CSci 4707: Practice of Database Systems
Lab 3
Spring 2017

Due: 04/11/2017 18:30 on Moodle
There will be a 10% penalty off your grade for a 24 hours late submission.
This lab can be done in a group of two.

A. Introduction

This lab needs to be done in a group of two. You are going to modify the functionality of the OFFSET operator in PostgreSQL. The original functionality of the OFFSET operator can be seen in here.

B. Modified OFFSET

The modified OFFSET functionality should have the following behavior: when "OFFSET k" is used in a query, instead of skipping the first k rows, the database should keep k rows, then skip k rows, then keep another k rows, and so on. An example of the operation can be seen as follows:

sid	name
1	John
2	Sam
3	Mark
4	Ted
5	Ross
6	James
7	Tom

SELECT * FROM Student OFFSET 2;

sid	name
1	John
2	Sam
5	Ross
6	James

C. Setting-Up PostgreSQL (Same as Lab 1)

PostgreSQL is a large software. You will want at least 200 MB of space in your machine. Download version 9.6.1 of PostgreSQL and create the installation location by executing the following commands:

```
// Download the PostgreSQL and extract it.
$wget https://ftp.postgresql.org/pub/source/v9.6.1/postgresql-9.6.1.tar.gz
$tar xvzf postgresql-9.6.1.tar.gz

// Create the installation folder, called "install".
$mkdir install
```

Then, we retrieve the full path of both source and installation folder by executing the following command:

```
// Retrieve the full path of the directory.
$pwd
# This will return a full path of your current directory. Throughout this
documentation, this path is called as $W$
```

Thus, the path of the PostgreSQL's source code is located at "W/postgresql-9.6.1" and the path where we will install PostgreSQL is located at "W/install".

Next, you will configure the installation of PostgreSQL and install PostgreSQL on the given path by executing the following commands:

```
// Go to the source directory.
$cd postgresql-9.6.1

// Run the configure command.
$./configure --prefix=$W$/install

// Run the makefile.
$make
# You should see the following output.
All of PostgreSQL successfully made. Ready to install.

// Run the installation.
$make install
# You should see the following output.
PostgreSQL installation complete.
```

After the installation has finished, you will need to initialize and create a database to use. In this example, we will initialize the database at "W/install/data" folder by executing the following command:

```
// Go to the installation folder.
$cd ../install
// Initialize database.
$bin/initdb -D data
```

Once the database has been initialized, we can start the PostgreSQL backend by executing the following command:

```
// Execute the backend.
$bin/postgres -D data
```

We can then use this terminal to get information on what is happening in our DBMS.

To run the client, open another terminal and use the following command to create a database to use: (In this example, we call the database as ProjectDB)

```
// Create the ProjectDB database.
$cd $W$/install
$bin/createdb -h localhost ProjectDB
```

We interact with our DBMS by using a program called psql. To start psql, use the following command:

```
// Run psql
$bin/psql -h localhost ProjectDB
```

The next time you want to start the database again, you only need to run two consoles where one is for the backend and one is for the psql console:

```
// Execute the backend.
$bin/postgres -D data

// Execute the psql console.
$bin/psql -h localhost ProjectDB
```

Several important commands for the lab are:

```
// You must exit psql by typing the following command and do not use Ctrl+C
ProjectDB=#\q

// To run an sql script located at $W$/script.sql
ProjectDB=#\i $W$/script.sql
```

D. Modification

Most (if not all) of your changes will be located in the following directory:
"W/postgresql-9.6.1/src/backend/executor/". With this change, the original LIMIT operator
needs to be working as is and we should be able to execute both LIMIT and OFFSET together
within a query.

E. Compiling and Testing Your Changes

To compile your changes, you must run the following three commands from the source directory,
i.e., W/postgresql-9.6.1:

```
// Clean the executable.
$make clean
// Remake
$make
// Install the changes.
$make install
```

To test your change, you may use the dataset from any previous labs or create a new dataset on
your own, and look at the resulting query with the LIMIT operator.

F. Help

The PostgreSQL online source code documentation will be an invaluable resource for this lab
and the next. You can find it here.

Since reading and understanding an open-source framework is the main goal of the lab, the TA is
only allowed to do the following:
Help you with the installation of PostgreSQL.
Help you in understanding the concept of buffer management policy (not specific to PostgreSQL
query optimizer).
Help you in understanding what the assignment wants you to do.

Unfortunately, the TA is not allowed to help you in navigating the source code (including telling you the functionality of a function or variables) since one of the goal of the lab is to make sure that you understand the source code of the query optimizer in PostgreSQL. Once you understand the source code and know where to make the change, it is very easy to solve the lab.

G. Submission Guideline

One submission per group! You must submit a zip file named lab2.zip which contain:
(1) "changes": A folder that contains all files that you have changed in order to fulfill the lab. Please only submit the file itself (don't include the directory). For example: if you change a file in src/backend/foo.c, only put foo.c in the folder.
(2) "solution.txt": Modify the solution.txt template from the zip file as per your changes.
Each violation to the submission guideline will result in a 10% penalty.

H. Grading Criteria

- 20 Points: Your changes must be able to compile without any errors.
- 50 Points: The OFFSET operator.
- 30 Points: The quality of your solution.txt