Assignment 2

Part 1

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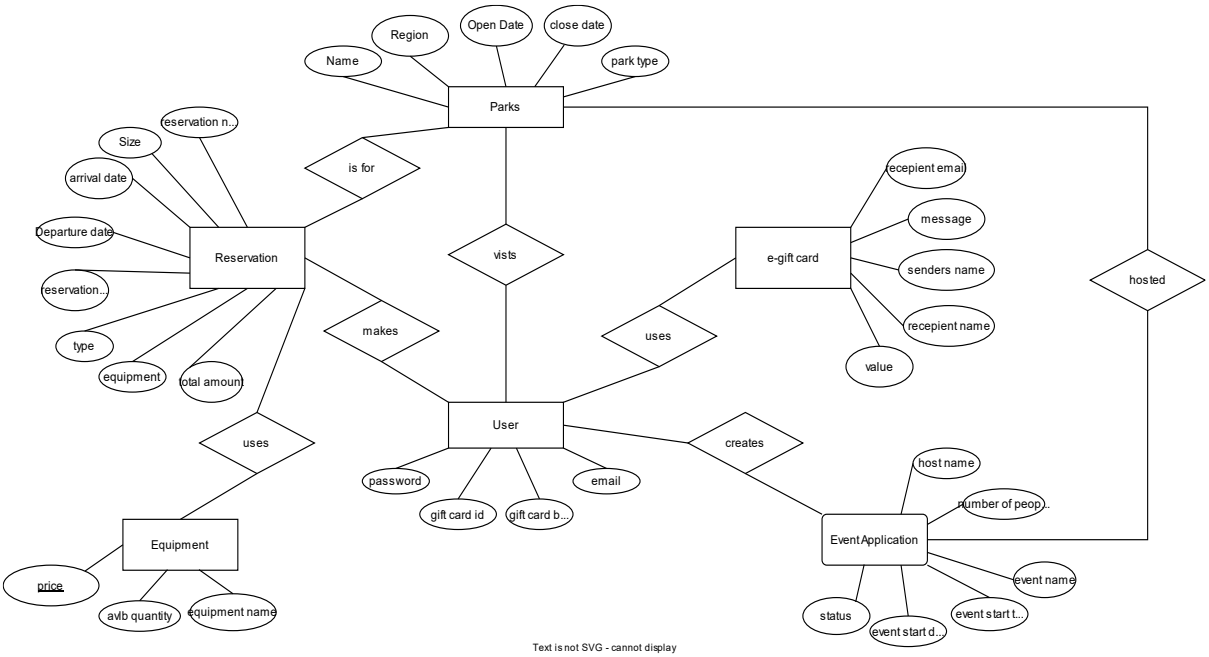
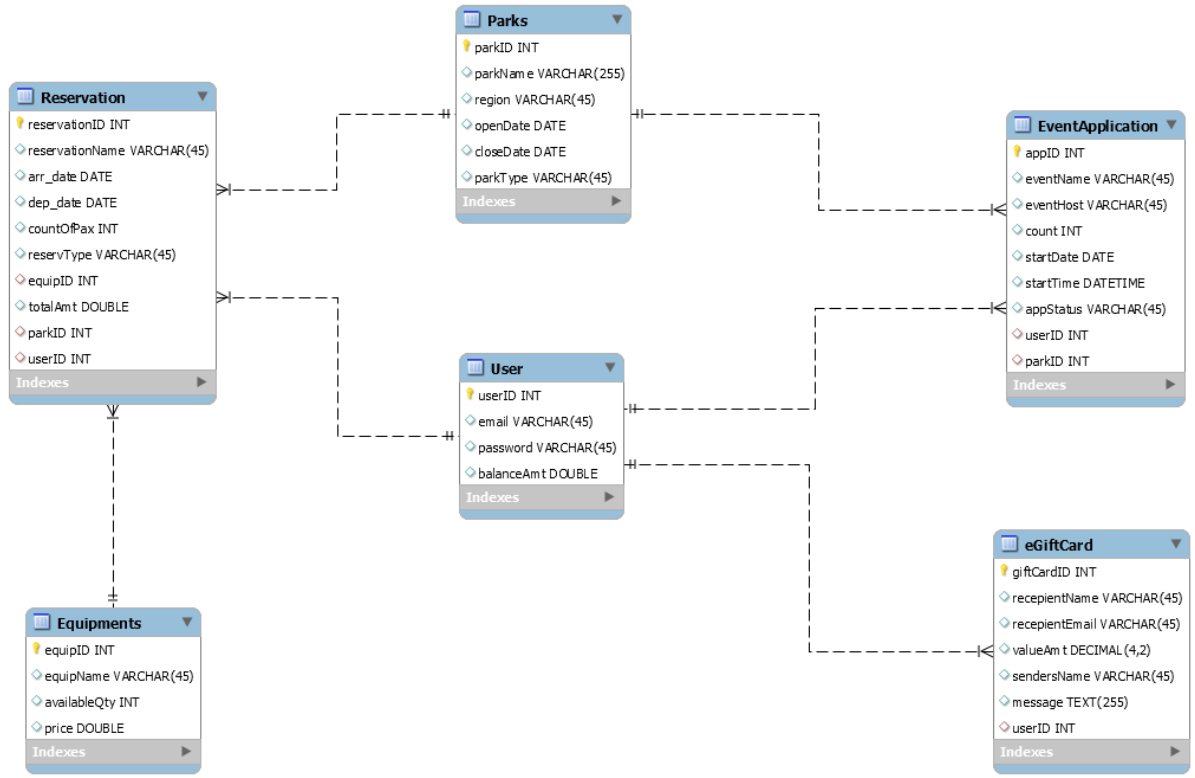
Identified the following entities from Home | Nova Scotia Parks

1. Parks
2. Reservations
3. User
4. e-gift card
5. Equipment
6. Event application

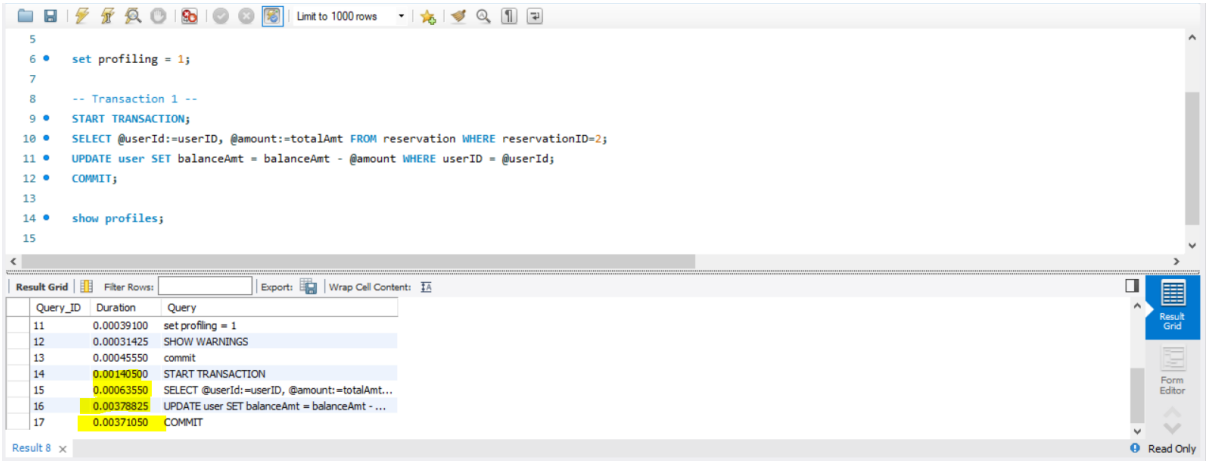
A user can visit a park. A user can make a reservation to visit a park and reserve equipment's needed during the park visit. User can purchase an e-gift card and send it to a recipient user. Gift card value could be used for making a reservation. An event can be hosted in the park by filling an event application form.



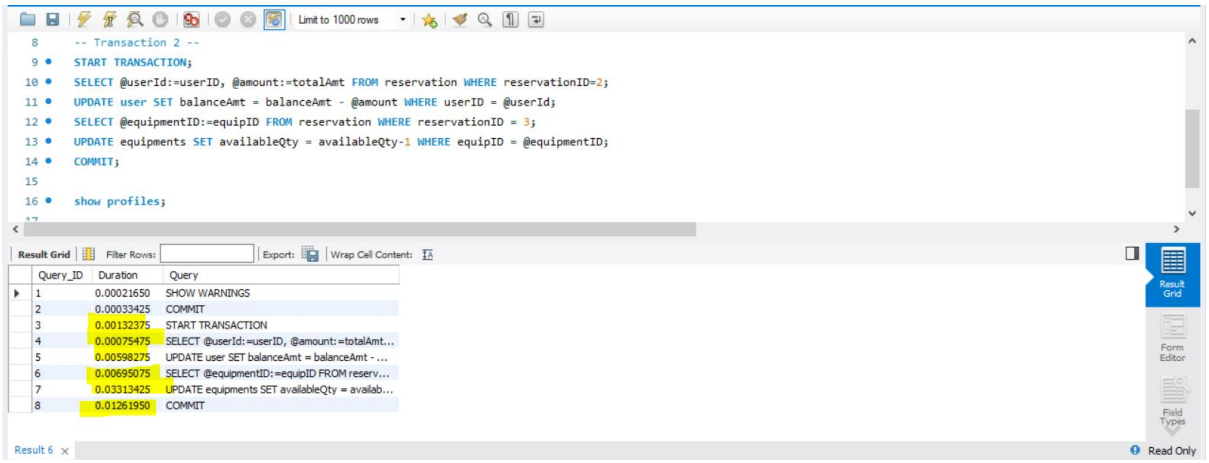
Physical Model



1. Executed the following transaction with 1 Select and 1 Update query as shown below on the **local database A2_Locvrxxxxxx**



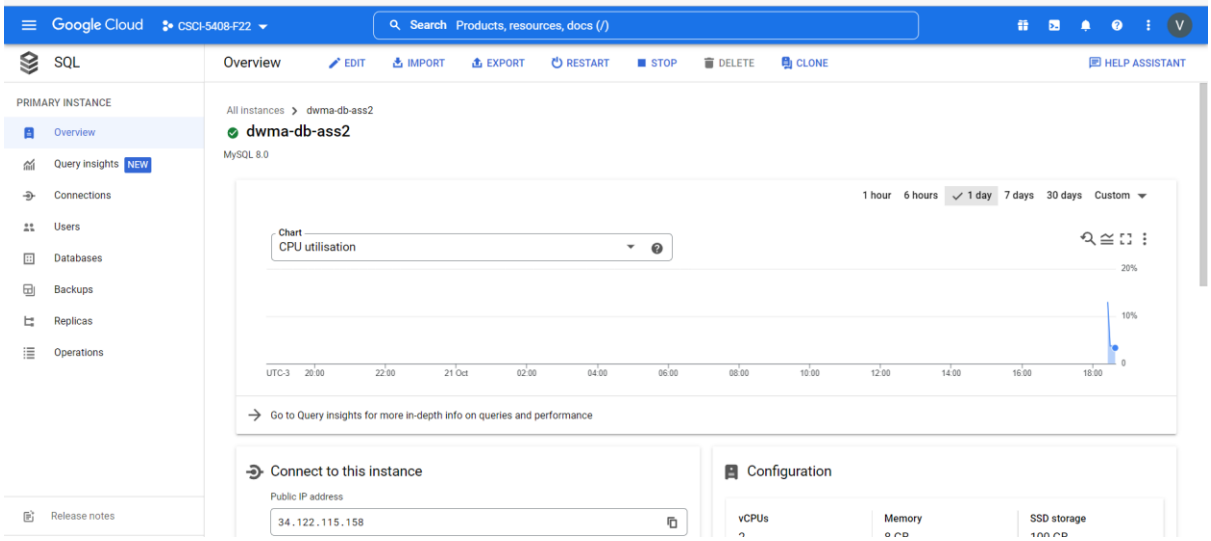
2. Executed the following transaction with 2 Select and 2 Update query as shown below on the **local database A2_Locvrxxxxxx**



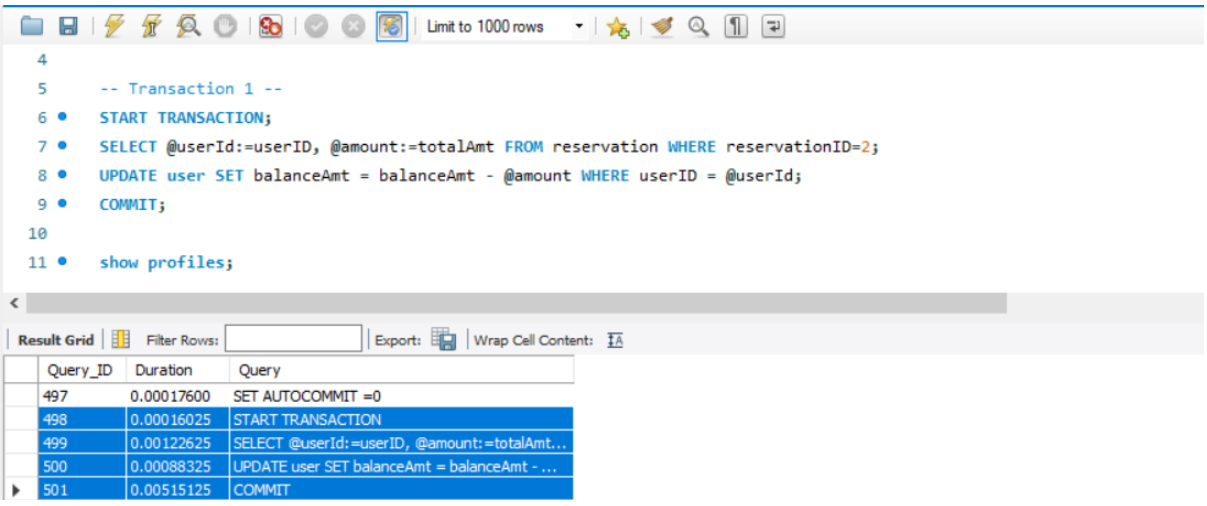
Results

	Local Databse Transaction Execution time	
2	START TRANSACTION	0.001405
3	SELECT @userId:=userID, @amount:=totalAmt FROM reservation WHERE reservationID=2\nLIMIT 0, 1000	0.0006355
4	UPDATE user SET balanceAmt = balanceAmt - @amount WHERE userID = @userId	0.00378825
5	COMMIT	0.0037105
6		
7	Total	0.00953925
8		
9	START TRANSACTION	0.00132375
10	SELECT @userId:=userID, @amount:=totalAmt FROM reservation WHERE reservationID=2\nLIMIT 0, 1000	0.00075475
11	UPDATE user SET balanceAmt = balanceAmt - @amount WHERE userID = @userId	0.00598275
12	SELECT @equipmentID:=equipID FROM reservation WHERE reservationID = 3\nLIMIT 0, 1000	0.00695075
13	UPDATE equipments SET availableQty = availableQty-1 WHERE equipID = @equipmentID	0.03313425
14	COMMIT	0.0126195
15		
16	Total	0.06076575

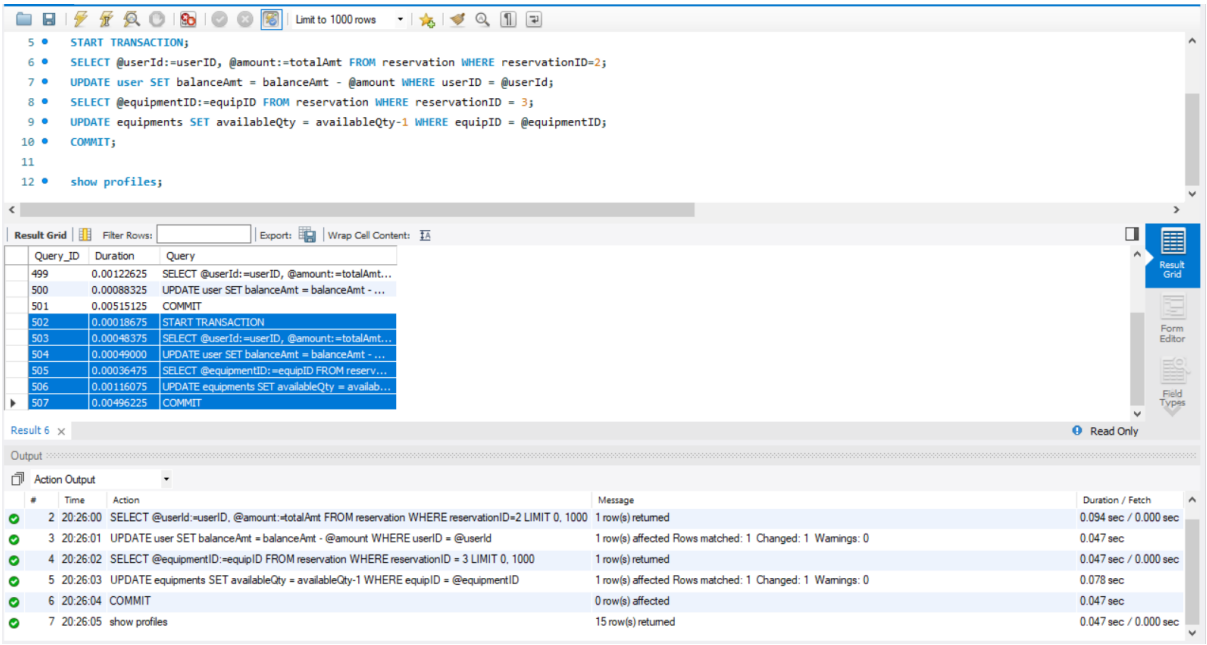
Created a remote database on GCP.



1. Executed the following transaction with 1 Select and 1 Update query as shown below on the **remote database A2_Remvrxxxxxx**



2. Executed the following transaction with 2 Select and 2 Update query as shown below on the **remote database A2_Remvrxxxxxx**



Results

Remote Databse Transaction Execution time	
START TRANSACTION	0.00016025
SELECT @userId:=userID, @amount:=totalAmt FROM reservation WHERE reservationID=2\nLIMIT 0, 1000	0.00122625
UPDATE user SET balanceAmt = balanceAmt - @amount WHERE userID = @userId	0.00088325
COMMIT	0.00515125
Total	0.007421
START TRANSACTION	0.00018675
SELECT @userId:=userID, @amount:=totalAmt FROM reservation WHERE reservationID=2\nLIMIT 0, 1000	0.00048375
UPDATE user SET balanceAmt = balanceAmt - @amount WHERE userID = @userId	0.0049
SELECT @equipmentID:=equipID FROM reservation WHERE reservationID = 3\nLIMIT 0, 1000	0.00036475
UPDATE equipments SET availableQty = availableQty-1 WHERE equipID = @equipmentID	0.0116075
COMMIT	0.0496225
Total	0.06716525

Created a distributed database with the following data dictionary

```
equipment,remote
user,local
egiftcard,local
parks,local
eventapplication,remote
reservation,remote
```

Created schema **a2_distvrxxxxxx** on local with user,egiftcard and parks table.

Created schema **a2_distvrxxxxxx** on GCP with equipment,eventapplication and reservation table.

1.Executed java code to run a distributed transaction

```
Problems  Debug Shell  Search  Terminal  Debug  Coverage  Console
<terminated> Main (2) [Java Application] C:\Users\viraj\.p2\pool\plugins\org.eclipse.justj.openjdk.hotspot.jre.full.win32.x86_64_17.0.0.v20211012-1059\jre\bin\javaw.exe  (27-Oct-2022, 4:04:15 pm – 4:04:19 pm)
{equipments=remote, parks=local, egiftcard=local, eventapplication=remote, reservation=remote, user=local}

     Statement: SET autocommit=0
Execution time: 0.000408 seconds.
     Statement: START TRANSACTION
Execution time: 0.000366 seconds.
     Statement: SELECT @parkID:=parkID FROM parks WHERE parkName ='Crystal Crescent Beach'
Execution time: 0.001130 seconds.
     Statement: INSERT INTO egiftcard VALUES (6158,'tony','tony@bbc.com',25.0,'viraj','Congrats',1)
Execution time: 0.005740 seconds.
     Statement: commit
Execution time: 0.003697 seconds.

     Statement: SET autocommit=0
Execution time: 0.000210 seconds.
     Statement: START TRANSACTION
Execution time: 0.000159 seconds.
     Statement: SELECT @equipId:=equipID FROM equipments WHERE equipName='camp'
Execution time: 0.000524 seconds.
     Statement: INSERT INTO reservation (reservationName,arr_date,dep_date,countOfPax,reservType,equipID,totalAmt,parkID,userID) VALUES ('Mike','20220901','20220907',7,'online',@equipId
Execution time: 0.000562 seconds.
     Statement: UPDATE equipments SET availableQty = availableQty -1 WHERE equipID = @equipId
Execution time: 0.000594 seconds.
     Statement: commit
Execution time: 0.006284 seconds.
Close Connections
```

Results

Distributed Database Transaction Execution time (Local tables)	
START TRANSACTION	0.000366
SELECT @parkID:=parkID FROM parks WHERE parkName ='Crystal Crescent Beach'	0.00113
INSERT INTO egiftcard VALUES (6158,'tony','tony@bbc.com',25.0,'viraj','Congrats',1)	0.00574
commit	0.003697
Total	0.010933
Distributed Database Transaction Execution time (GCP tables)	
START TRANSACTION	0.000159
SELECT @equipId:=equipID FROM equipments WHERE equipName='camp'	0.000524
INSERT INTO reservation (reservationName,arr_date,dep_date,countOfPax,reservType,equipID,totalAmt,park	0.000562
UPDATE equipments SET availableQty = availableQty -1 WHERE equipID = @equipId	0.000594
commit	0.006284
Total	0.008123

Observation and analysis

The local database resides on the user's system while the remote database is hosted on a google server using Google Cloud Platform. The google cloud platform has been configured to use us-central region which is comparatively nearby Canada (current location) compared to the southeast Asian region. It is observed that the time taken to execute the transaction with 1 select and 1 update SQL on local and remote database is nearly same but the transaction with 2 select and 2 update SQLs takes more time executing on the remote database than the local. This is because, it takes more time to send and retrieve data between the user system and cloud server. If GCP was configured to use a far east region, the time to execute the transaction on remote database would be even longer. It is also observed that SELECT SQLs take lesser time than SQLs to update or delete values. Time to execute select SQLs is dependent on the number of rows contained in the tables, joins and indexes on the table.

In case of the distributed database, part of the database resides on the local server and part on the remote cloud server. The java code executes a transaction containing queries to use/modify tables that reside on both the servers. Thus, making it a distributed transaction. A global data dictionary (GDD) is maintained to provide information about the location of each table in the database. Using GDD as a reference, code determines whether to fire the SQL on the remote or local database. It is observed that SQLs executing on the remote database take more or relatively similar time.

Citations

1.MySQL Workbench (8.0 CE). Oracle. Available: https://dev.mysql.com/downloads/workbench/

2. Google Cloud Platform. Google. Available: https://console.cloud.google.com

3. DrawIo, Entity Relation, Draw.io, . [Online]. Available: https://app.diagrams.net/ [Accessed: 22 Sept. 2022].