

CSCI 3901 Winter 2021

Lab 9: Database design

Due Friday Mar. 26th, 08:30 AST in Brightspace

Objective

In this lab, you will practice designing databases with key constraints.

Complete this lab **alone or in a group of 2**.

Preparation

- Make sure that you are using your own private database on db.cs.dal.ca.
 - To do so, execute the command `use USERID;` where USERID is your CSID.
- Ensure that MySQLWorkbench is allowing you to do updates and deletions.
 - To do this, you may execute the command `set SQL_SAFE_UPDATES=0;`
 - Alternatively, you can go into the MySQLWorkbench Preferences, then the SQL Editor tab and uncheck the Safe Updates box.

Resources

- MySQLWorkbench

Procedure

Set-up

1. Create two tables in your database and include some basic information into the tables using the following commands:

```
create table web (  
    web_id int primary key,  
    URL varchar(50)  
);  
  
create table course (  
    course_key int primary key,  
    name varchar(10),  
    web_id int  
);
```

```

insert into web values
    (1, "cs.dal.ca"),
    (2, "google.com"),
    (3, "dal.ca");
insert into course values
    (1, "csci3901", 1),
    (2, "csci5100", 1),
    (3, "math1000", 3);

```

Lab steps

In part 1 you will execute a sequence of steps to modify the database you just created. In part 2, you will design a database given an ER diagram.

Part 1 - Key constraints

1. Make the following changes to the database and report on their success or failure:
 - (a) Add an entry to `course` with `web_id` of NULL
 - (b) Add an entry to `course` with `web_id` of 2
 - (c) Add an entry to `course` with `web_id` of 4
 - (d) Add an entry to `web` with `web_id` of 5

2. Explain how you could identify all the entries in `course` with bad `web_id` keys.

3. A foreign key constraint can be added to the `course` table with the command

```
alter table course add foreign key (web_id) references web (web_id);
```

Determine whether the foreign key constraint can be successfully added with the above command in each of the following cases:

- (a) `course` contains a `web_id` that is a bad foreign key
 - (b) `course` contains a `web_id` that is NULL
 - (c) `course` contains only `web_ids` that are in `web`
4. Add `web_id` as a foreign key in `course`, making any changes to either table necessary to do so.
5. Explain what it means if you allow a foreign key column to be NULL
6. Explain what it means if you **do not** allow a foreign key column to be NULL
7. Make the following changes to the database and report on their success or failure:
 - (a) Delete `course_key 2` in `course`
 - (b) Delete `web_id 3` in `web`
 - (c) Delete `web` (i.e. using `drop table web;`)
 - (d) Delete `course` (i.e. using `drop table course;`)
8. Explain why the previous commands succeeded or failed.

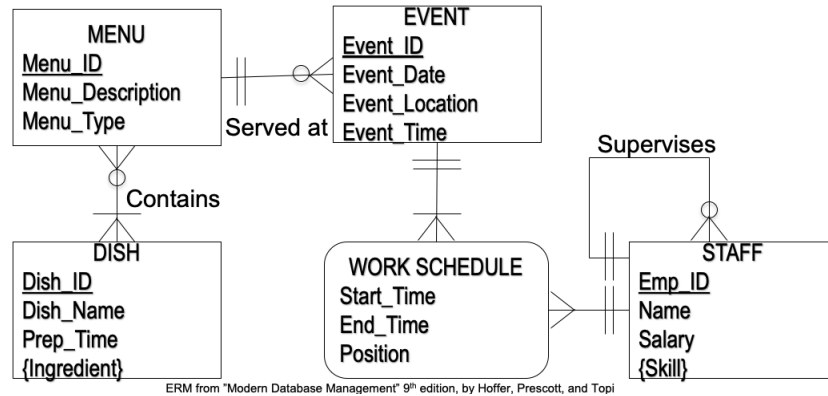


Figure 1: Entity relationship diagram

Part 2 - Database design Translate the ERD from fig. 1 to a set of tables in your database. Use the prefix `ds_` (for “dining service”) in your table names to let you group all the tables from this exercise.

In the figure, underlined attributes represent primary keys and attributes in curly braces `{ }` represent multi-valued fields.

Questions

1. How can foreign key constraints help to maintain the integrity of data in your database?
2. Is there only one valid design for a database with a given ER diagram?

Reporting

1. In one file, list
 - The members of your team.
 - Your answers to the questions in Part 1
 - The SQL commands to create your database in Part 2
 - Your answers to the broadening questions
2. Generate a PDF from the document.
3. Submit the PDF in Brightspace in the Lab/Lab 9 folder.

Assessment

The assessment will be on a letter grade and will reflect your understanding of database keys and database design.