Lab 2: ERD Design & DDL Conversion

University of Toronto Mississauga

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ER Diagram Requirements

The University of Toronto (UofT) is trying to design a new simple database to manage most of the information for its employees, students, and administration departments/faculties because the current database structure is too redundant.

You've been hired by UofT as the Database Administrator(s)/Architect(s), where you have been tasked with preparing an Entity-Relationship Diagram (ERD) describing the university schema for Human Resource (HR) management.

First of all, the HR department of the University of Toronto wants to know general tri-campus information. For each campus, it should have a unique CampusID, a campus name, and an address (e.g., UTM has the CampusID `5`, with the name `Erindale`, and address `3353 Mississauga Road`).

Each campus holds at least one Faculty (e.g. "The Faculty of Arts and Science", "The Faculty of Medicine", etc.) and a Faculty can have the same name (e.g., we have "The Faculty of Medicine" located at both UTSG and UTM). Each Faculty record can have the CampusID where the Faculty is located and must have the name of the Faculty, the EID (a unique Employee IDentification number) of the Dean of the Faculty, and the phone number of the Office of the Registrar for that particular Faculty.

A Faculty can manage 1 or more Departments. Each Department has an unique DepartmentID. The database needs to record the name of the Department and the Faculty that manages that Department. Also, the database needs to have a contact phone number for the Department's academic advisor. Each Department has a Chair, so we record the Chair's EID of each Department.

Furthermore, a Department can offer multiple Courses. Each Course has its own course code, and session offered. The course code can be reused each term, so it must be paired with the session it's offered in to uniquely identify the tuple. Each Course is coordinated by one Professor and has one or more lecture sections offered at a specific time that is taught by a Professor. Further, a professor can coordinate more than one courses in a semester. Both coordinating and lecturing professors' EID must be recorded. Students have to attend a specific lecture section of a course. After the courses end, the final mark is provided by their professor. The grade is formed by the CourseCode, Letter Grade, and the numeric Mark.

The HR department of the University of Toronto also needs to know general information for a person. Every person is assigned an alphanumeric UtorID, which is unique to that person and cannot be reused. A person has first name, last name, date of birth, and might also have a SIN.

A Student can be identified by their UtorID, however, the HR department has asked us to make them uniquely identifiable by their StudentID (i.e., a 9-10 digit number) because some systems require only numeric values. Additionally, every student needs to have an emergency contact, this means having one emergency contact name and one emergency contact phone number. The HR department also needs to identify student's status, whether the student is registered as full-time or part-time at a campus.

Students and employees should belong to a campus, so the HR department can contact them easily. Employees might be cross-hired which means that they might be working at more than one campus or in more than one department. A student can take any courses that are offered at any of the three campuses but they will only be registered at the one campus which they pay their tuition to. There is no limit on the number of lecture sections a student can attend.

If the person is an Employee, then the HR department needs that person's unique Personnel Number and EID (Employee ID). An EID is for access purposes (e.g., building access, computer access, etc.) while a Personnel Number is for HR purposes (e.g., salary and benefits). Of course, an employee needs to provide their SIN to HR in order to be taxed properly. Moreover, an employee's status can be either part-time or full-time. The Role of an Employee can be either a Faculty, a Staff, or a Librarian.

If the student is a Teaching Assistant, which is a Staff member, they can support 1 or more courses and have a specific number of ContractHours assigned by the HR department. Furthermore, the student needs to provide the SIN (Social Insurance Number), and is assigned a PersonnelNum (personnel number) allowing the student to work at the university and receive a pay slip and T4 form (for tax purposes); otherwise, the information is optional.

The employee can also be a Professor. The HR department needs to keep track of the type of professor they are (i.e., Teaching Stream, Tenure Stream, and CLTA) and their rank (i.e., Assistant Professor, Associate Professor, and Professor) in order to run the correct program to pay their salary.

Tasks

1. Construct the Entity-Relationship Diagram (ERD)

Draw an Entity-Relationship Diagram (ERD) to capture the described requirements. The ERD must be electronically drawn (using Draw.io). You cannot add additional attributes, relationships, or entity-sets not defined in the specification above. You cannot assume anything as the set of requirements are very particular. If you wish to justify a choice made due to ambiguity, you may do so in text format in the submission PDF (on a different page from the ERD). You must use Chen's Notation, as per the notational reference sheet provided in lecture. Do not make up your own notation, do not use the textbook notation, do not google notation. Please ensure that your ERD is clearly readable and that line crossing does not happen. Neither handwritten submission nor hand-drawn illustrations will be accepted for credit.

2. Convert the ERD to Data Definition Language (DDL)

Provide the corresponding PostgreSQL "CREATE TABLE" statements describing the relational schema. You must enforce both inter- and intra-relational constraints (note: you **cannot disable** foreign key checks!). Please include all your statements in an executable script (`lab2.ddl`) that can be run on the MCS PostgreSQL server. Scripts that do not execute on the server, when the file is run, will not be marked and a grade of 0 assigned.

Requirements and Submission

This lab is to be completed in partners (in the same pairs of 2 selected in Lab 1) unless written permission is given by the Course Coordinator. You and your partner are required to work together, equally contribute to, and understand all parts of your submission. Please refer to the syllabus for additional details on groups and the "Minimum Standards for Submitted Work".

All submission are required to be written in LaTeX. I would strongly suggest using Overleaf as a means of collaboratively editing LaTeX documents. You are not permitted to use another word processor.

All files are to be submitted using the MarkUs platform (https://markus108.utm.utoronto.ca/csc343s22/). You or your partner must create the "group" and the other must accept the invitation to join. Once your group is formed on MarkUs, only one person from each group is required to submit the file(s). You may submit as many times as you like, in fact you are encouraged to do so! Groups that were created in Lab 1 will persist (so there may be no need for you to create a group!). Please ensure your answers are typed and submissions is clearly legible/understandable.

Entity-Relationship Diagrams (ERDs) must be completed on Draw.io allowing you and your partner to collaborate and extract the raw `XML` file (which is to be submitted too).

You must include your, and your partner's, full name and student ID number in both the LaTeX file, DDL file, and in the PDF. Submit your answers to the ERD in one file called **`lab2.pdf`** and your answers to your `DDL` file called **`lab2.ddl`**. Additionally, you must submit the source LaTeX file (**`lab2.tex`**) and `XML` file (**`lab2.xml`**).