(IGTS) - Intercity Goods Transportation System

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ABSTRACT- Efficient management of intercity goods transportation is critical for ensuring timely deliveries, operational efficiency, and customer satisfaction. Despite the growing demand for streamlined logistics, many transport agencies still rely on manual or semi-digital methods for booking, driver allocation, transport request management, and billing. Such practices often result in delays, human errors, limited transparency, and suboptimal resource utilization.

The Intercity Goods Transportation System (IGTS) is a web-based platform designed to digitalize and automate transport agency operations. The system integrates core functionalities such as transport request booking, driver and vehicle allocation, billing management, and capacity load management within a centralized framework. Developed using React.js for the frontend, Node.js and Express.js for the backend, and MongoDB for data management, IGTS ensures secure record keeping, efficient data processing, and a scalable architecture.

By centralizing operations, IGTS improves coordination among customers, administrators, and drivers while reducing paperwork and operational complexity. The system enhances transparency, optimizes resource utilization, minimizes manual billing, and increases the overall reliability and efficiency of intercity goods transportation services.

Keywords: Intercity goods transportation, logistics management, driver and vehicle allocation, capacity load management, transportation system automation, reduced manual billing, user-friendly system.

I. INTRODUCTION

Efficient intercity goods transportation is a cornerstone of modern logistics and supply chain management, where timely delivery, operational efficiency, and customer satisfaction are essential. Transport agencies operating across multiple cities must coordinate customers, drivers, and vehicles while ensuring the safe and punctual movement of goods.

However, many small- and medium-scale transport agencies continue to rely on manual documentation, telephone-based bookings, and fragmented record-keeping systems. These traditional approaches often lead to delays in transport request processing, inefficient resource utilization, communication gaps, and limited scalability to meet growing operational demands.

Conventional transport management practices typically lack centralized coordination mechanisms for managing bookings, vehicle availability, driver assignments, and billing. This absence results in delayed updates, inconsistent records, and limited visibility for customers regarding the status of their transport requests. Such limitations reduce operational efficiency, transparency, and trust between service providers and clients.

To address these challenges, the Intercity Goods Transportation System (IGTS) has been developed as a comprehensive web-based platform that integrates essential operational modules into a unified framework. The system incorporates transport request booking, driver and vehicle allocation, billing management, and real-time request monitoring. Developed using React.js, Node.js, Express.js, and MongoDB, IGTS provides a scalable, secure, and efficient solution for modern logistics operations.

By automating workflows and centralizing transport data, IGTS improves coordination among customers, administrators, and drivers, reduces human errors, enhances transparency, and optimizes resource utilization,

offering a reliable framework for intercity goods transportation.

II. LITERATURE REVIEW

In recent years, several researchers have worked on digital transportation and logistics management systems using web-based platforms to improve coordination, efficiency, and transparency in intercity goods transport.

Kumar and Patel [1] discussed integrated transport management platforms that automate booking, driver allocation, and record management. Their study highlighted improved resource utilization and reduced operational delays. However, it mainly focuses on basic automation and lacks real-time shipment tracking and centralized operational control.

Sharma et al. [2] emphasized that centralized web-based logistics platforms enhance coordination among operational units and minimize manual intervention. Although their system improves workflow transparency, it primarily addresses coordination without integrating billing or complaint management.

Singh and Verma [3] proposed an online transport management framework that automates booking and vehicle scheduling. While reducing paperwork and improving transparency, it is limited to scheduling automation and does not include real-time shipment updates or return-trip planning.

Gupta [4] focused on fleet monitoring and scheduling to optimize vehicle utilization and resource planning. The study improves efficiency but does not integrate bookings, driver allocation, or centralized reporting within a single system.

Mehta and Singh [5] highlighted the importance of secure login mechanisms and role-based authentication in enterprise systems. While focused on security, their approach is not specific to logistics workflows. IGTS adopts similar role-based access for administrators, drivers, and customers to ensure secure operations and transparency.

Agarwal and Mishra [6] developed a unified logistics platform combining booking, tracking, and billing modules. Although the system improves operational efficiency, it lacks advanced fleet coordination, return-trip optimization, and comprehensive administrative monitoring. IGTS addresses these gaps with automated driver allocation, return-trip vehicle utilization, and centralized reporting.

Kumar and Sharma [7] proposed digitizing transport documentation to improve data accuracy and retrieval. While improving documentation, the system does not integrate operational workflows. IGTS advances this approach by combining digital documentation with booking, billing, and shipment monitoring in a single platform.

Patel and Verma [8] emphasized real-time shipment tracking to enhance delivery reliability and customer satisfaction. Their system focuses primarily on tracking and does not integrate booking, billing, or complaint management.

Sharma and Joshi [9] demonstrated that automated billing reduces financial discrepancies and human errors. However, it is limited to billing and does not integrate with fleet allocation, booking, or shipment monitoring.

NITI Aayog [10] and the Ministry of Road Transport and Highways [12] stress digital transformation in logistics, highlighting the importance of centralized platforms, automated documentation, and data-driven management. IGTS aligns with these recommendations by digitalizing workflows, maintaining structured records, and providing centralized administrative control.

Rao et al. [11] proposed centralized freight information management to enhance coordination and scalability. IGTS strengthens this architecture with automated allocation, real-time updates, and role-based control to ensure efficient intercity goods transportation.

III. METHODOLOGY

The Intercity Goods Transportation System (IGTS) follows a layered, role-based architecture designed to streamline intercity logistics by enabling real-time transport request monitoring, driver and vehicle management, administrative control, and secure verification. The system is divided into three primary layers: the Sender layer, the Admin layer, and the Driver layer, which enhances clarity, scalability, resource utilization, and security.

At the Sender layer, users register or log in through the web application. Authenticated users can create transport requests by providing pickup and delivery details, package information, and service preferences. The system

calculates transportation costs and generates a transport request record with a "Payment Pending" status. Once payment is completed via the integrated module, the request status is updated, and a Pickup OTP (One-Time Password) is generated for secure verification during collection.

The Admin layer provides centralized control through a dashboard, allowing administrators to monitor active transport requests, assign drivers and vehicles, and optimize routes. Driver availability and route suitability are evaluated in real time. Once a driver is assigned, the transport request status is updated to "Assigned", and the driver is marked as "Busy", ensuring efficient utilization of resources and reducing scheduling conflicts.

At the Driver layer, assigned drivers verify the Pickup OTP, transport the goods, and confirm delivery using a Delivery OTP. All updates are reflected in real time, allowing senders and administrators to track the progress continuously. Upon delivery, the driver becomes available for new assignments.

The system is implemented using HTML, CSS, and JavaScript for the frontend, Node.js and Express.js for backend processing, and MongoDB for centralized data management. Comprehensive unit, integration, and system testing ensure functional correctness, secure data flow, and seamless module interaction across all layers.

Through this methodology, IGTS provides real-time request monitoring, OTP-based verification, optimized driver allocation, instant status updates, and enhanced transparency and accountability for all participants in intercity goods transportation.

❖ **Block Diagram**

Fig. 1. Shows Block Diagram of the Proposed System

❖ **Data Flow Diagram**

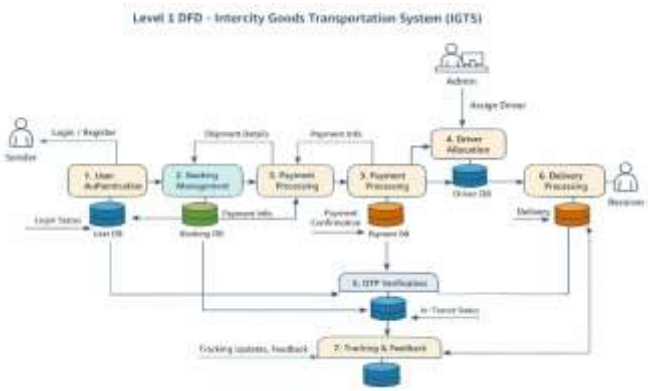


Fig. 2 Shows the DFD of the Proposed System

IV. IMPLEMENTATION

A. Implementation

The Intercity Goods Transportation System (IGTS) is implemented as a web-based application using the MERN stack, ensuring scalability, flexibility, and efficient data handling. The system provides a structured platform for managing shipment booking, administrative control, and delivery operations through multiple functional modules.

1. Home Page

The homepage serves as the primary entry point to the Intercity Goods Transportation System (IGTS). It provides users with clear options to register or log in according to their roles—Sender, Admin, or Driver. The interface is designed to be simple and user-friendly,

ensuring intuitive navigation and quick access to essential system features.

Fig. 3 shows the homepage of the IGTS platform.

2. Sender Account Creation

Senders can create accounts by registering through a secure form, providing essential details such as name, email, contact number, and password. Once registered,

senders can securely access shipment booking, payment, and tracking functionalities.

Fig. 4 shows the Create Account interface of the system.

3. Login Interface

The login module ensures secure authentication of users. Users enter their credentials, and based on their roles (Sender, Admin, or Driver), they are redirected to their respective dashboards.

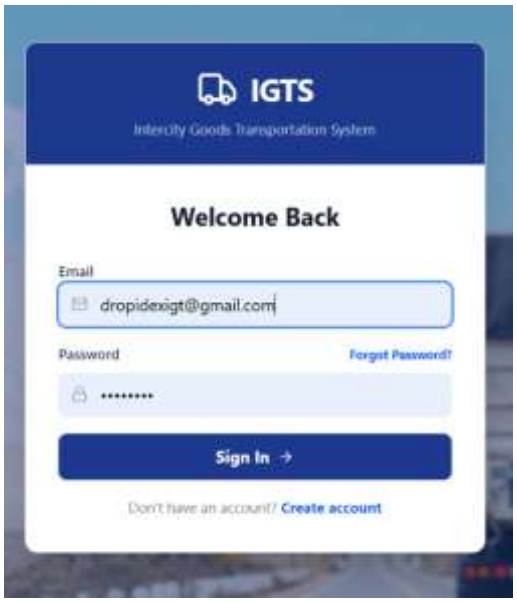


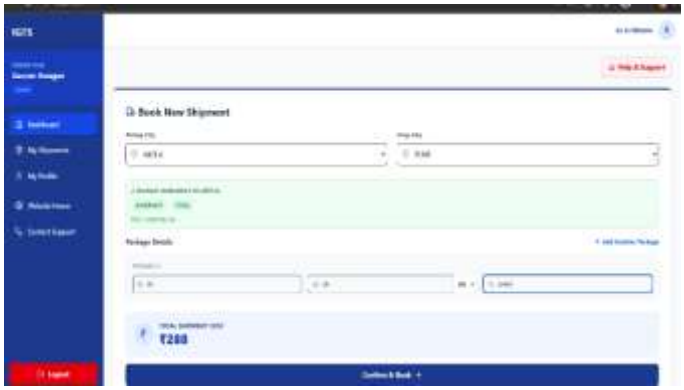
Fig. 4 shows the login interface of the system.

4. Sender Dashboard

After login, senders access a dashboard to manage shipments. They can create new shipment requests, view shipment history, and track shipment status through stages such as *Payment Pending, Assigned, In Transit,* and *Delivered.*

Fig. 5 shows the Sender dashboard.

5. Shipment Booking Module



Senders can book shipments by entering details such as pickup location, delivery destination, package type, weight, and service preferences. After submitting the details, the system calculates the total transportation cost and creates a shipment record in the sender's dashboard. The shipment status is updated automatically as it progresses through stages like *Booked, Payment Completed, Assigned, Picked, In Transit,* and *Delivered*, ensuring proper tracking without explicitly showing "Payment Pending."

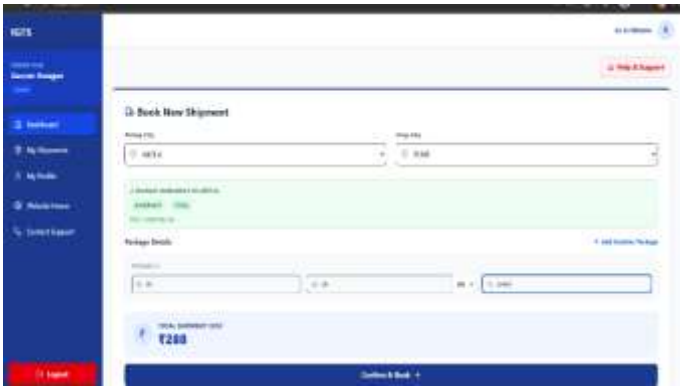


Fig. 6 shows the food entry form.

6. Payment Module

The payment module allows senders to complete transactions securely. Upon successful payment, the shipment status is updated, and a **Pickup OTP** is generated for secure verification during collection.

Fig. 7 shows the* Payment *interface.

7. Admin Dashboard

The Admin dashboard provides centralized control over the system. Admins can monitor all shipments, assign drivers, manage vehicle availability, and optimize routes.

- **Driver ID and Credentials Assignment:** The Admin generates a unique **Driver ID** and login credentials for each driver. These credentials allow drivers to securely log in to the Driver Dashboard, access assigned shipments, and update delivery progress.
- Once a driver is assigned to a shipment, the shipment status is updated to *"Assigned,"* and the driver's status is set to *"Busy."*

Fig. 8 shows the admin dashboard.

8. Driver Dashboard

Drivers log in using their assigned credentials to view and accept shipments. They proceed to the pickup location, verify the Pickup OTP, transport the goods, and confirm delivery with a Delivery OTP.

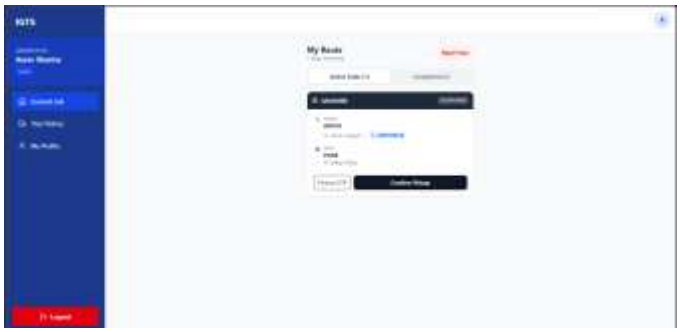


Fig. 9 shows the driver dashboard..

9. OTP Verification Module

The system generates **Pickup OTP** for collection and **Delivery OTP** for confirming successful delivery. This ensures secure handling of shipments and prevents unauthorized access.

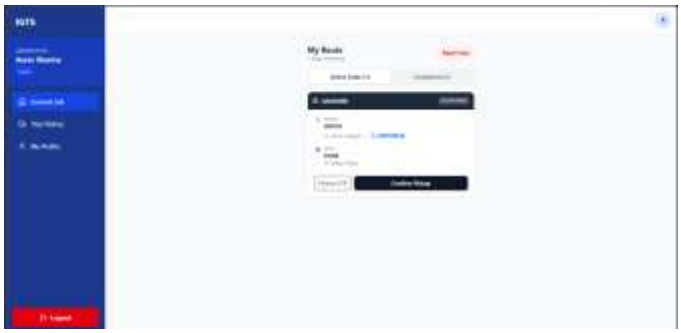


Fig. 10 shows the OTP verification process.

10. Shipment Status Tracking

The system provides **status-based tracking**, allowing senders and admins to monitor shipment progress through predefined stages such as *Assigned, In Transit,* and *Delivered.* This ensures transparency and accountability without requiring real-time GPS tracking.

Fig. 11shows the shipment status flow.

The proposed Intercity Goods Transportation System (IGTS) is implemented as a web-based application using the MERN stack, which ensures scalability, flexibility, and efficient data management. The frontend is developed using HTML, CSS, and JavaScript to provide a user-friendly interface, while Node.js and Express.js are used for backend services and API handling. MongoDB is used as the database to store user information, shipment details, payment records, and driver data.

The system is divided into multiple functional modules to ensure smooth operation. The user authentication module manages secure registration and login for senders, administrators, and drivers. The shipment booking module allows users to enter details such as pickup location, delivery destination, package type, and weight. This data is stored in the database and processed by the system to generate cost estimates and shipment records.

The payment module enables users to complete

transactions securely, after which the system updates the shipment status and generates a Pickup OTP for verification. The driver allocation module allows administrators to assign drivers based on availability and route suitability, ensuring efficient resource utilization.

To ensure security and transparency, an OTP-based verification mechanism is implemented. A Pickup OTP is verified during parcel collection, and a Delivery OTP is used to confirm successful delivery. The system also includes a status-based tracking module, which allows users to monitor shipment progress through stages such as *Assigned, In Transit,* and *Delivered*.

Additionally, the system provides a structured workflow that enables effective coordination between senders, administrators, and drivers. This enhances operational efficiency, reduces manual errors, and ensures reliable shipment handling throughout the delivery process.

V. RESULT AND DISCUSSION

The implementation of the Intercity Goods Transportation System (IGTS) demonstrates a significant improvement in managing intercity shipments through secure verification, efficient driver allocation, and status-based tracking.

System Performance

- The platform enables status-based tracking of shipments, allowing senders and admins to monitor progress through stages such as *Assigned, In Transit,* and *Delivered*.
- OTP verification ensures secure pickup and delivery of shipments.
- The system provides faster coordination and communication compared to traditional manual shipment management methods.

Efficiency Improvements

- Delivery coordination and driver allocation are optimized, reducing delays and scheduling conflicts.
- Shipment processing time is improved due to automated workflows for booking, assignment, and verification.
- Centralized dashboards for admins and senders enhance operational efficiency and resource utilization.

Transparency and Reliability

- OTP-based verification ensures authenticity and prevents unauthorized handling of shipments.
- Centralized data storage improves record management and tracking of all shipments.
- Status updates at each stage reduce uncertainty and provide visibility to all stakeholders.

Table 1: Comparison of Existing Systems and Proposed IGT

Feature	**Existing Systems**	**IGTS System**
Status-Based Shipment Tracking	Limited / Manual	Available
OTP Verification (Pickup & Delivery)	Not Available	Available
Driver Allocation	Manual	Optimized & Automated
Transparency & Security	Low	High
Real-Time GPS Tracking	Not Available	Not Available (status-based only)

The results indicate that structured workflows, automated driver allocation, and OTP-based verification significantly enhance shipment efficiency and security. Unlike traditional systems that rely on manual coordination and limited tracking, IGTS provides a streamlined approach where shipment progress is clearly monitored and verified at each stage.

The centralized management improves operational transparency, while automated status updates and verification mechanisms reduce errors and enhance reliability. Overall, IGTS demonstrates strong potential as a scalable and practical solution for intercity goods transportation.

These results are based on system testing under simulated shipment conditions, reflecting realistic operation scenarios.

VI. CONCLUSION

Intercity goods transportation continues to be a critical operational concern, affecting economic efficiency, service reliability, and stakeholder satisfaction. At the same time, many transport agencies still rely on manual processes, highlighting the need for efficient and practical solutions for shipment management and tracking. This

paper presented IGTS, a web-based, automated intercity goods transportation system designed to improve operational efficiency, security, and accountability. The system integrates features such as shipment booking, OTP-based verification, status-based tracking, and role-based dashboards within a unified web platform. These functionalities enable users to manage shipments effectively, take timely actions, and facilitate seamless coordination between senders, drivers, and administrators. The implementation of the system demonstrates that combining modern web technologies with structured workflows can significantly improve the efficiency and transparency of intercity logistics operations. The platform not only helps in optimizing fleet utilization but also promotes accurate record keeping and secure handling of goods. In conclusion, IGTS provides a practical and scalable solution for addressing the challenges of intercity shipment management. The system has the potential to be further enhanced by incorporating predictive delivery scheduling, mobile application support, and integration with larger logistics networks, making it more effective for real-world deployment.

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