CSE 512 Distributed Database Systems

Project Part - 5

This project focuses on the implementation of a distributed NoSQL database system to understand the data storage and retrieval processes within a chosen domain. The chosen NoSQL database system is MongoDB. NoSQL databases offer flexible and scalable solutions for data storage, especially in distributed and large-scale environments. MongoDB provides a document-based model that suits a variety of data types and structures. The design is similar to the one used for the postgres. The collections created are state, users, user_preferences, accounts, account_type, transactions, and transaction_status.

Create

All the created collection snapshot is attached.

Fig 1. Output indicating creation of Collections

Read

The data in collections of users, user_preferences, accounts and transactions are attached. This also indicates read queries were used for different collections.

```
Users:
{'_id': ObjectId('656386df3122714cec25d708'), 'user_id': 1, 'full_name': 'User 1', 'email': 'user1@example.com', 'mobile
_number': 746790308, 'state_id': ObjectId('656386df3122714cec25d6e9')}
{'_id': ObjectId('656386df3122714cec25d709'), 'user_id': 2, 'full_name': 'User 2', 'email': 'user2@example.com', 'mobile
_number': 897987462, 'state_id': ObjectId('656386df3122714cec25d6e6')}
{'_id': ObjectId('656386df3122714cec25d70a'), 'user_id': 3, 'full_name': 'User 3', 'email': 'user3@example.com', 'mobile
_number': 711048532, 'state_id': ObjectId('656386df3122714cec25d6fd')}
{'_id': ObjectId('656386df3122714cec25d70b'), 'user_id': 4, 'full_name': 'User 4', 'email': 'user4@example.com', 'mobile
_number': 839531530, 'state_id': ObjectId('656386df3122714cec25d6eb')}
{'_id': ObjectId('656386df3122714cec25d70c'), 'user_id': 5, 'full_name': 'User 5', 'email': 'user5@example.com', 'mobile
_number': 414572476, 'state_id': ObjectId('656386df3122714cec25d6d3')}
{'_id': ObjectId('656386df3122714cec25d70d'), 'user_id': 6, 'full_name': 'User 6', 'email': 'user6@example.com', 'mobile
_number': 527533691, 'state_id': ObjectId('656386df3122714cec25d6ec')}
{'_id': ObjectId('656386df3122714cec25d70e'), 'user_id': 7, 'full_name': 'User 7', 'email': 'user7@example.com', 'mobile
_number': 116280906, 'state_id': ObjectId('656386df3122714cec25d6f5')}
{'_id': ObjectId('656386df3122714cec25d70f'), 'user_id': 8, 'full_name': 'User 8', 'email': 'user8@example.com', 'mobile
_number': 930516303, 'state_id': ObjectId('656386df3122714cec25d6dd')}
{'_id': ObjectId('656386df3122714cec25d710'), 'user_id': 9, 'full_name': 'User 9', 'email': 'user9@example.com', 'mobile
_number': 844641202, 'state_id': ObjectId('656386df3122714cec25d6fc')}
{'_id': ObjectId('656386df3122714cec25d711'), 'user_id': 10, 'full_name': 'User 10', 'email': 'user10@example.com', 'mob
ile_number': 849507297, 'state_id': ObjectId('656386df3122714cec25d6fe')}
```

Fig 2. Users Collection

```
User Preferences:
{'_id': ObjectId('656386df3122714cec25d76c'), 'user_id': 1, 'notification_preference': 'Mail'}
{'_id': ObjectId('656386df3122714cec25d76d'), 'user_id': 2, 'notification_preference': 'Mail'}
{'_id': ObjectId('656386df3122714cec25d76e'), 'user_id': 3, 'notification_preference': 'Mail'}
{'_id': ObjectId('656386df3122714cec25d76f'), 'user_id': 4, 'notification_preference': 'SMS'}
{'_id': ObjectId('656386df3122714cec25d770'), 'user_id': 5, 'notification_preference': 'Email'}
{'_id': ObjectId('656386df3122714cec25d771'), 'user_id': 6, 'notification_preference': 'Email'}
{'_id': ObjectId('656386df3122714cec25d772'), 'user_id': 7, 'notification_preference': 'Mail'}
{'_id': ObjectId('656386df3122714cec25d773'), 'user_id': 8, 'notification_preference': 'Mail'}
{'_id': ObjectId('656386df3122714cec25d774'), 'user_id': 9, 'notification_preference': 'SMS'}
{'_id': ObjectId('656386df3122714cec25d775'), 'user_id': 10, 'notification_preference': 'Mail'}
```

Fig 3. User Preferences Collection

```
Accounts:
{'_id': ObjectId('656386df3122714cec25d7d0'), 'user_id': 1, 'balance': 4633, 'type_id': ObjectId('656386df3122714cec25d707')}
{'_id': ObjectId('656386df3122714cec25d7d1'), 'user_id': 2, 'balance': 406, 'type_id': ObjectId('656386df3122714cec25d706')}
{'_id': ObjectId('656386df3122714cec25d7d2'), 'user_id': 3, 'balance': 141, 'type_id': ObjectId('656386df3122714cec25d707')}
{'_id': ObjectId('656386df3122714cec25d7d3'), 'user_id': 4, 'balance': 1153, 'type_id': ObjectId('656386df3122714cec25d706')}
{'_id': ObjectId('656386df3122714cec25d7d4'), 'user_id': 5, 'balance': 1116, 'type_id': ObjectId('656386df3122714cec25d706')}
{'_id': ObjectId('656386df3122714cec25d7d5'), 'user_id': 6, 'balance': 3688, 'type_id': ObjectId('656386df3122714cec25d706')}
{'_id': ObjectId('656386df3122714cec25d7d6'), 'user_id': 7, 'balance': 4322, 'type_id': ObjectId('656386df3122714cec25d707')}
{'_id': ObjectId('656386df3122714cec25d7d7'), 'user_id': 8, 'balance': 3422, 'type_id': ObjectId('656386df3122714cec25d707')}
{'_id': ObjectId('656386df3122714cec25d7d8'), 'user_id': 9, 'balance': 1184, 'type_id': ObjectId('656386df3122714cec25d707')}
{'_id': ObjectId('656386df3122714cec25d7d9'), 'user_id': 10, 'balance': 4989, 'type_id': ObjectId('656386df3122714cec25d707')}
```

Fig 4. Accounts Collection

Transactions:
{'_id': ObjectId('656386df3122714cec25d834'), 'sender_account_id': 7, 'receiver_account_id': 91, 'amount': 172, 'status_
id': ObjectId('656386df3122714cec25d705'), 'timestamp': datetime.datetime(2023, 11, 26, 17, 56, 47, 709000))
{'_id': ObjectId('656386df3122714cec25d835'), 'sender_account_id': 68, 'receiver_account_id': 84, 'amount': 184, 'status
_id': ObjectId('656386df3122714cec25d703'), 'timestamp': datetime.datetime(2023, 11, 26, 17, 56, 47, 716000))
{'_id': ObjectId('656386df3122714cec25d836'), 'sender_account_id': 86, 'receiver_account_id': 56, 'amount': 379, 'status
_id': ObjectId('656386df3122714cec25d704'), 'timestamp': datetime.datetime(2023, 11, 26, 17, 56, 47, 723000))
{'_id': ObjectId('656386df3122714cec25d837'), 'sender_account_id': 33, 'receiver_account_id': 91, 'amount': 113, 'status
_id': ObjectId('656386df3122714cec25d705'), 'timestamp': datetime.datetime(2023, 11, 26, 17, 56, 47, 729000))
{'_id': ObjectId('656386df3122714cec25d838'), 'sender_account_id': 75, 'receiver_account_id': 23, 'amount': 309, 'status
_id': ObjectId('656386df3122714cec25d705'), 'timestamp': datetime.datetime(2023, 11, 26, 17, 56, 47, 737000))

Fig 5. Transactions Collection

Update

The user preferences table was updated for user 2 and for user 2, notification preference was changed from mail to push. The value before updating is in Fig 3. The relevant snapshots are attached.

User 2's notification preference updated to Push.

Fig 6. Output indicating the value has been updated

User Preferences:
{'_id': ObjectId('656386df3122714cec25d76d'), 'user_id': 2, 'notification_preference': 'Push'}
{'_id': ObjectId('656386df3122714cec25d76e'), 'user_id': 3, 'notification_preference': 'Mail'}
{'_id': ObjectId('656386df3122714cec25d76f'), 'user_id': 4, 'notification_preference': 'SMS'}
{'_id': ObjectId('656386df3122714cec25d770'), 'user_id': 5, 'notification_preference': 'Email'}
{'_id': ObjectId('656386df3122714cec25d771'), 'user_id': 6, 'notification_preference': 'Email'}
{'_id': ObjectId('656386df3122714cec25d772'), 'user_id': 7, 'notification_preference': 'Mail'}
{'_id': ObjectId('656386df3122714cec25d773'), 'user_id': 8, 'notification_preference': 'Mail'}
{'_id': ObjectId('656386df3122714cec25d774'), 'user_id': 9, 'notification_preference': 'SMS'}
{'_id': ObjectId('656386df3122714cec25d775'), 'user_id': 10, 'notification_preference': 'Mail'}

Fig 7. Updated User Preferences Collection

Delete

The values of user id 1 are all deleted for collections. With the user preference shown in Fig 7 and other collections which contain user id – users, accounts, and transactions. Attached are the relevant snapshots.

User 1 and associated data deleted successfully.

Fig 8. Output indicating deletion

Users:
{'_id': ObjectId('656386df3122714cec25d709'), 'user_id': 2, 'full_name': 'User 2', 'email': 'user2@example.com', 'mobile_number': 897987462, 'state_id': ObjectId('656386df3122714cec25d6e6')}
{'_id': ObjectId('656386df3122714cec25d70a'), 'user_id': 3, 'full_name': 'User 3', 'email': 'user3@example.com', 'mobile_number': 711048532, 'state_id': ObjectId('656386df3122714cec25d6fd')}
{'_id': ObjectId('656386df3122714cec25d70b'), 'user_id': 4, 'full_name': 'User 4', 'email': 'user4@example.com', 'mobile_number': 839531530, 'state_id': ObjectId('656386df3122714cec25d6eb')}
{'_id': ObjectId('656386df3122714cec25d70c'), 'user_id': 5, 'full_name': 'User 5', 'email': 'user5@example.com', 'mobile_number': 414572476, 'state_id': ObjectId('656386df3122714cec25d6d3')}
{'_id': ObjectId('656386df3122714cec25d70d'), 'user_id': 6, 'full_name': 'User 6', 'email': 'user6@example.com', 'mobile_number': 527533691, 'state_id': ObjectId('656386df3122714cec25d6ec')}
{'_id': ObjectId('656386df3122714cec25d70e'), 'user_id': 7, 'full_name': 'User 7', 'email': 'user7@example.com', 'mobile_number': 116280906, 'state_id': ObjectId('656386df3122714cec25d6f5')}
{'_id': ObjectId('656386df3122714cec25d70f'), 'user_id': 8, 'full_name': 'User 8', 'email': 'user8@example.com', 'mobile_number': 930516303, 'state_id': ObjectId('656386df3122714cec25d6dd')}
{'_id': ObjectId('656386df3122714cec25d710'), 'user_id': 9, 'full_name': 'User 9', 'email': 'user9@example.com', 'mobile_number': 844641202, 'state_id': ObjectId('656386df3122714cec25d6fc')}
{'_id': ObjectId('656386df3122714cec25d711'), 'user_id': 10, 'full_name': 'User 10', 'email': 'user10@example.com', 'mobile_number': 849507297, 'state_id': ObjectId('656386df3122714cec25d6fe')}

Fig 9. Users Collection after deletion

Accounts:
{'_id': ObjectId('656386df3122714cec25d7d1'), 'user_id': 2, 'balance': 406, 'type_id': ObjectId('656386df3122714cec25d706')}
{'_id': ObjectId('656386df3122714cec25d7d2'), 'user_id': 3, 'balance': 141, 'type_id': ObjectId('656386df3122714cec25d707')}
{'_id': ObjectId('656386df3122714cec25d7d3'), 'user_id': 4, 'balance': 1153, 'type_id': ObjectId('656386df3122714cec25d706')}
{'_id': ObjectId('656386df3122714cec25d7d4'), 'user_id': 5, 'balance': 1116, 'type_id': ObjectId('656386df3122714cec25d706')}
{'_id': ObjectId('656386df3122714cec25d7d5'), 'user_id': 6, 'balance': 3688, 'type_id': ObjectId('656386df3122714cec25d706')}
{'_id': ObjectId('656386df3122714cec25d7d6'), 'user_id': 7, 'balance': 4322, 'type_id': ObjectId('656386df3122714cec25d707')}
{'_id': ObjectId('656386df3122714cec25d7d7'), 'user_id': 8, 'balance': 3422, 'type_id': ObjectId('656386df3122714cec25d707')}
{'_id': ObjectId('656386df3122714cec25d7d8'), 'user_id': 9, 'balance': 1184, 'type_id': ObjectId('656386df3122714cec25d707')}
{'_id': ObjectId('656386df3122714cec25d7d9'), 'user_id': 10, 'balance': 4989, 'type_id': ObjectId('656386df3122714cec25d707')}

Fig 10. Accounts Collection after deletion

Also, with transactions collections did not contain any values containing user id
1. So no change is exhibited for this collection.