Problem Statement

GPS Toll-based System Simulation using Python

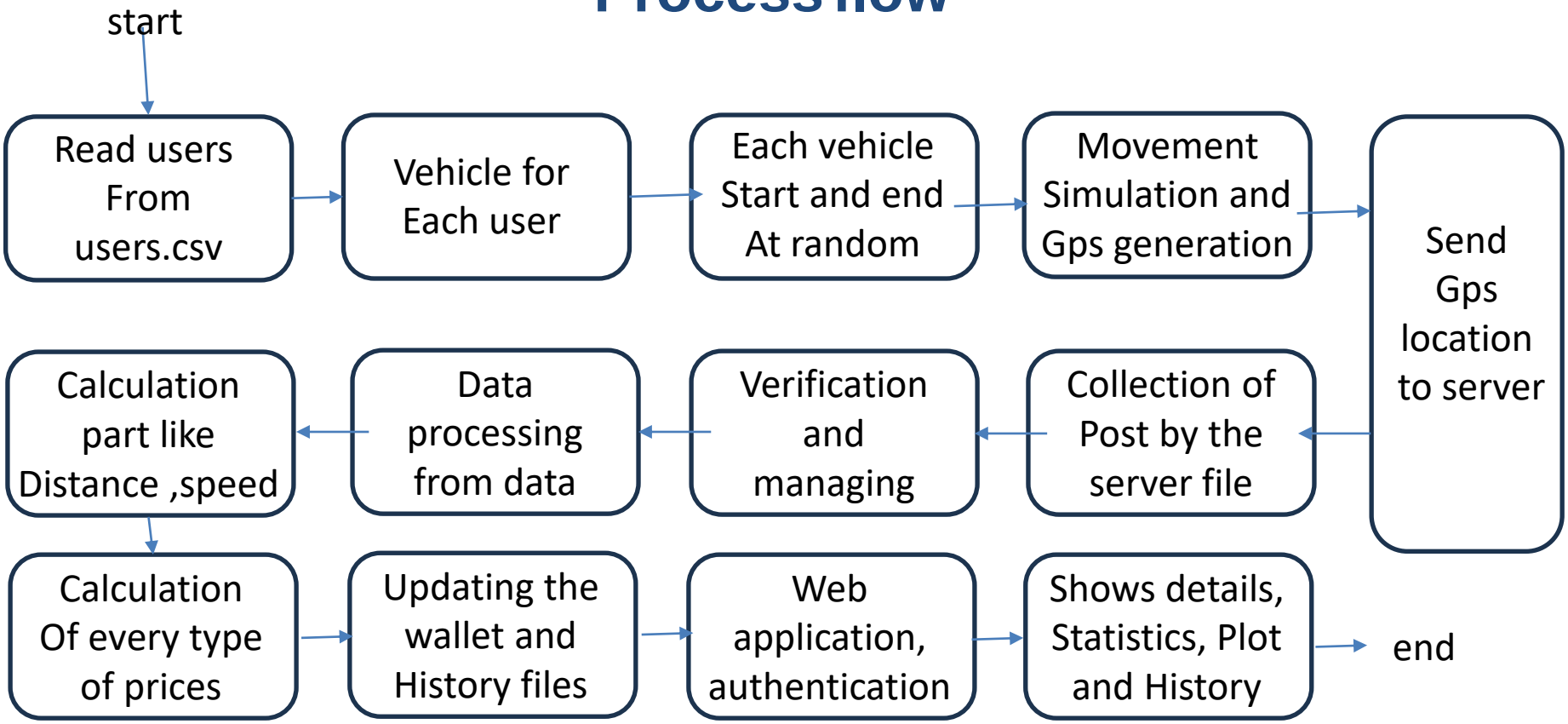
Brief Solution

Our Python-based solution integrates a scalable map, realistic vehicle simulation, and a server. Using a robust client-server mechanism, we ensure GPS-based toll calculation in real time while preserving user privacy. The system efficiently updates histories and wallets, ensuring accurate automated toll collection system.

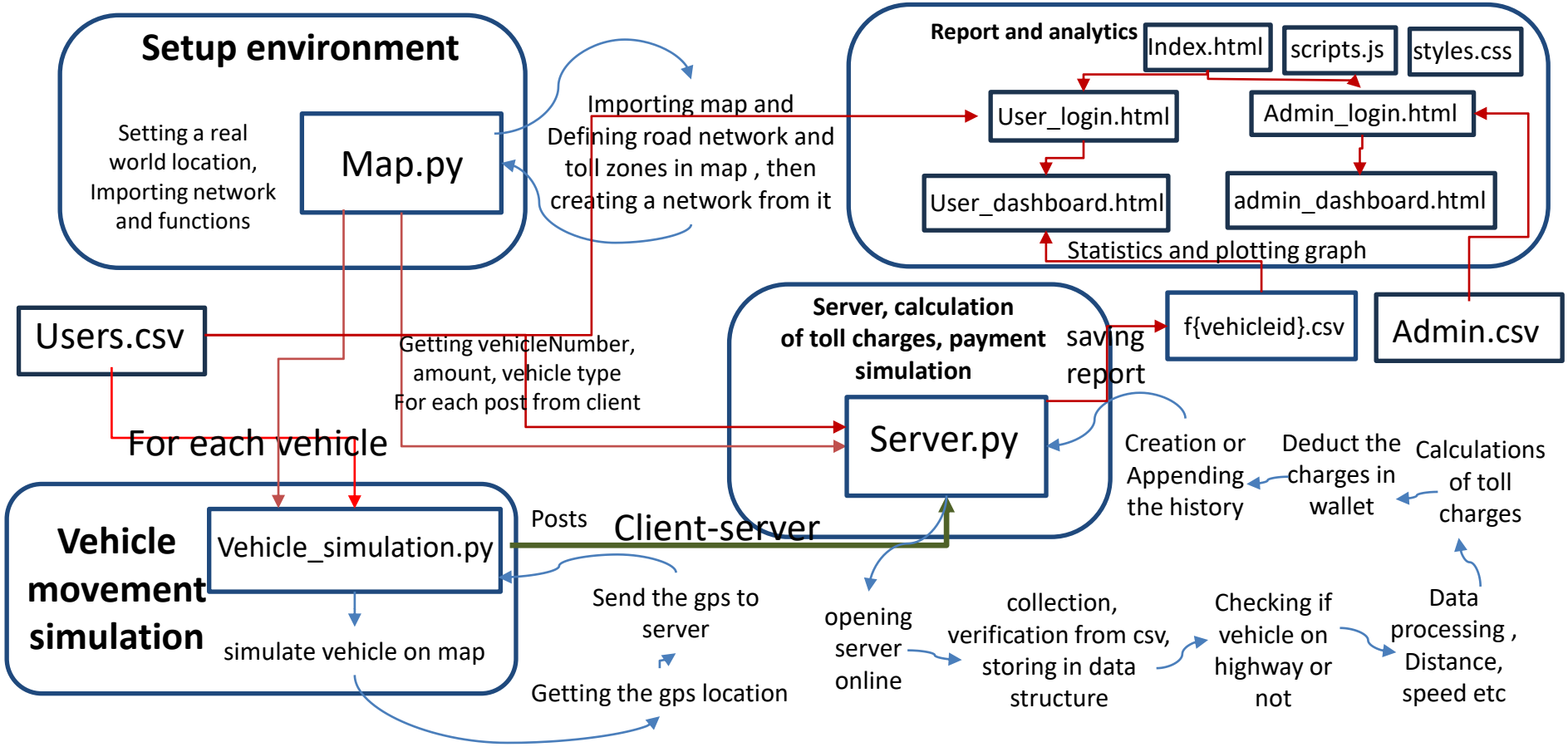
Features Offered

- **Scalable Map**: Dynamic, scalable mapping for various routes.
- **Vehicle simulation**: realistic multiple vehicle movement
- **Automated Toll Collection**: Streamlined toll collection process.
- **GPS Toll Calculation**: Real-time toll calculation using GPS data.
- **Client-Server Mechanism**: Robust real-time data processing.
- **Privacy Preservation**: Ensures user privacy.
- **Efficient Updates**: Accurate history and wallet updates.
- **User Web Application**: vehicle details and transaction history.
- **Detailed Reports**: Generate detailed CSV reports for each vehicle.

Process flow



Architecture



Technologies used:

Programming Language: Python 3.8
Web Framework: Flask
Mapping Library: Folium, NetworkX
Data Analysis: Pandas, NumPy
Frontend: HTML5, CSS3, JavaScript

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Conclusion

Achievements:

- Successfully developed a GPS Toll-based System Simulation.
- Implemented real-time vehicle tracking and dynamic toll pricing.
- Automated toll calculation and payment, reducing congestion and delays.
- Successfully implemented all requirement conditions mentioned in ideation.

Future Scope:

- Enhance the system to handle larger datasets and more vehicles.
- Add more features like toll fee prediction and anomaly detection in vehicle movements.
- Simulation comparison between existing classic toll collection method and this method to get increase in accuracy and efficiency of this method
- Integration with external systems for broader data analysis.