MTN MoMo SMS Dashboard – Detailed Project Report

The **MTN MoMo SMS Dashboard** is a fullstack web application designed to parse, clean, categorize, and analyze SMS messages containing financial transaction data from MTN Mobile Money (MoMo). By converting unstructured XML data into structured, queryable records, the system allows users to explore detailed trends, view transaction insights, and interact with a real-time visualization dashboard. The goal is to replicate real-world analytics tools that could be deployed by financial institutions or individuals seeking deeper insights into their financial history.

Technical Architecture

Frontend

Technology Stack:

- **HTML5** – for markup and structure
- **CSS** – for fast and responsive UI styling
- **JavaScript + Chart.js** – for dynamic charts and real-time interactivity

Key Functional Features:

- **Responsive Dashboard Layout**: Ensures usability across devices
- **Real-time Visualizations**: Live updating graphs (bar, pie, and line charts) showing financial insights.
- **Search & Filter**: Users can narrow data by transaction type, date range, and amount.
- **Detailed Transaction View**: Clickable transaction rows that reveal full metadata (sender, receiver, timestamp, message body).

Backend

Technology Stack:

- **Node.js** – JavaScript runtime environment
- **PostgreSQL** – Relational database with strong data typing and reliability

Core Components:

- **XML Parsing**: Raw XML is parsed using DOM parsing libraries.
- **Transaction Categorization** : Uses regex and keyword matching to classify SMS content.
- **RESTful API**:
    - `GET /transactions`: Fetch all or filtered transactions
    - `GET /summary`: Return summary stats by category or date
- **Error Handling Middleware**: Catches exceptions and returns consistent error responses.

Database Design

Schema Highlights:

One central `transactions` table with the following structure:

```
CREATE TABLE transactions (
  id SERIAL PRIMARY KEY,
  transaction_id TEXT UNIQUE,
  type transaction_type,
  amount INTEGER,
  sender TEXT,
  receiver TEXT,
  timestamp TIMESTAMP,
  raw_message TEXT
);
```

Implementation Challenges & Solutions

1. Message Parsing

- **Challenge**: SMS messages have inconsistent formatting and content length.
- **Solution**: Created a message parsing engine using RegEx and keyword matching, tuned to detect known patterns (e.g., "received X RWF", "withdrawn X RWF", "payment of X RWF").

2. Data Consistency

- **Challenge**: management of the data from backend to frontend .
- **Solution**: we export the data into json and then import it to visualize on the frontend.

3. File Handling

- **Challenge**: Handling large XML files (1600+ entries) without crashing the server.
- **Solution**:
    - Limited file size to 5MB
    - Used in-memory parsing and batch insertion
    - Added fallback for corrupt entries

4. Live Dashboard Updates

- **Challenge**: Display new transactions without requiring a page reload.
- **Solution**: Used polling-based data fetching with loading indicators and fallback UI in case of failure.

Performance Optimization

Frontend

- Chart elements are lazy-loaded only when in view

- Reduced DOM re-rendering through conditional updates
- Debounced input handling to limit server hits

File Processing

- XML files are parsed line-by-line
- Batch insertion reduces DB write cycles
- Memory use is tracked to prevent overflow

Conclusion

The MTN MoMo SMS Dashboard provides a production-ready platform for transaction data visualization. With solid backend processing, clean schema design, and an intuitive dashboard, the system is ready for enhancements such as user authentication, deeper analytics, and mobile compatibility. It demonstrates the power of combining structured data engineering with accessible user interfaces in addressing real-world fintech data needs.