

Evaluation criterias:

1. Quality of the modelization and of the corresponding DB.
2. Quality of the SQL code.
3. Quality of the application code, which must meet quality criteria like those which are required in project 2.
4. Smooth execution of the application with management of all exceptions (we should not have to restart the application). Please note that a penalty of up to 15 points could be applied if it is not.
5. Ergonomics of the interface.
6. Professionalism of the report.

Case study

Consider a Netflix_Poly online video rental platform. This platform allows members to buy and/or download videos.

For each member, we want to keep an email address, a password, a name, a postal address as well as credit card information (holder, number, expiration date, CCV). Note that you can have multiple credit cards for a given member.

The password can't stay as it is in the database, it needs to be encrypted before being saved.

There are two distinct categories of members: members who have a monthly subscription (we then keep the subscription price and the start and end date of the subscription) and members who make a payment per view. In this case, we then want to keep the number of films viewed in a film_payperview attribute.

Films are described by number, title, genre, production date and total duration in minutes. For any film, we want to know who are the people that participated to the film as well as their role (director, producer, actor, makeup artist, director, etc.). Note that we want to keep information about these different people such as their name, age, gender, or their nationality. We also want to know the salary received by each person in a given role. Note that the same person can take on several roles in the same film or in different movies. Note also that the same person can take on multiple roles in during his career. For example, Angelina Jolie was an actress in "Salt" and a director in "First they killed my father".

We also want to know if a film was nominated or won an Oscar, and in which category (Example: best director, best male actor, etc.). And for each ceremony of Oscars, we want to remember the date, the master of ceremony and the place of the ceremony. Note that the same film can be nominated or win several Oscars in different roles.

Some movies may have physical DVDs associated with them. Note that the number of a DVD is not unique per film and that one can have for example a film F1 with DVD1 and a film F2 with DVD1 too. Members can choose to order their own DVD and have it sent to their mailing address

or choose to watch a movie online. In the latter case, we keep the viewing date and the viewing duration. Indeed, when viewed in online, we want to be able to relaunch the film in the same place where it stopped.

The cost of sending a DVD is calculated based on the distance from the customer's address. Netflix_Poly therefore calculates, from the address of Polytechnique Montréal University, the number of Km to travel for the DVD to get to the member's home. Each Km costs 25 cents. We can then find out the cost of sending a DVD in dollars and record it in the customer's order, as well as the DVD's shipping date. You must be able to find all the orders of a member, whether they concern sending a DVD to their home or viewing a film online.

Work to be done (100 points)

- 1) Read the case study carefully. Establish your assumptions. Discuss it with your teacher assistant. Make sure your model represents what was requested.
- 2) Suggest an entity-relationship model allowing you to meet the needs expressed above and allowing you to respond to the queries mentioned below. Don't forget any component of the model. Use your software choice to create the model in UML notation. (10 points)
- 3) List your tables, their functional dependencies and indicate the normal form of the relational database obtained. Explain in detail and with a rigorous approach how you came to your conclusion on the normal form of your database. (5 points)
- 4) Create the corresponding PostgreSQL database. Indicate your primary keys and foreign keys. Don't forget any constraint necessary in your model (example: integrity referential, non-zero values, etc.). Note that your script must be done by hand and not generated with PGADMIN. Save your SQL code in bdschema.sql. (10 points)
- 5) Enter data in the database and save your data in data.sql. Note that your script must be done by hand and not generated with PGADMIN. Make sure you have data to respond to queries as indicated in the query list below. (2 points)
- 6) Create the queries below and save them in a query.sql file. Note that each SQL query must be preceded by a comment containing the query in French. (15 points)
- 7) Express the queries #1, 2 and 5 in relational algebra (3 points)
- 8) Create a trigger in a trigger.sql file which calculates the cost of sending a DVD to a given address. When the DVD is sent, this trigger must automatically insert the calculated cost and store the corresponding information in the database. Here you have the choice to integrate an API such as Google maps (this is the ideal solution) or to calculate a number of "standard" kms based on predetermined postal codes. (5 points)
- 9) Create two transactions in a transaction.sql file as explained in the Transactions section. (5 points)

10) Create a web application so that the user can directly query the database data (see Web Application section). (35 points)

11) Create a report called matricule1_matricule2_TP4.pdf. See the Report section. (10 points)

List of queries to implement

- 1) Display all the information about a film specified by the user (according to the title).
- 2) For each genre of film, list all the film titles in that genre as well as the last date on which a film was purchased (DVD) or viewed.
- 3) For each genre of film, find the names and emails of the members who downloaded them most of the time. For example, Amal Z is the member who has downloaded the most animal documentaries.
- 4) Find the total number of films grouped by director.
- 5) Find the names of members whose total DVD purchase cost is higher than the average.
- 6) Return a list of ordered films in terms of total quantity sold (DVD) and number of downloads
- 7) Find the title and price of films that have never been ordered in the DVD form, but which have been downloaded more than 10 times.
- 8) Find the name and date of birth of the actors who play in the movies that are downloaded most often (more than average).
- 9) Find the name of the director(s) who made the films with the greatest number of Oscar nominations. For example, Woody Allen and Steven Spielberg made 10 films that have been nominated for Oscars.
- 10) Find the names of the directors who were most often nominated for the Oscars but who never won an Oscar.
- 11) Find the movies (title, year) that won the most Oscars. Also list their directors and their actors.
- 12) Which pairs of Quebec women most often worked together in different movies?
- 13) How has the career of Woody Allen evolved? (We want to know all his roles in a film (director, actor, etc.) from oldest to most recent)

Transactions

Let T1 be the transaction which inserts a new DVD shipment and updates the cost of the shipment and which validate the transaction.

Let T2, the competing transaction to T1 which sends a query on the average cost of sending all DVDs and who validates the transaction.

Implement these transactions with the minimum level of isolation that ensures integrity of the data returned to the user (we do not want to have a false average) in case concurrent execution.

Demonstrate smooth concurrent execution by showing SQL execution steps by step as done in the school laboratory tutorial. Show that it no longer works with a higher level of isolation using SQL.

Web application

You must program a web application using the Node and Angular stack. Your Web application must allow, through an interface, to insert, delete, modify and to query data from your database. You must allow:

1) Administrative functionality (20 points):

- a. Registering a new member. (5 points)
- b. Adding, deleting and editing a new movie. (and the information associated) (15 points)

2) Functionality for a given member (the member must be able to log in the system) (15 points)

- a. Display all the information about a film specified by the user. In other words, the user must select the title of a film from a list, and the information should then be displayed on the screen. (5 points)
- b. Watch a film as a member, either from the beginning or by resuming it where the member stopped. This involves logging in, having an interface containing a choice of films and then being able to watch the film from the beginning or continue it from where it stopped (10 points).

-Note that the teacher assistant must be able to install and run your application trouble-free by following the installation guide and user guide you're going to prepare.

- Also note that your application must add/modify/search the data via appropriate SQL queries. In no case you should process data on the application level (example: using Javascript filters).