CSE 512 Distributed Database Systems

Project Part - 1

Project Topic

The project topic which we opted for was Finance. We live in a day and age where everything happens over the internet. Gone are the days of managing pen and paper records or receipts. With the rise of digital payment systems, mobile banking, and online transactions, the overall number of financial transactions has increased. Many people now conduct financial transactions through digital channels, contributing to a higher daily transaction volume.

We have applications like Zelle, Paypal and Chime which enable transactions between different users. We were inspired by such applications which have a large number of users and handle transactions every second of the day. We came up with a distributed database that focuses on transactions between users. Each user has an account and an opening balance > 0. We make use of id's to monitor the transactions and have separate statuses to distinguish between the various results of a transaction. The users can have either savings or a checking account. We have fields to help us query users from different states and so on.

The transactions database acts as the ledger where all transactions are recorded. Proper care has to be taken to ensure that the transactions are reflected correctly.

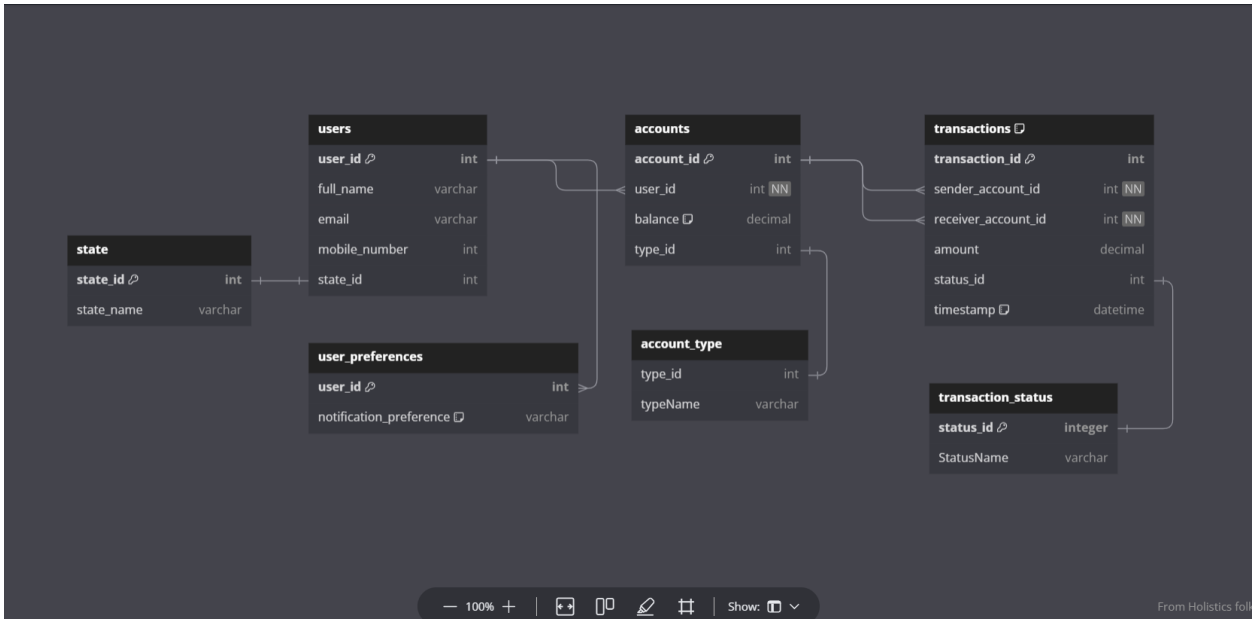


Figure 1: Schema Design

1st Normal Form (1NF)

The above schema design ensures that 1NF is maintained. All the tables have a primary key

Ensures that there is no repetition of data. The use of additional tables for state_id,account_type and transaction_status ensures that there is no enum type used which would once again make us responsible for having to normalize the database.

2nd Normal Form (2NF)

The schema ensures that non-key attributes are fully functionally dependent on the primary key.

3rd Normal Form (3NF)

The schema ensures 3NF as there are no transitive dependencies.

The Users table has a foreign key state_id that depends on State_id, which is the primary key. This is not a transitive dependency because it is a direct relationship

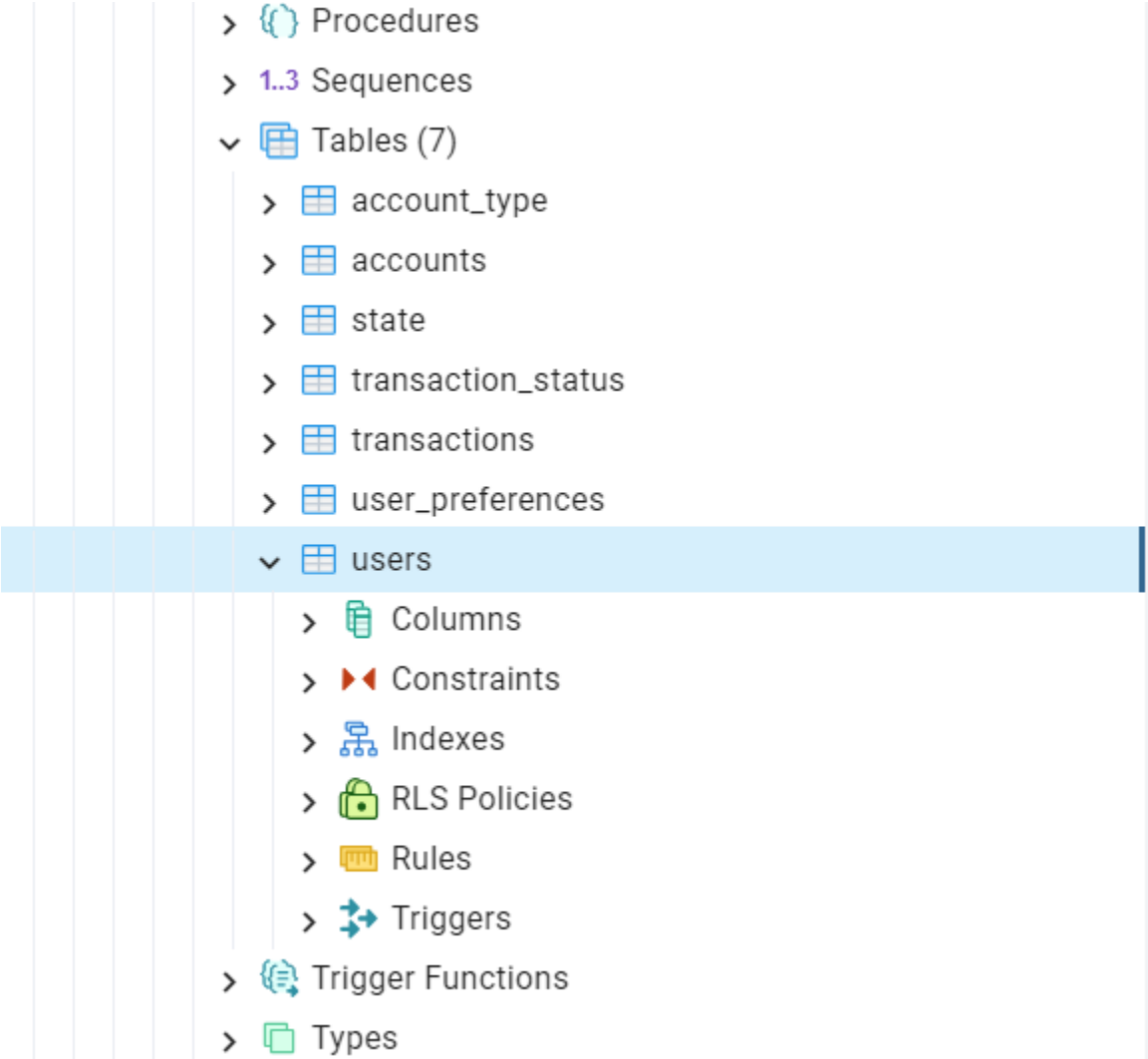
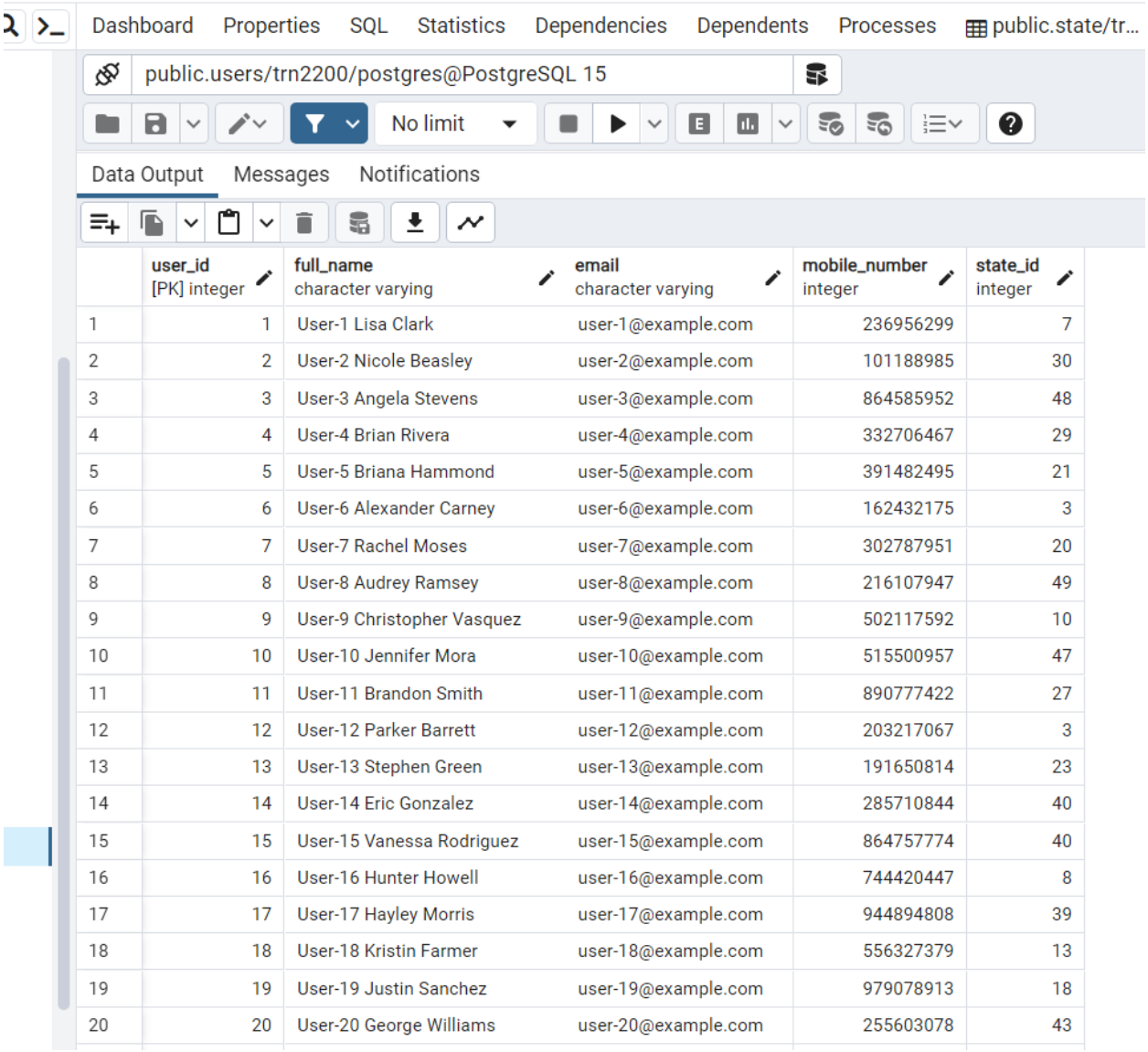


Figure 2: Tables Creation

On inserting the data into the table, the User table, User preference table, State table, Accounts table, Accounts type table, transactions table, transactions status.



	user_id [PK] integer	full_name character varying	email character varying	mobile_number integer	state_id integer
1	1	User-1 Lisa Clark	user-1@example.com	236956299	7
2	2	User-2 Nicole Beasley	user-2@example.com	101188985	30
3	3	User-3 Angela Stevens	user-3@example.com	864585952	48
4	4	User-4 Brian Rivera	user-4@example.com	332706467	29
5	5	User-5 Briana Hammond	user-5@example.com	391482495	21
6	6	User-6 Alexander Carney	user-6@example.com	162432175	3
7	7	User-7 Rachel Moses	user-7@example.com	302787951	20
8	8	User-8 Audrey Ramsey	user-8@example.com	216107947	49
9	9	User-9 Christopher Vasquez	user-9@example.com	502117592	10
10	10	User-10 Jennifer Mora	user-10@example.com	515500957	47
11	11	User-11 Brandon Smith	user-11@example.com	890777422	27
12	12	User-12 Parker Barrett	user-12@example.com	203217067	3
13	13	User-13 Stephen Green	user-13@example.com	191650814	23
14	14	User-14 Eric Gonzalez	user-14@example.com	285710844	40
15	15	User-15 Vanessa Rodriguez	user-15@example.com	864757774	40
16	16	User-16 Hunter Howell	user-16@example.com	744420447	8
17	17	User-17 Hayley Morris	user-17@example.com	944894808	39
18	18	User-18 Kristin Farmer	user-18@example.com	556327379	13
19	19	User-19 Justin Sanchez	user-19@example.com	979078913	18
20	20	User-20 George Williams	user-20@example.com	255603078	43

Figure 3:Users Table

	user_id [PK] integer	notification_preference character varying
1	1	SMS
2	2	SMS
3	3	Mail
4	4	SMS
5	5	Mail
6	6	SMS
7	7	Email
8	8	Mail
9	9	SMS
10	10	SMS
11	11	Email
12	12	Email
13	13	SMS
14	14	Mail
15	15	SMS
16	16	Email
17	17	SMS
18	18	Mail
19	19	Mail
20	20	Email
21	21	SMS

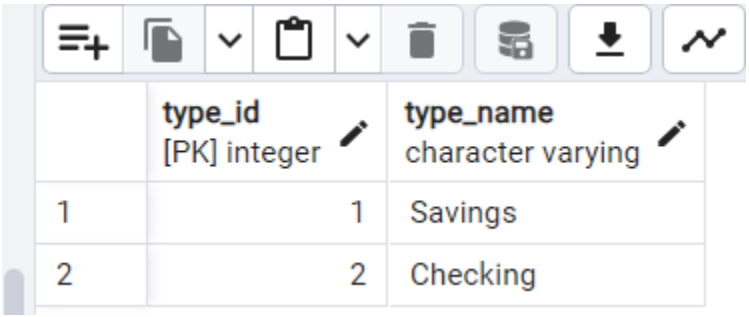
Figure 4:User Preferences Table

	state_id [PK] integer	state_name character varying
1	1	Alabama
2	2	Alaska
3	3	Arizona
4	4	Arkansas
5	5	California
6	6	Colorado
7	7	Connecticut

Figure 5: State Table

	account_id [PK] integer	user_id integer	balance numeric	type_id integer
1	1	1	2162	1
2	2	2	4558	1
3	3	3	4081	1
4	4	4	3596	2
5	5	5	1581	2
6	6	6	4292	2

Figure 6: Accounts table

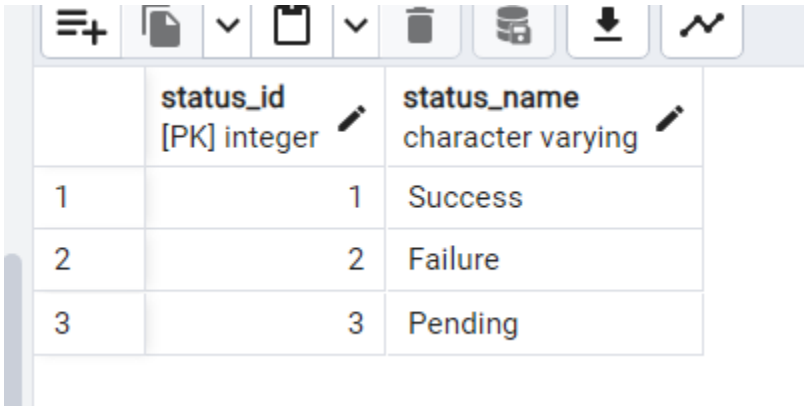


	type_id [PK] integer	type_name character varying
1	1	Savings
2	2	Checking

Figure 7: Account Types Table

	transaction_id [PK] integer	sender_account_id integer	receiver_account_id integer	amount numeric	status_id integer	timestamp timestamp without time zone
1	1	27	21	207	1	2023-11-25 18:57:28.052912
2	2	90	82	51	1	2023-11-25 18:57:28.056146
3	3	76	51	277	2	2023-11-25 18:57:28.056783
4	4	68	3	231	2	2023-11-25 18:57:28.057285
5	5	12	16	76	1	2023-11-25 18:57:28.057802
6	6	76	30	197	2	2023-11-25 18:57:28.058413

Figure 8: Transaction Table



	status_id [PK] integer	status_name character varying
1	1	Success
2	2	Failure
3	3	Pending

Figure 9:Transaction Status

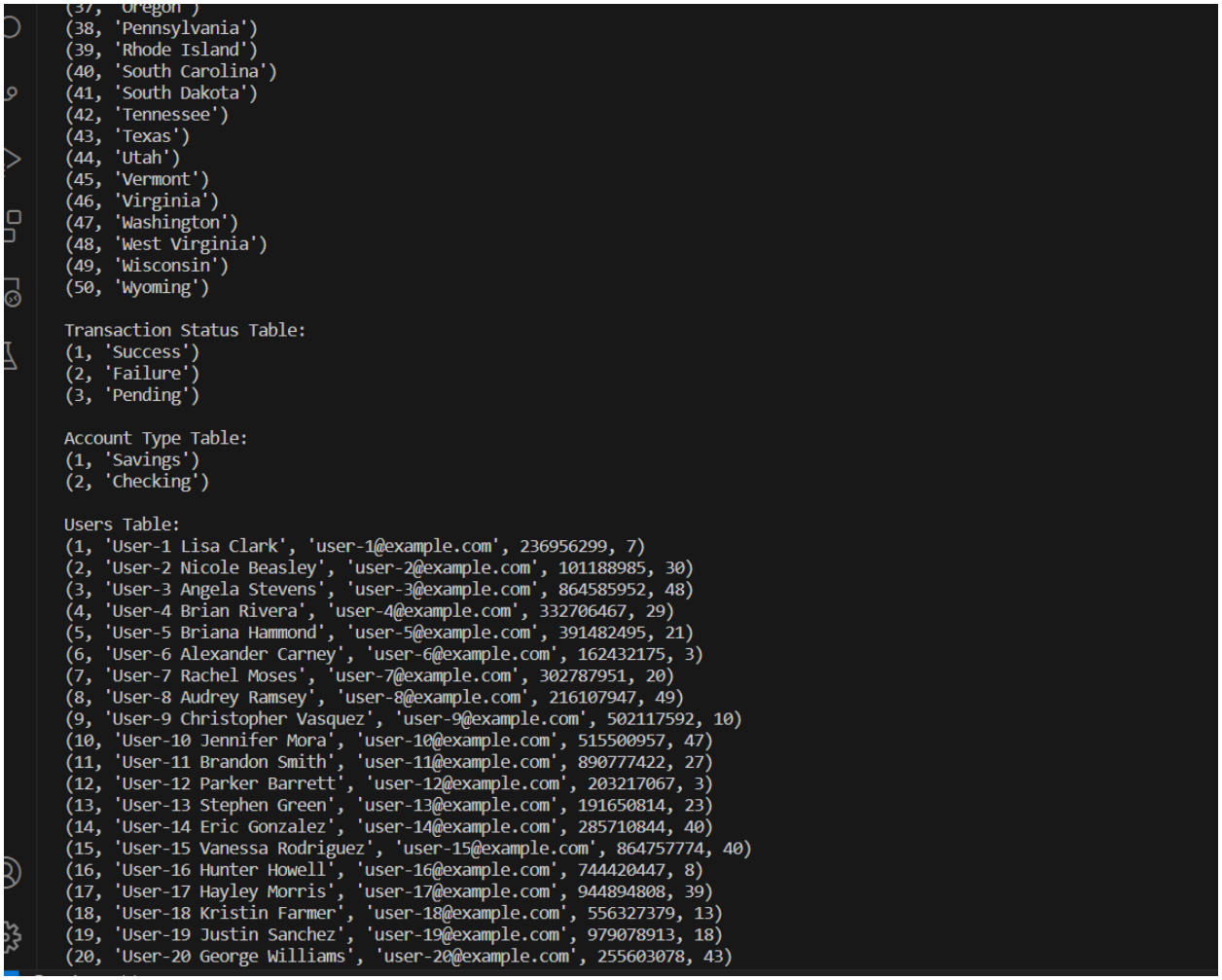


Figure 10: Results of Data Retrieval