CS 284, Interim 2018, R. Brown

Homework 3 Due Tuesday, 1-16-18

Note: Create a subdirectory ∼/MCA/hw3 for your work on this homework. Submit your work using `stogit`

A. SQL

1. *By hand*, write Postgres SQL commands to accomplish the following. Use the text page *Introduction to SQL* and the Postgres reference (linked to homepage) to look up the syntax. For this part, try to get the syntax exactly correct without checking your work on the computer.

   a) Write a `CREATE TABLE` command to define a table `book` representing books in a library, with fields described by the following diagram.

callno	category	title	author

   The call number `callno` should be a primary key, and should be a string of up to ten characters. The other fields should be strings of any width (use the Postgres type `text`).

   b) Write `INSERT` commands to add the following values to the table `book` .
   Note: Write out at least one of these `INSERT` commands by hand.

   - The novel *War and Peace* by Tolstoy, with call number `TOL-WP`.
   - The biography *PT 109* by Kennedy, with call number `KEN-PT1`.
   - The text *Modern Operating Systems* by Tanenbaum, with call number `TAN-MOS`.
   - The text *Structured Computer Organization* by Tanenbaum, with call number `TAN-SCO`.
   - The novel Catch-22 by Heller, with call number `HEL-C22`.

   c) Write a `CREATE TABLE` command to define a table `patron` representing a person who may check out books from a library, with fields described by the following diagram.

pid	name	phone

   The column `pid` should be the primary key and should be an integer. The column `name` should be a string of any length, and must not be `null`. The column `phone` should be a string of length four. Also, no two rows of the table should have the same combination of `name` and `phone` values.

   d) Write `INSERT` commands to add the following values to the table `patron`.
   Note: Write out at least one of these `INSERT` commands by hand.

   - Chris, with phone number 9162 and key value 1.
   - Paul, with phone number 9044 and key value 2.
   - Sam, with no phone number and key value 4.
   - Sue, with phone number 9292 and key value 5.

2. Enter your SQL commands from the previous question, using your Postgres database on our system.

   Notes:

- These instructions assume you are working on a Link machine, either logged into the console or connected via `ssh`.
- Your database password was distributed to you in a specially formatted google doc. Download that google doc and rename it to ∼/`.pgpass`, then execute

  ```
  % chmod 600 ∼/.pgpass
  ```

  to prevent others from accessing this password. (The Postgres programs we will use expect that security protection.)
- To connect to the system, enter

  ```
  % psql mca_i18 -h shelob.cs.stolaf.edu
  mca_i18=> set search_path = username,public;
  ```

  where *username* is your Postgres username (same as your St. Olaf username).
  - Entering the `set` command above causes the table operations you perform to happen in your personal Postgres schema rather than someplace else.
  - The `public` provides you with access to the shared schema for the course.
- To exit `psql`, you can enter `\q` or `\quit` at the `mca_i18=>` prompt. *Note:* `\q` and `\quit` are **not SQL commands**. They are "meta-commands" that are processed by `psql`, not by the Postgres DBMS.
- Here are suggested steps for entering your table definitions:

  i) First, enter the definition of the table `patron` and the four `INSERT` commands for populating it, directly into your `psql` session, to get experience with that interface. You can check your work by entering

  ```
  mca_i18=> SELECT * FROM patron;
  ```

  which, at the end, should display the four user records.

  ii) Then, use an editor to create a text file `book.sql` containing your `book` table definition and `INSERT` commands.

  iii) Now in `psql`, enter the meta-command

  ```
  mca_i18=> \i book.sql
  ```

  You can use `SELECT * FROM book;` to check for success, and you can edit `book.sql` to make corrections and try again using `\i`. *Note:* To remove an (incorrect) version of the table `book`, enter

  ```
  mca_i18=> DROP TABLE book;
  ```

3. To deliver this work, create a dump of your database using the following command, where *user* is your username, then submit the file `hw3A3.sql` electronically with the remainder of your homework via `stogit`.

   ```
   % pg_dump mca_i18 -n username -h shelob.cs.stolaf.edu > hw3A3.sql
   ```

   Here, *username* is your St. Olaf username. Be sure to submit your files `hw3A3.sql` and `book.sql` via `stogit`.

   Note: A *dump* of a database can be used as a backup to restore that database in case of data loss, or to move that database between different servers for the same DBMS software.

B) **Databases vs. file systems [H]**

Read the advantages of a DBMS vs. a file system in the online text web page "Introduction to Databases" (`http://www.stolaf.edu/people/rab/mca/text/dbintro.html`, hereafter abbreviated as `mca/text/dbintro.html`), then answer the following question for each of the data situations below.

Question: For each of the purposes listed below, which type of system would you use to store data for that purpose, and why? Answer D for database or F for file system, and justify your answer in a paragraph citing advantages of those systems listed in `mca/text/dbintro.htm`. (Submit these answers by hand.)

1. External documentation for developers of a software application.
2. Telephone company records of phone calls (not transcripts of the conversations, but dates, times, costs, phone numbers, etc.)
3. Components of a newspaper page: column structure, text, pictures, page number and section name, etc.
4. A body of email messages.
5. Responses to a survey consisting of multiple choice and short answer questions.

C) **Reading**

1. Read the *Introduction to Databases* (`mca/text/dbintro.html` and the Introduction to SQL SELECT in the "text" area, `mca/text/sql.html#select`, and submit one or more questions on that (or other SQL pages in the "text") using the reading-question form.
2. **Also, read Lab 7 which will be assigned soon.** You may optionally submit one or more questions in a *separate submission* of the reading-question form.