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Lab 8 Report Images:

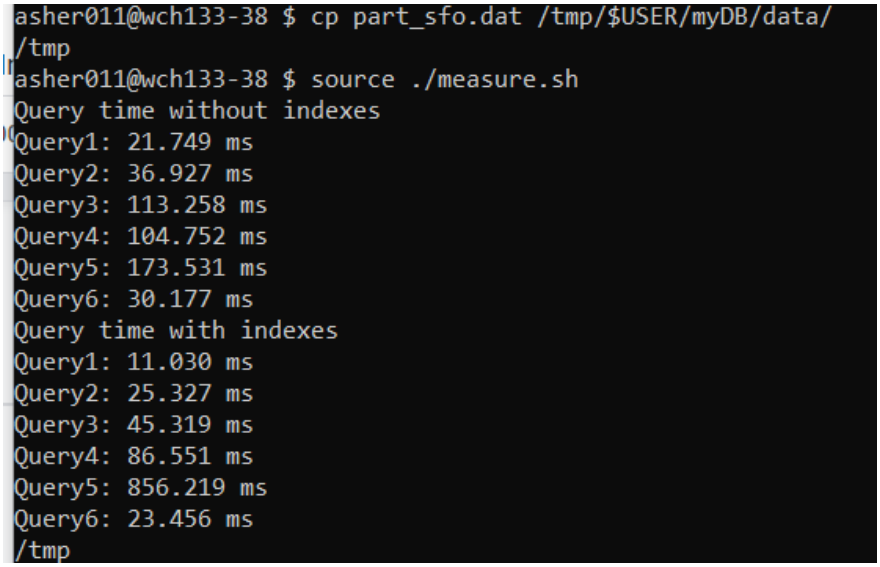
First I logged into my designated lab machine - wch 133-38.
Next I copied over the new and needed files from the lab 8 zip folder to the /tmp folder.
Then I ran source ./startPostgreSQL.sh inside the /tmp folder
Next I ran source ./createPostgreDB.sh

Next I created my queries.sql file, my create_indexes.sql file, and updated measure.sh to repopulate the table after the running of the queries first without any indexes created, so when ran with indexes later, the same values of data are present. I also modified measure.sh to match the naming convention of my database.

Next I moved the data files to where they needed to go:
cp part_nyc.dat /tmp/$USER/myDB/data/
cp part_sfo.dat /tmp/$USER/myDB/data/

Then I ran measure.sh three times to get average results.
source ./measure.sh

First run:



Results:
Run 1:
Query time without indexes
Query1: 21.749 ms
Query2: 36.927 ms
Query3: 113.258 ms
Query4: 104.752 ms

Query5: 173.531 ms
Query6: 30.177 ms
Query time with indexes
Query1: 11.030 ms
Query2: 25.327 ms
Query3: 45.319 ms
Query4: 86.551 ms
Query5: 856.219 ms
Query6: 23.456 ms

Run 2:
Query time without indexes
Query1: 21.134 ms
Query2: 34.984 ms
Query3: 114.530 ms
Query4: 103.868 ms
Query5: 121.017 ms
Query6: 27.859 ms
Query time with indexes
Query1: 8.108 ms
Query2: 18.785 ms
Query3: 37.203 ms
Query4: 74.541 ms
Query5: 760.658 ms
Query6: 16.453 ms

Run 3:
Query time without indexes
Query1: 21.277 ms
Query2: 36.701 ms
Query3: 120.766 ms
Query4: 103.420 ms
Query5: 114.324 ms
Query6: 18.573 ms
Query time with indexes
Query1: 6.057 ms
Query2: 14.361 ms
Query3: 29.956 ms
Query4: 63.070 ms
Query5: 626.348 ms
Query6: 7.472 ms

Average results:
Query time without indexes
Query1: 21.3867 ms
Query2: 36.204 ms
Query3: 116.1847 ms
Query4: 104.013 ms
Query5: 136.2907 ms
Query6: 25.5363 ms
Query time with indexes
Query1: 8.3983 ms
Query2: 19.491 ms
Query3: 37.4927 ms
Query4: 74.7207 ms
Query5: 747.7417 ms
Query6: 15.7937 ms

Average Difference From Regular Run to Index Use:
Query1: With Indexes = 12.9884 ms saved
Query2: With Indexes = 16.713 ms saved
Query3: With Indexes = 78.692 ms saved
Query4: With Indexes = 29.2923 ms saved
Query5: With Indexes = 611.451 ms wasted
Query6: With Indexes = 9.7426 ms saved

For most queries used here, indexes increase run speed, except in the case of Query 5 (update all on hand values) in that case, Indexes greatly increased run time due to the storage component of each index that was saved. (I created an index for every value I found used)

Modified contents of measure.sh:

```
#!/bin/bash
psql -h localhost -p $PGPORT $USER"_DB" < create_tables.sql > /dev/null
sleep 5

echo "Query time without indexes"
cat <(echo '\timing') queries.sql | psql -h localhost -p $PGPORT $USER"_DB" | grep Time | awk -F "Time" '{print "Query" FNR $2;}'

psql -h localhost -p $PGPORT $USER"_DB" < create_tables.sql > /dev/null
sleep 5

psql -h localhost -p $PGPORT $USER"_DB" < create_indexes.sql > /dev/null

echo "Query time with indexes"
cat <(echo '\timing') queries.sql | psql -h localhost -p $PGPORT $USER"_DB" | grep Time | awk -F "Time" '{print "Query" FNR $2;}'

```

I then ran source ./stopPostgreDB.sh to shut down the database.

In elearn I will submit both my queries.sql file and my create_indexes.sql file.
As well my lab8.txt file including my average results, along with this report.