

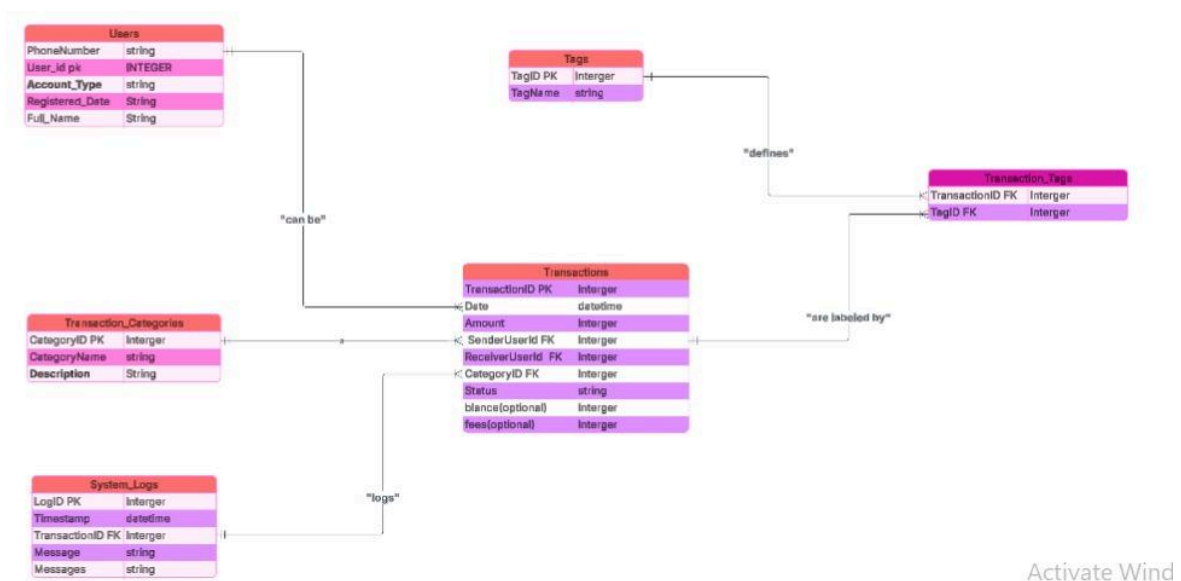
Database Design Document – MoMo SMS Data Processor

1. Introduction

- The MoMo SMS Data Processor database is designed to store, manage, and analyze mobile money transaction data efficiently. It helps to track users, transactions, categories, logs and tags accurately and efficiently.

2. ERD (Entity-Relationship Diagram)

This is the ERD showing all entities, attributes and their relationships.



3. Design Rationale & Justification

Explanation of each table created:

- **Users:** It stores all registered users.
- **Transactions:** It stores all transaction details like amount, date, sender, receiver...
- **Transaction_Categories:** It keeps categories organised, avoids repetition.
- **Tags & Transaction_Tags:** Help in transaction labeling.
- **System_Logs:** This table helps to store all actions and errors for auditing and debugging.

4. Data Dictionary

This shows all tables in the dictionary and their column descriptions

USERS			
Field	Type	Null	Key
User_id	varchar(50)	NO	PRI
PhoneNumber	varchar(20)	YES	UNI
AccountType	varchar(20)	YES	
RegisteredDate	datetime	YES	
FullName	varchar(50)	YES	

TRANSACTIONS			
Field	Type	Null	Key
TransactionID	varchar(50)	NO	PRI
Date	datetime	YES	MUL
Amount	int(11)	YES	
SenderUserId	varchar(50)	YES	MUL
ReceiverUserId	varchar(50)	YES	MUL
CategoryID	varchar(50)	YES	MUL
Status	varchar(50)	YES	MUL

TRANSACTION CATEGORIES			
Field	Type	Null	Key
CategoryID	varchar(50)	NO	PRI
CategoryName	varchar(100)	YES	MUL
Description	text	YES	

Tags			
Field	Type	Null	Key
TagID	varchar(50)	NO	PRI
TagName	varchar(100)	YES	MUL

System Logs			
Field	Type	Null	Key
LogID	varchar(50)	NO	PRI
TimeStamp	datetime	YES	MUL
TransactionId	varchar(50)	YES	MUL
Message	text	YES	
ErrorDetails	text	YES	

Transaction Tags			
Field	Type	Null	Key
TransactionID	varchar(50)	YES	MUL
TagID	varchar(50)	YES	MUL

6. Sample queries demonstrating the database functionality(with screenshots).

- **List all users**
SELECT * FROM Users;

```
MariaDB [MomoSmsDataProcessingSystem]> SELECT * FROM Users;
```

User_id	PhoneNumber	AccountType	RegisteredDate	FullName
U001	250781234567	Personal	2024-01-10 09:30:00	Alice Mukamana
U002	250782345678	Business	2024-02-15 14:20:00	John Kamali
U003	250783456789	Personal	2024-03-01 08:00:00	Grace Niyonsaba
U004	250784567890	Personal	2024-03-20 11:45:00	Eric Habimana
U005	250785678901	Business	2024-04-05 17:15:00	Claudine Uwase

```
5 rows in set (0.012 sec)
```

- **Top 5 transactions by amount**

SELECT * FROM Transactions ORDER BY Amount DESC LIMIT 5;

```
MariaDB [MomoSmsDataProcessingSystem]> SELECT * FROM Transactions ORDER BY Amount DESC LIMIT 5;
```

TransactionID	Date	Amount	SenderUserId	ReceiverUserId	CategoryID	Status
Tr003	2024-05-03 15:45:00	15000	U002	U005	C004	Pending
Tr004	2024-05-04 09:15:00	10000	U005	U001	C005	Failed
Tr005	2024-05-05 18:20:00	8000	U004	U003	C003	Success
Tr001	2024-05-01 10:00:00	5000	U001	U002	C002	Success
Tr002	2024-05-02 12:30:00	2000	U003	U004	C001	Success

```
5 rows in set (0.003 sec)
```

- **Transactions by a specific user**

SELECT * FROM Transactions WHERE SenderUserId = 'U003';

```
MariaDB [MomoSmsDataProcessingSystem]> SELECT * FROM Transactions WHERE SenderUserId = 'U003';
```

TransactionID	Date	Amount	SenderUserId	ReceiverUserId	CategoryID	Status
Tr002	2024-05-02 12:30:00	2000	U003	U004	C001	Success

```
1 row in set (0.070 sec)
```

7. Unique Rules & Security Enhancements

- **Unique Phone Number per User:** As you can see in the image below, we encounter an error when we try to insert the same phone number we used before.

```
MariaDB [MomoSmsDataProcessingSystem]> INSERT INTO Users (User_id, PhoneNumber, AccountType, RegisteredDate, FullName) VALUES ('U010', '250788888888', 'Personal', '2024-01-10 19:30:00', 'Alice Mukesha');
Query OK, 1 row affected (0.030 sec)

MariaDB [MomoSmsDataProcessingSystem]> INSERT INTO Users (User_id, PhoneNumber, AccountType, RegisteredDate, FullName) VALUES ('U010', '250788888888', 'Personal', '2024-01-10 19:30:00', 'Alice Mukesha');
ERROR 1062 (23000): Duplicate entry 'U010' for key 'PRIMARY'
MariaDB [MomoSmsDataProcessingSystem]>
```

- **Sender and Receiver Cannot Be the Same:** From the screenshot below, we encounter an error because the sender and receiver are the same.

```
MariaDB [MomoSmsDataProcessingSystem]> INSERT INTO Transactions (TransactionID, Date, Amount, SenderUserId, ReceiverUserId, CategoryID, Status) VALUES
-> ('Tr010', '2024-05-01 12:00:00', 5000.00, 'U010', 'U010', 'C002', 'Success');
ERROR 4025 (23000): CONSTRAINT 'check_sender_receiver' failed for 'MomoSmsDataProcessingSystem`.`Transactions`
MariaDB [MomoSmsDataProcessingSystem]> |
```