

GPS TOLL BASED SYSTEM SIMULATION

Efficient, Accurate, and Convenient Toll Management



PROBLEM STATEMENT

Challenges in Current Toll Collection Systems:

- Manual toll collection causing congestion
- Inaccurate toll calculations
- Privacy and security concerns
- Integration issues with existing systems
- GPS signal strength and accuracy



UNIQUE IDEA BRIEF

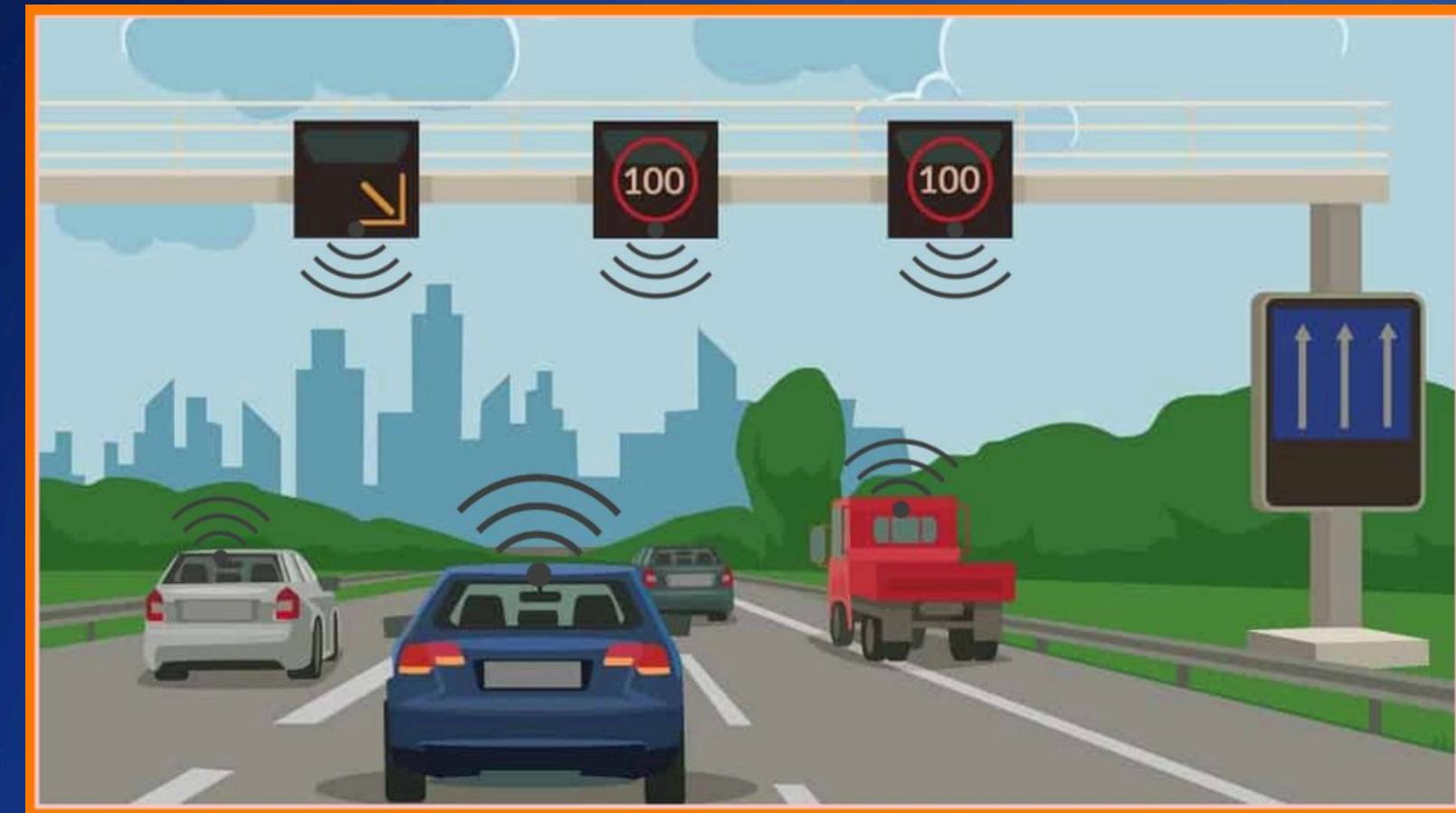
- Proposed Solution:
 - Automated toll collection based on GPS data.
 - Calculates tolls by distance traveled within geofenced areas.
 - Uses Flask for backend and MySQL for database.
 - Provides a user-friendly interface for car registration and GPS data submission



KEY FEATURES



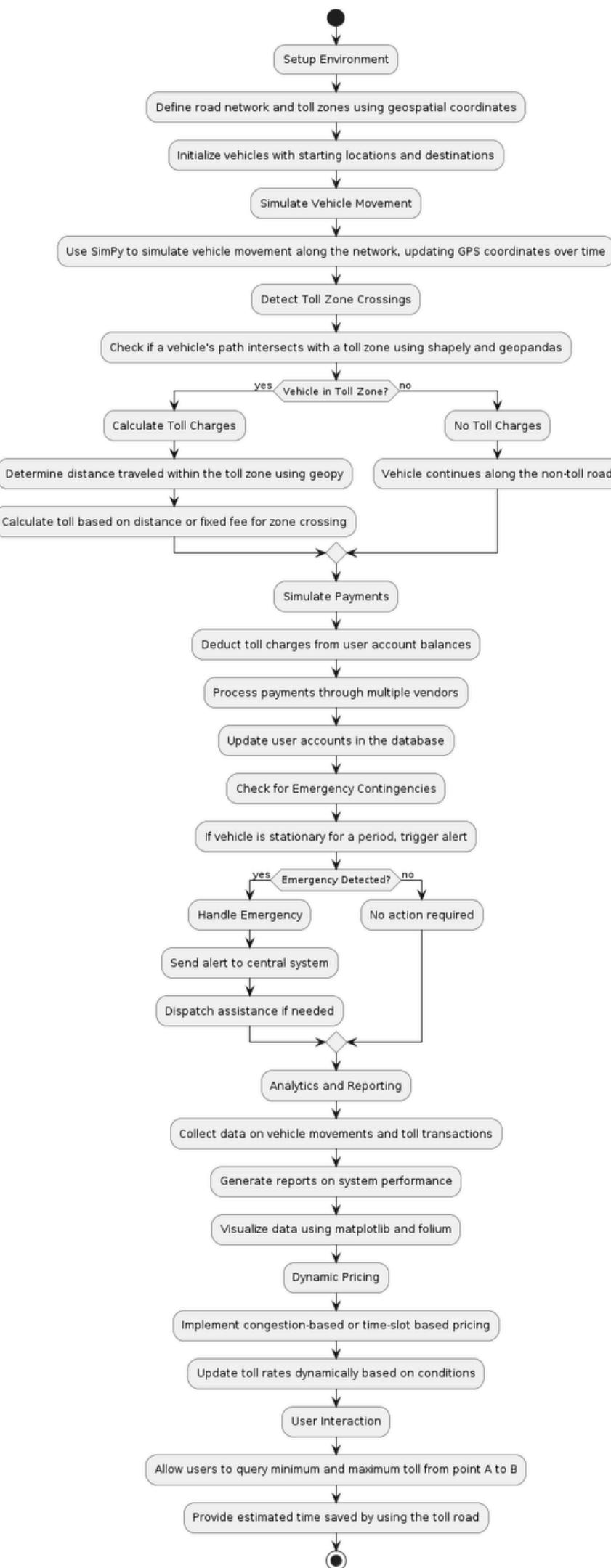
- 1 Car registration and balance management
- 2 GPS data submission for toll calculation
- 3 Transaction history display
- 4 Interactive map for visualizing car routes
- 5 Automated toll calculation based on distance within geofence



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PROCESS FLOW

- Steps Involved:
 - User registers car and submits GPS data.
 - System calculates distance traveled and toll amount.
 - User views updated balance and transaction history.
 - Map visualization shows car routes and geofence areas



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ARCHITECTURE DIAGRAM

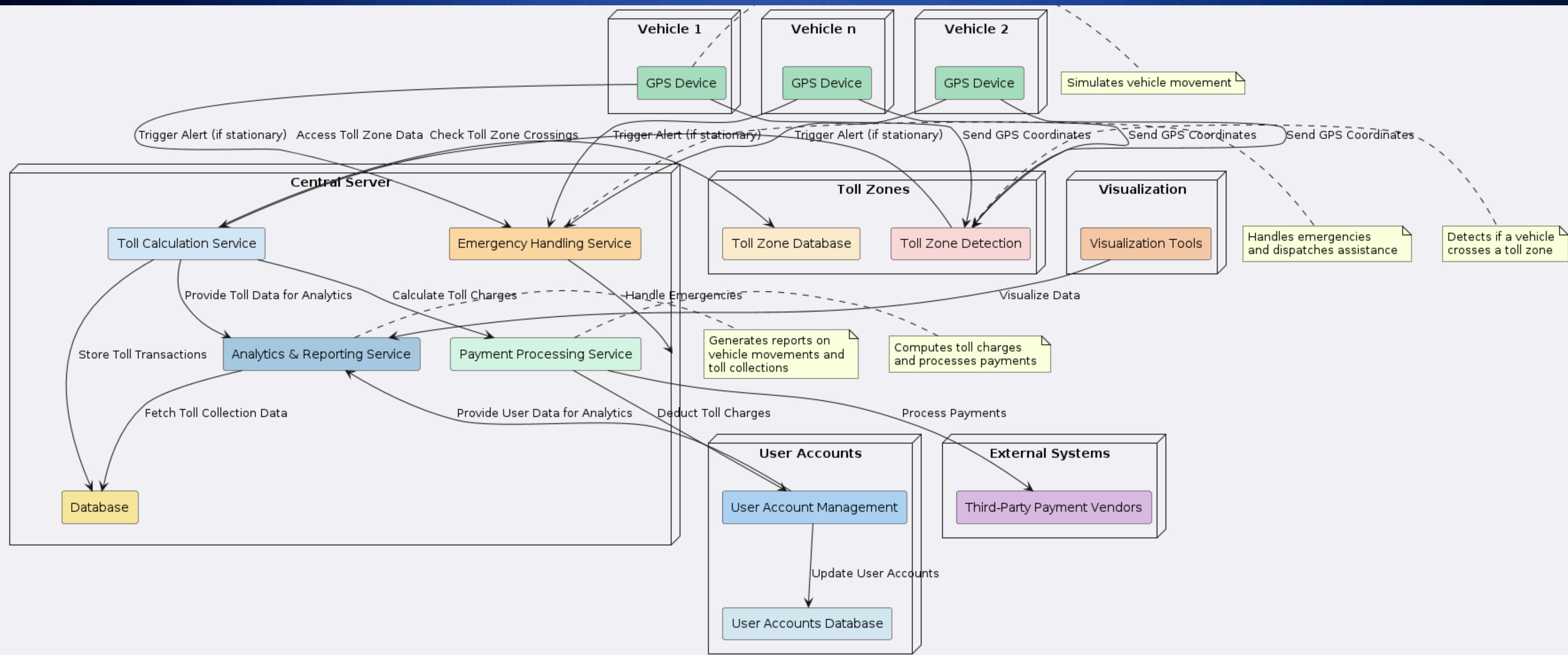


System Architecture:

- User interacts with the frontend (HTML, CSS, JavaScript).
 - Backend (Flask) processes requests and performs calculations.
 - Database (MySQL) stores car and GPS data.
 - Leaflet.js renders interactive maps.
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- Flow:
 - GPS Data -> Central Server -> Toll Calculation -> Payment Processing -> Receipt Generation



ARCHITECTURE DIAGRAM



TECHNOLOGIES USED

Frameworks and Libraries:

- Simulation Framework: SimPy
- Geospatial Analysis: Geopandas, shapely
- Distance Calculation: Geopy
- Data Handling: pandas
- Visualization: matplotlib, folium
- Backend Framework: Flask
- Database: MySQL
- Map Rendering: Leaflet.js

TEAM MEMBERS AND CONTRIBUTION

Member 1:ANIRUDH.K

- Backend Developer: Implemented Flask for car registration, GPS handling, and DB interactions

Member 2: JAASWIN.S

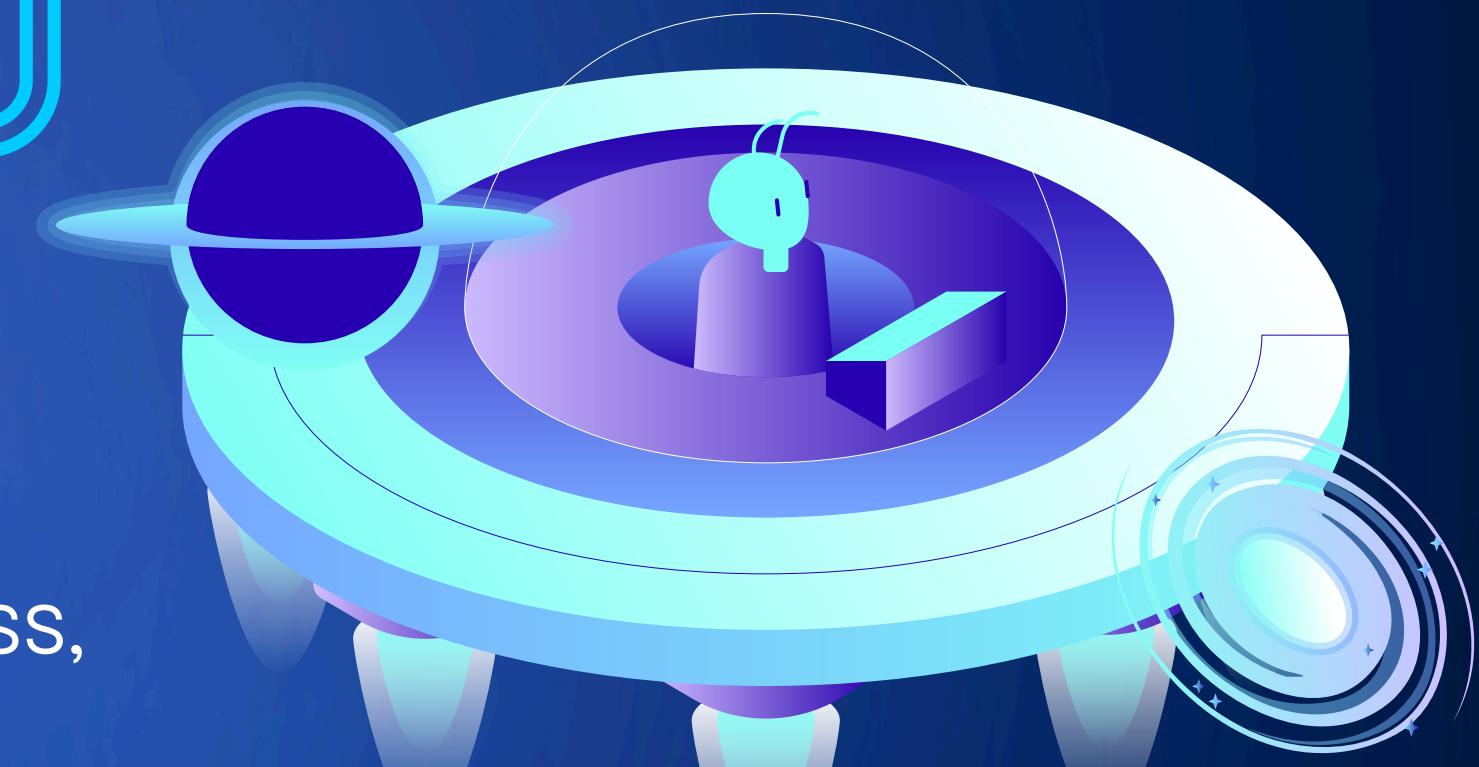
- Frontend Developer: Developed UI using HTML, CSS, and Leaflet.js for maps and forms

Member 3: EDWARD SAMUEL.L

- Data Analyst & Geospatial Analyst: Analyzed GPS with Geopy for distance, geofencing for tolls.

Member 4: GOKUL.P

- Simulation & Report Developer:Conducted simulations for toll calculation scenarios and compiled the project report.



CONCLUSION

- Benefits of GPS-Based Toll Calculation:
 - Real-time accuracy and reduced errors
 - Convenient and automated toll payment
 - Reduced congestion at toll booths
 - Increased transparency and better expense tracking
 - Enhanced customer experience

