated (and other measures included in UDC regulations for these cases will also be applicable).
  - Those works **not defended** within the established deadlines will not be evaluated either.

3. Software for drawing the E/R diagram

No special software is required, but below are some programs that make it easy to create the E-R diagram.

- Dia: http://dia-installer.de/, available for Windows, Linux and Mac.
- yEd: https://www.yworks.com/products/yed, in Java (multiplatform)

4. Personalized attention

The practical lessons will be devoted, until the submission date, to the realization of the supervised assignment, under the supervision of the teacher of each group.

Doubts about the supervised assignment may be raised both during the classes and during the tutoring hours of the teachers.

IMPORTANT NOTICE: All questions related to the supervised assignment must be addressed to the teacher of the group that corresponds to you (who is the person who will finally evaluate your work). No teacher will answer questions to students who do not belong to any of his/her groups.