SMART INDIA HACKATHON 2024

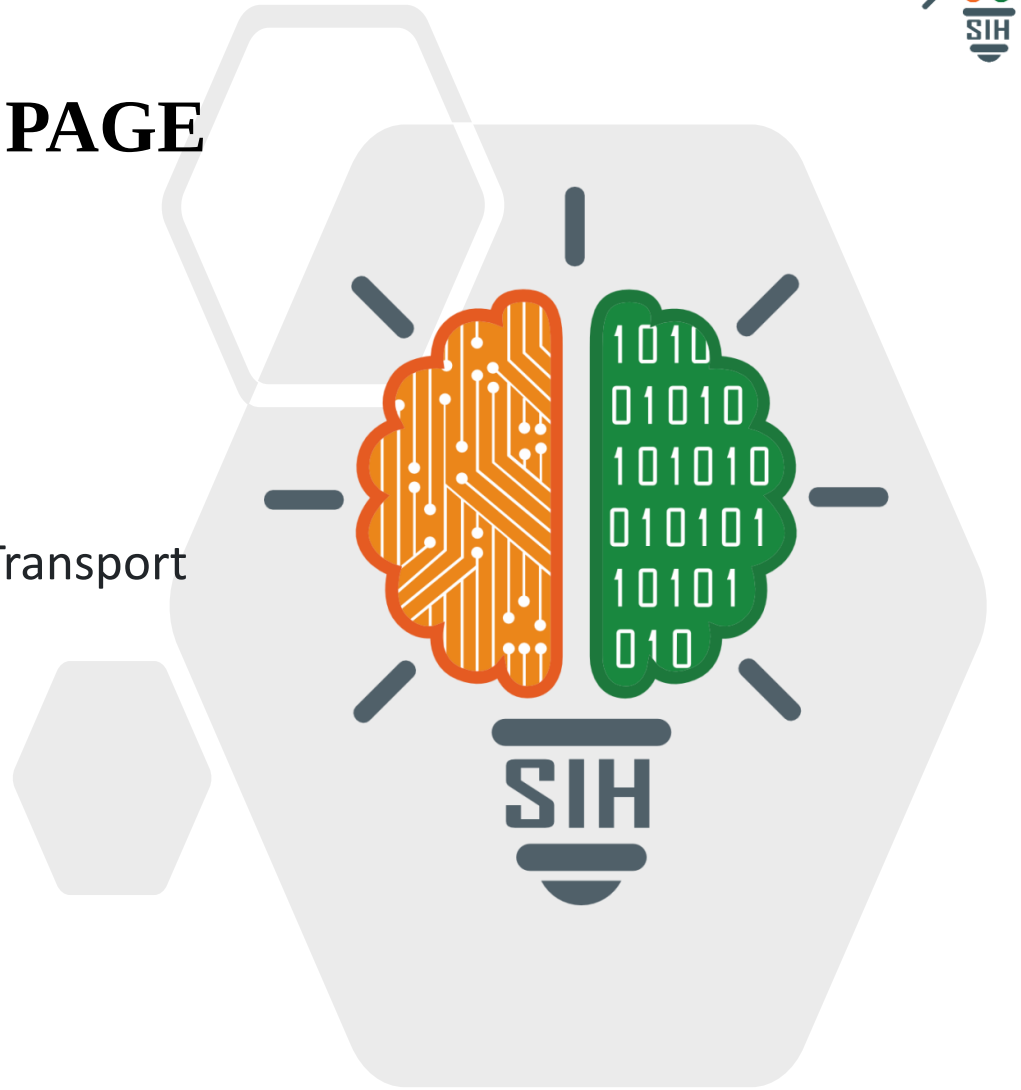
TITLE PAGE

- **Problem Statement ID –** 1612
- **Problem Statement Title-**

  Automated Bus Scheduling and

  Route Management System for Delhi Transport

  Corporation
- **Theme -** Smart Vehicles
- **PS Category - Software**
- **Team ID -** 13023
- **Team Name -** RouteOptiX



RouteOptiX

RouteOptiX : A Modern Bus Managing System

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EXISTING PROBLEMS:

Improper Buses & Crew Scheduling:

- **60%** of total commuting in Delhi requires buses.
- Manual scheduling leads to **90% time wastage** and **25% error rate**.
- With **15.6 lakh** daily passengers, poor scheduling and analysis result in revenue loss and fuel wastage.

Route Management/Planning:

- Difficulty in visualizing existing routes for informed decision-making.
- Challenges in proposing new routes lead to inefficient fuel use, revenue loss, and resource mismanagement.

No Alert System:

- **Delayed communication** of schedule changes to crew members causes **operational issues**.

PROPOSED SOLUTION :

Automate Everything:

- **Dynamically** schedules crew and buses
- Handles rest period
- Alert System

Analytics Support:

- **Real Time** Dashboard
- **Route Analysis**

GIS Mapping System:

- Shows Existing Routes
- Connects Different stops
- **Visualizes** routes
- Enables **Interactivity** with map, to get insights

Innovation & Uniqueness:

- **Schedules** 12000 crew members & 5000 buses within **3 seconds.**
- Automates **Rest Period** and **over scheduling automatically.**
- Providing **update**, **add**, **Delete** options to Planners.
- **Fastest Alert** messaging.
- **Secure** & **Scalable** System.

Source:

https://en.wikipedia.org/wiki/Transport_in_Delhi

https://delhiplanning.delhi.gov.in/sites/default/files/Planning/ch._12_transport_0_0.pdf

RouteOptiX

TECHNICAL APPROACH

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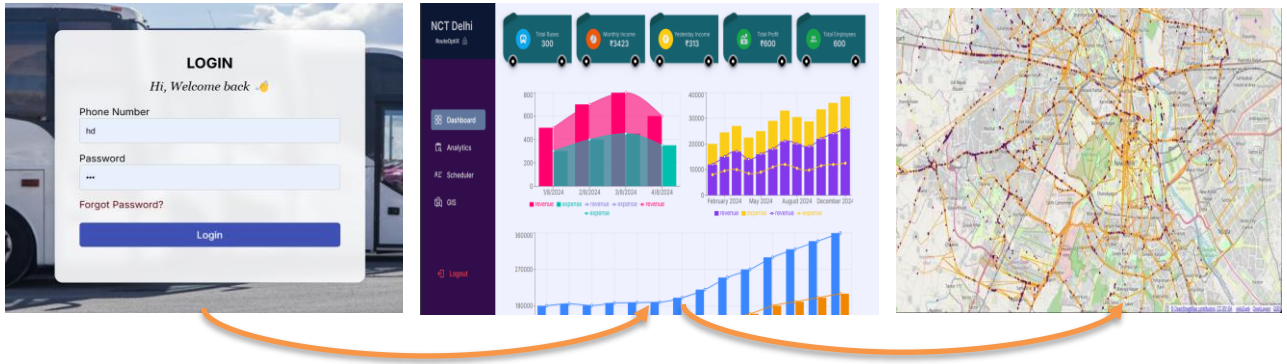
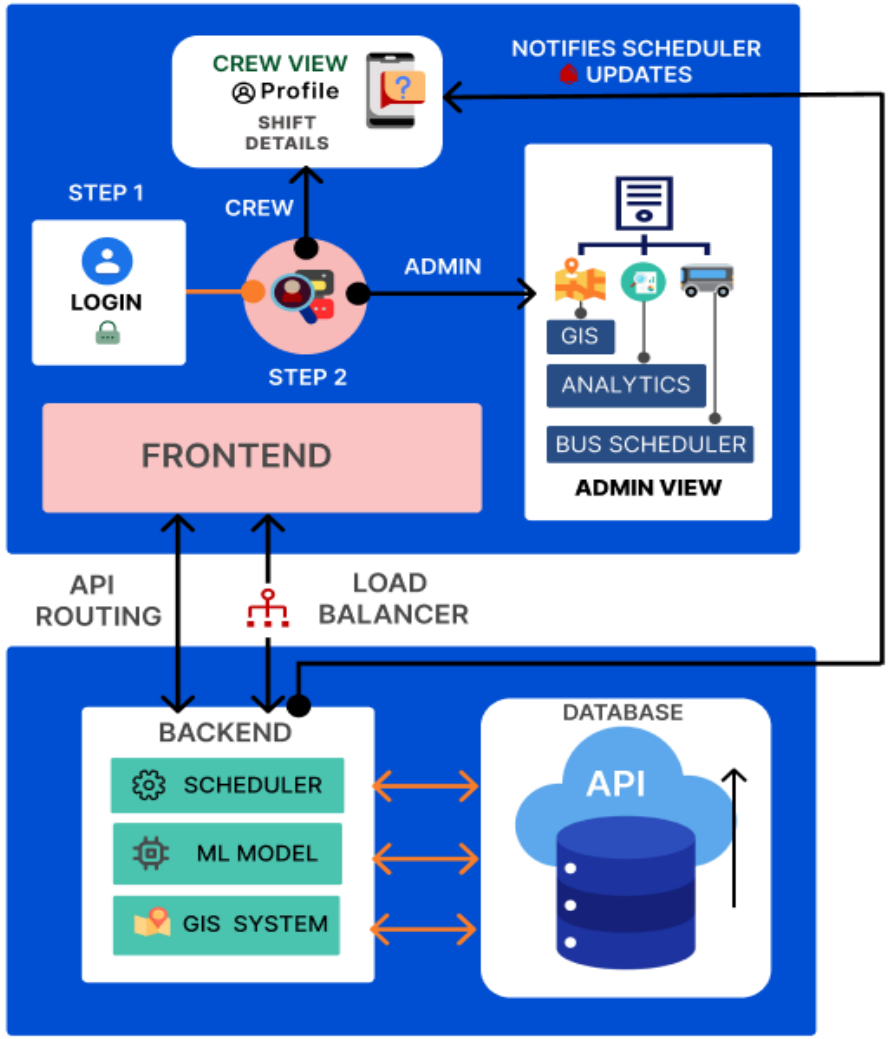
Technologies & Frameworks:

- *React JS* -- Realtime ***Dynamic*** state management
- *Django* -- ***Highly Secured*** , ***Scalable*** Backend
- *QGIS* -- **Realtime seamless** integration of Map
- *Python* -- **Efficient** & **Fastest** Scheduling
- *Scikit Learn* -- **ML model** and **Data analysis**
- *PostgreSQL* -- Database & geographical data handling.
- Leaflet/Open layers - **interactive** web map.

Prototype Images: (40% - 50% completed)



Architecture Process



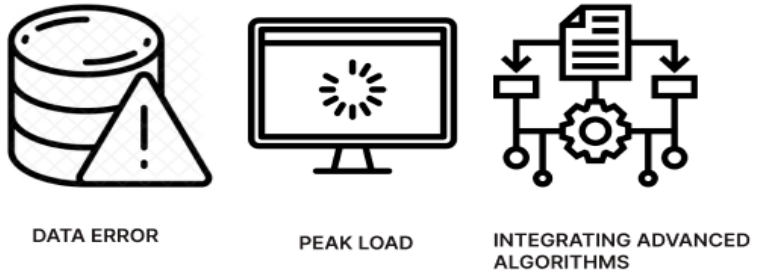
FEASIBILITY AND VIABILITY

➢ Analysis of the feasibility of the idea

1] Integrate advanced technology with existing systems.

2] Cost savings and improvements outweigh initial development costs.

3] Advanced features boost efficiency, decision-making.



➢ Potential challenges and risks

1] Integrating advanced algorithms with real-time traffic data.

2] Ensuring system reliability under peak loads.

3] Overcome resistance to new technology.

4] Data errors disrupt operations.

5] Generating real-time data

➢ Strategies for overcoming these challenges

1] Implement adaptive algorithms that self-optimize with real-time data.

2] Run rigorous system simulations.

3] Offer hands-on training.

4] Prioritize data quality and security.

5] Set up GPS/IoT devices for real-time data

IMPACT AND BENEFITS

ASPECT	EXISTING SYSTEM	AUTOMATIC SCHEDULED SYSTEM
Scheduling Method	Manual	Automated
Duty Scheduling	Manual Handling	Automated management
Route Management	Manual Mapping	Automated route optimization, highlighting overlaps
Resource Utilization	Less Efficient	Optimized resource allocation
Technology Integration	Minimal	Data Analytics ,GIS

➢ Potential impact on the target audience

1] Makes commutes faster, more reliable.

2] It enhances efficiency, service quality.

3] Automating scheduling cuts delays and improves the commuter experience.

➢ Benefits of the solution (social, economic, environmental, etc.)

1] It cuts costs by optimizing fuel consumption and reducing errors.

2] It makes buses more accessible enhancing public mobility.

3] Efficient routing reduces 10 - 15% emission, supporting a greener Delhi.

RESEARCH AND REFERENCES

- Chunjie Zhou, Pengfei Dai, Zhenxing Zhang, "***Passenger demand prediction on bus services***", *IEEE **International** Conference on Green Computing and Internet of Things (ICGCIoT), 2015*.
- Anilkumar Bachu, "***Dynamic Bus Scheduling Based on Real-Time Demand and Travel Time***", ***ResearchGate** International Journal of Civil Engineering, 2019*.
- Anubhav Jain, Avdesh Kumar, "***Benchmark Dataset for Timetable Optimization of Bus Routes in the City of New Delhi***", ***IEEE** 23rd International Conference on Intelligent Transportation Systems (ITSC), 2020.*
- Mingming Chen, Huimin Niu, "***Research on the Scheduling Problem of Urban Bus Crew Based on Impartiality***", ***ScienceDirect** 8th International Conference on Traffic and Transportation Studies, 2012.*