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DEVELOPMENT OF AN INTEGRATED OFFICIAL VEHICLE DATA MANAGEMENT SYSTEM USING QR CODES AND ACTIVITY LOGS

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DEVELOPMENT OF AN INTEGRATED OFFICIAL VEHICLE DATA MANAGEMENT SYSTEM USING QR CODES AND ACTIVITY LOGS

Abstract: *This study aims to design and implement an integrated web-based Official Vehicle Management Information System utilizing QR Code technology and operational logs, named SIPAKAD (Sistem Informasi Pengelolaan Kendaraan Dinas Angkatan Darat). The system was developed to address inefficiencies, recording errors, and data redundancy commonly found in manual management of official vehicles within military environments. The research employed a system engineering approach with black-box testing to evaluate key functions such as vehicle, driver, and route data management, operational log recording, real-time GPS tracking, and report export features. The implementation results show that SIPAKAD is capable of managing data centrally, accurately, and in real-time, supporting operational monitoring through interactive maps, and reducing human resource requirements and operational costs. The system is considered effective in improving efficiency, transparency, and accuracy in official vehicle management and holds potential for further development in maintenance scheduling and additional security integrations in the future.*
Keywords: Information System, Official Vehicles, QR Code, Operational Log, GPS

Abstrak: *Penelitian ini bertujuan untuk merancang dan mengimplementasikan Sistem Informasi Pengelolaan Kendaraan Dinas berbasis web yang terintegrasi dengan teknologi Kode QR dan log operasional, yang dinamakan SIPAKAD (Sistem Informasi Pengelolaan Kendaraan Dinas Angkatan Darat). Sistem ini dikembangkan untuk mengatasi ketidakefisienan, kesalahan pencatatan, dan redundansi data yang umum terjadi dalam pengelolaan kendaraan dinas secara manual di lingkungan militer. Penelitian ini menggunakan pendekatan rekayasa sistem dengan pengujian black-box untuk mengevaluasi fungsi utama seperti manajemen data kendaraan, sopir, dan rute, pencatatan log operasional, pelacakan GPS secara real-time, serta fitur ekspor laporan. Hasil implementasi menunjukkan bahwa SIPAKAD mampu mengelola data secara terpusat, akurat, dan real-time, mendukung pemantauan operasional melalui peta interaktif, serta mengurangi kebutuhan sumber daya manusia dan biaya operasional. Sistem ini dinilai efektif dalam meningkatkan efisiensi, transparansi, dan akurasi dalam pengelolaan kendaraan dinas, serta memiliki potensi untuk dikembangkan lebih lanjut dalam penjadwalan perawatan dan integrasi keamanan tambahan di masa depan.*
Kata Kunci: Sistem Informasi, Kendaraan Dinas, Kode QR, Log Operasional, GPS

INTRODUCTION

Vehicle and operational data management is a crucial aspect in ensuring the smooth execution of activities within high-mobility institutions, such as the army. According to Firdaus (2024), in practice, the process of managing information including vehicle data, drivers, routes, and operational activity logs is still largely carried out manually or through non-integrated systems. This condition leads to various problems, such as work inefficiency, risk of recording errors, data redundancy, and obstacles in presenting the necessary data for quick and accurate decision-making. In the military operational context, such inefficiencies can directly affect the effectiveness of monitoring, responsiveness to emergency situations, and the overall reliability of the logistics system.

With the advancement of information technology, solutions are now available to implement an integrated data management system designed to comprehensively manage master data within a single digital platform. According to Purnomo and Alijoyo (2024), this system integrates vehicle data, drivers along with supporting information such as driving licenses (SIM) and vehicle registration documents (STNK), travel routes, and technology-based operational features such as QR codes, GPS, and web- and mobile-based applications. The implementation of this technology enables real-time and automated recording of operational activities, starting from the creation of travel orders by operators based on superiors' instructions, validation by drivers through the application, to vehicle monitoring during entry and exit at guard posts validated through QR code scanning and facial recognition. All this information is stored in the system and can be monitored and verified via a web client by operators, who play a central role in data management and reporting.

Theoretically, an integrated data management system aligns with the concept of Enterprise Data Management (EDM), which emphasizes the importance of consistent, centralized, and easily accessible data management to support organizational efficiency. Nugroho (2020) explains that the use of QR codes and GPS as part of a Real-Time Operational Monitoring System adds value in accurate recording and tracking of activities. In the military sphere, the presence of a system capable of delivering direct and reliable information is essential to support operational readiness in both Military Operations for War (OMP) and Military Operations Other Than War (OMSP).

The main problem underlying this research is the absence of a system capable of integrating all elements of vehicle and operational data management into a single comprehensive and efficient platform.

Therefore, this study aims to design an integrated data management system that includes the management of master data on vehicles, drivers, license plates, driving licenses (SIM), vehicle registration documents (STNK), fuel types, and travel routes. Syafarina, Zaenuddin, and Sanjaya (2024) state that this system also develops supporting features such as travel order validation, QR code- and GPS-based activity log recording, emergency condition (SOS) notifications, and automatic operational reports accessible via a web client by operators.

This research is expected to provide relevant and applicable solutions to the modern needs of official vehicle management in the army. The system developed under the title “Development of an Integrated Official Vehicle Data Management System Using QR Code and Operational Log” is expected to improve efficiency, transparency, and accuracy in data management, as well as support advanced analysis for better planning and decision-making. Furthermore, the benefits of this system will be significant both in OMP such as improving vehicle coordination and monitoring and in OMSP such as supporting humanitarian operations, securing border areas, and reducing administrative errors. Supported by regulations such as Law No. 3 of 2025 concerning the amendment to Law No. 34 of 2004 on the Indonesian National Armed Forces, this system is expected to serve as a tangible contribution to the digital transformation of official vehicle management within military institutions.

RESEARCH METHODOLOGY

This study uses an experimental method aims to test the effectiveness of an integrated official vehicle data management system based on QR codes and operational logs. According to Purnomo and Alijoyo (2024), the use of QR codes in operational systems can accelerate data validation and reduce recording errors, making it highly effective in supporting official vehicle management. The research was conducted in the Laboratory, Workshop, and the Telecommunications Student Work Unit at Poltekad Kodiklatad, from November 2024 to July 2025. The type of research used is system engineering research with a quantitative approach, in which the system is developed, tested, and analyzed directly based on specific performance parameters. Firdaus (2024) emphasizes that the development of a web-based vehicle management application using a system engineering approach must go through the stages of design, development, testing, and evaluation to ensure its effectiveness.

The dependent variables in this study include the efficiency of vehicle data management, the accuracy of operational tracking, the speed of information updates, as well as the transparency and accuracy of reports. Meanwhile, the independent variables consist of QR codes, GPS technology, webhook integration, the Python and Flask frameworks, and Leaflet as a map visualization library. All independent variables are core components of the developed system and play a role in producing outputs relevant to the research objectives.

The research stages follow a systematic flowchart that includes: initial data collection, needs analysis, system design, system development, testing, refinement, implementation, and report preparation. Furthermore, the system design is elaborated through a main block diagram and program diagram, illustrating the integration of various components such as GPS, information systems, QR code generators, databases, Firebase Cloud Messaging, and reporting modules. Wicaksono and Maheswara (2021) state that the use of Firebase Cloud Messaging enables rapid and targeted notification delivery, thereby supporting system-based operational coordination. The system is designed for both web and mobile clients, integrating various features such as QR code scanning for vehicle activity logs, real-time GPS tracking, and notification delivery via Firebase.

Table 1. Database Program
(Source: Researcher, 2025)

Table	Primary Key	Primary Column
sos_logs	sos_id	log_id, photo, description, timestamp
routes	route_id	start_point, end_point, distance_km, estimated_time_minutes, fuel_estimation_liters, created_at, updated_at
operational_logs	log_id	vehicle_id, driver_id, route_id, qr_code_scanned_at, arrival_status, sos_photo, sos_description, current_radius, gps_coordinates, created_at, updated_at, dijkstra_id
vehicles	vehicle_id	license_plate, nama_material, merk_type, no_reg, cc, bbm, standard_km_per_liter, stnk_number, stnk_expiry_date, fuel_type, status, created_at, updated_at
gps_tracking	tracking_id	vehicle_id, timestamp, latitude, longitude, created_at, updated_at
admins	admin_id	username, password_hash, role, created_at, updated_at
dijkstra_routes	dijkstra_id	start_point, end_point, shortest_path, total_distance_km, estimated_time_minutes, created_at, updated_at
driver_licenses	license_id	driver_id, license_type, license_number, expiry_date
drivers	driver_id	name, license_number, civil_license_number, civil_license_expiry, military_license_number, military_license_expiry, phone_number, fcm_token, status, created_at, updated_at
notifications	notification_id	vehicle_id, message, recipient, fcm_token, status, created_at, updated_at
webhook_logs	webhook_id	vehicle_id, tracking_id, received_data, created_at, updated_at

Data collection in this study was conducted through both primary and secondary sources. Primary data were obtained through direct observation of vehicle operational processes, the use of QR codes, and system performance during testing. Secondary data were gathered from various scientific literature and relevant technical documentation, including references related to the implementation of GPS, QR codes, webhooks, and Python- and Flask-based programming. To ensure objectivity and data completeness, the system also records all vehicle operational logs in a relational database designed using MySQL and implemented on a VPS server.

Data analysis was carried out quantitatively using a descriptive approach. The system testing results were compared with the manual standards or operational baselines previously in use. The analyzed parameters included data access speed, vehicle tracking accuracy, and the system's effectiveness in presenting operational reports. The results of this analysis were then used to assess the extent to which the developed system can improve efficiency, accuracy, and transparency in official vehicle management.

RESEARCH RESULTS

The results of this study led to the implementation of a web-based official vehicle management information system called SIPAKAD (*Sistem Informasi Pengelolaan Kendaraan Dinas Angkatan Darat*), applied within the Indonesian Army Polytechnic (POLTEKAD). The system is designed to support the digitalization of official vehicle management by providing key features such as vehicle data management, driver management, travel routes, and real-time recording of vehicle operational activities via an interactive map-based dashboard.

The system architecture was built using the Laravel framework, utilizing routing mechanisms, models, and controllers in accordance with the MVC (Model-View-Controller) design pattern. The implementation of code in web.php demonstrates how the system responds to various user and external system requests. At the model layer, each entity such as Vehicle, Driver, Route, and OperationalLog is represented with interconnected data relationships. The DijkstraRoute model indicates the presence of an optimal route calculation feature based on a graph algorithm.

The controller layer is responsible for handling business logic, such as the authentication process (AuthController), dashboard display (HomeController), master data management (DriverController, VehicleController, RoutesController), and the management of official operational activity logs (OperationLogsController). The data input process includes validation, route and fuel consumption estimation, as well as notification integration through Firebase Cloud Messaging. A data export feature is also provided to support documentation needs.

1. User Interface

The SIPAKAD system interface reflects a professional and structured approach, beginning with the login page as the system's entry point, featuring an authentication method based on email or NRP (Service Registration Number). The main dashboard displays operational statistics and vehicle locations in real time using the Leaflet.js map library. All data management features including vehicles, drivers, routes, and operational activities are presented on dedicated pages with support for data input, system validation, interactive dropdown menus, and an export feature to Excel format.

2. System Testing Results

Figure 1. Login Page
(Source: Researcher, 2025)

System testing was carried out using the black-box method to evaluate system functionality without reviewing the internal code structure. The testing scenarios included login, vehicle data management, driver management, route management, travel activity logs, and the export feature.

Table 2. Testing Scenarios for the Route Data Page
(Source: Researcher, 2025)

No.	Objective	Input	Testing Steps	Expected Output
1	Add complete route data	Complete: starting point, destination, and coordinates	Fill in all fields, click Save Data	Data is saved and displayed in the list
2	Validate mandatory fields	One or more mandatory fields left blank	Leave one field blank, click Save Data	Error notification appears, data is not saved

Each feature was tested through input validation, error response handling, and CRUD (Create, Read, Update, Delete) capabilities. Based on the testing results, all features demonstrated performance in accordance with the functional specifications. The login feature successfully verified user credentials, the system displayed error notifications when inputs were incomplete, and all CRUD functions operated optimally. The data export feature also successfully generated Excel files according to the selected filters. Therefore, the SIPAKAD system is declared to have successfully met POLTEKAD's operational needs for

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managing official vehicles in a digital, efficient, and accountable manner.

Table 3. Application Feature Testing

(Source: Researcher, 2025)

No.	Feature	Main Scenario	Testing Result	Status
1	Login	Validate login with correct and incorrect data combinations	Successfully logged in with valid account; system rejected invalid attempts	Pass
2	Vehicle	Input, edit, and delete vehicle data	All CRUD functions worked as expected and were properly validated	Pass
3	Driver	Input, edit, and delete driver data	All operations succeeded; errors displayed when input was incomplete	Pass
4	Route	Input, edit, and delete route data	Data added, updated, and deleted successfully; input validation worked correctly	Pass
5	Export to Excel	Export log record data to Excel file	File exported successfully when data was available	Pass

3. Login Page

Displays a login form using Laravel Blade. The form includes input fields for email/NRP and password, along with error validation. It is equipped with a password toggle feature and a submit button that directs to the *authenticate* route

Table 4. *Source Code* Login Page

(Source: Researcher, 2025)

<table>
<tr><th>No</th><th>Source Code</th></tr>
<tr><td>1</td><td>2</td></tr>
<tr><td>1</td><td><!-- Login Form --></td></tr>
<tr><td>2</td><td><form action="{{route('authenticate')}}" method="POST"></td></tr>
<tr><td>3</td><td>@csrf</td></tr>
<tr><td>4</td><td>@if ($errors->has('role'))</td></tr>
<tr><td>5</td><td><p class="text-sm text-red-600 mt-4 text-center"></td></tr>
<tr><td>6</td><td>{{ $errors->first('role') }}</td></tr>
<tr><td>7</td><td></p></td></tr>
<tr><td>8</td><td>@endif</td></tr>
<tr><td>9</td><td><div class="mb-4"></td></tr>
<tr><td>10</td><td><label class="block text-sm font-medium text-[#005731] mb-2" for="emailAddress"></td></tr>
<tr><td>11</td><td>Email/NRP</td></tr>
<tr><td>12</td><td></label></td></tr>
<tr><td>13</td><td><input type="text" class="army-input block w-full text-sm px-4 py-3 h-12 outline-none" id="emailAddress" placeholder="Masukkan email atau NRP" autocomplete="off" name="email" value="{{ old('email') }}"></td></tr>
<tr><td>14</td><td>@if ($errors->has('email') || $errors->has('username'))</td></tr>
<tr><td>15</td><td><p class="text-sm text-red-600 mt-1"></td></tr>
<tr><td>16</td><td>{{ $errors->first('email') ?? $errors->first('username') }}</td></tr>
<tr><td>17</td><td></p></td></tr>
<tr><td>18</td><td>@endif</td></tr>
<tr><td>19</td><td></div></td></tr>
<tr><td>20</td><td><div class="mb-4"></td></tr>
<tr><td>21</td><td><label class="block text-sm font-medium text-[#005731] mb-2" for="password"></td></tr>
<tr><td>22</td><td>Password</td></tr>
<tr><td>23</td><td></label></td></tr>
<tr><td>24</td><td><div class="relative"></td></tr>
</table>

4. Vehicle Page

Displays vehicle data in a table format with columns for Make/Type, License Plate Number, Engine Capacity (CC), Status, and Actions. The table data is populated dynamically using JavaScript or a frontend framework.

Table. 5 *Source Code* Vehicle Page
(Source: Researcher, 2025)

No	***Source Code***
1	*<table class="w-full min-w-[600px] border-collapse border border-gray-300 dark:border-gray-900">*
2	*<thead>*
3	*<tr>*
4	*<th class="py-2 px-4 border-y border-gray-300 dark:border-gray-900 text-center text-sm text-slate-400 font-normal">*
5	*Merk / Type*
6	*</th>*
7	*<th class="py-2 px-4 border-y border-gray-300 dark:border-gray-900 text-center text-sm text-slate-400 font-normal">*
8	*License Plate*
9	*</th>*
10	*<th class="py-2 px-4 border-y border-gray-300 dark:border-gray-900 text-center text-sm text-slate-400 font-normal">*
11	*CC*
12	*</th>*
13	*<th class="py-2 px-4 border-y border-gray-300 dark:border-gray-900 text-center text-sm text-slate-400 font-normal">*
14	*Status*
15	*</th>*
16	*<th class="py-2 px-4 border-y border-gray-300 dark:border-gray-900 text-end">*
17	*Actions*
18	*</th>*
19	*</tr>*
20	*</thead>*
21	*<tbody id="rowTableBody">*
22	*<!-- Dynamic rows will be inserted here -->*
23	*</tbody>*
24	*</table>*

5. Driver Page

This table displays driver information, including Name, Civil/Military Driver's License Number, Service Registration Number (NRP), Status, and Actions. Its structure and styling are similar to those of the Vehicle Page.

Table 6. *Source Code* Driver Page
(Source: Researcher, 2025)

No	***Source Code***
1	2
1	*<table class="w-full min-w-[600px] border-collapse border border-gray-300 dark:border-gray-900">*
2	*<thead>*
3	*<tr>*
4	*<th class="py-2 px-4 border-y border-gray-300 dark:border-gray-900 text-center text-sm text-slate-400 font-normal">*
5	*Name*
6	*</th>*
7	*<th class="py-2 px-4 border-y border-gray-300 dark:border-gray-900 text-center text-sm text-slate-400 font-normal">*
8	*Civil License Number*
9	*</th>*
10	*<th class="py-2 px-4 border-y border-gray-300 dark:border-gray-900 text-center text-sm text-slate-400 font-normal">*
11	*Military License Number*
12	*</th>*
13	*<th class="py-2 px-4 border-y border-gray-300 dark:border-gray-900 text-center text-sm text-slate-400 font-normal">*
14	*NRP*
15	*</th>*
16	*<th class="py-2 px-4 border-y border-gray-300 dark:border-gray-900 text-center text-sm text-slate-400 font-normal">*
17	*Status*
18	*</th>*
19	*<th class="py-2 px-4 border-y border-gray-300 dark:border-gray-900 text-end">*
20	*Actions*
21	*</th>*
1	2
22	*</tr>*
23	*</thead>*
24	*<tbody id="rowTableBody">*
25	*<!-- Dynamic rows will be inserted here -->*
26	*</tbody>*
27	*</table>*

6. Route Page

Displays vehicle route data in a table format with columns for Starting Point Name, Starting Coordinates, Destination Point Name, Destination Coordinates, and Actions. The data is also populated dynamically.

Table 7. *Source Code* Route Page
(Source: Researcher, 2025)

No	*Source Code*
1	2
1	*<table class="w-full min-w-[600px] border-collapse border border-gray-300 dark:border-gray-900">*
2	*<thead>*
3	*<tr>*
4	*<th class="py-2 px-4 border-y border-gray-300 dark:border-gray-900 text-center text-sm text-slate-400 font-normal">*
5	*Start Point Name*
6	*</th>*
7	*<th class="py-2 px-4 border-y border-gray-300 dark:border-gray-900 text-center text-sm text-slate-400 font-normal">*
8	*Start Point*
9	*</th>*
10	*<th class="py-2 px-4 border-y border-gray-300 dark:border-gray-900 text-center text-sm text-slate-400 font-normal">*
11	*End Point Name*
12	*</th>*
13	*<th class="py-2 px-4 border-y border-gray-300 dark:border-gray-900 text-center text-sm text-slate-400 font-normal">*
14	*End Point*
15	*</th>*
16	*<th class="py-2 px-4 border-y border-gray-300 dark:border-gray-900 text-end">*
1	2
17	*Actions*
18	*</th>*
19	*</tr>*
20	*</thead>*
21	*<tbody id="rowTableBody">*
22	*<!-- Dynamic rows will be inserted here -->*
23	*</tbody>*
24	*</table>*

7. Activity Log Page

A table used to record vehicle travel activity logs, containing information such as Purpose, Vehicle, Driver, Route, Arrival Status, and Actions.

Table 8. Source Code Activity Log Page
(Source: Researcher, 2025)

No	***Source Code***
1	2
1	*<table class="w-full min-w-[600px] border-collapse border border-gray-300 dark:border-gray-900">*
2	*<thead>*
3	*<tr>*
4	*<th class="py-2 px-4 border-y border-gray-300 dark:border-gray-900 text-center text-sm text-slate-400 font-normal">*
5	*Keperluan*
6	*</th>*
7	*<th class="py-2 px-4 border-y border-gray-300 dark:border-gray-900 text-center text-sm text-slate-400 font-normal">*
1	2
8	*Vehicle*
9	*</th>*
10	*<th class="py-2 px-4 border-y border-gray-300 dark:border-gray-900 text-center text-sm text-slate-400 font-normal">*
11	*Driver*
12	*</th>*
13	*<th class="py-2 px-4 border-y border-gray-300 dark:border-gray-900 text-center text-sm text-slate-400 font-normal">*
14	*Route*
15	*</th>*
16	*<th class="py-2 px-4 border-y border-gray-300 dark:border-gray-900 text-center text-sm text-slate-400 font-normal">*
17	*Arrival Status*
18	*</th>*

19	*<th class="py-2 px-4 border-y border-gray-300 dark:border-gray-900 text-end">*
20	*Actions*
21	*</th>*
22	*</tr>*
23	*</thead>*
24	*<tbody id="rowTableBody">*
25	*<!-- Dynamic rows will be inserted here -->*
26	*</tbody>*
27	*</table>*

8. Export Data to Excel

Displays start and end date inputs along with an export button to save the log data into an Excel file. This feature includes the use of a CSRF token and modern styling with Tailwind CSS.

Table 9. Source Code Export Data to Excel
(Source: Researcher, 2025)

No	*Source Code*
1	2
1	*<div class="col-span-12">*
2	*<div class="relative mb-5 last:mb-0">*
3	*<div class="relative flex w-full items-stretch text-sm h-9" data-range="init">*
4	*<!-- Start Date Input -->*
5	*<input type="text" placeholder="dd/mm/yyyy" name="startDate" id="startDate" class="block flex-grow min-w-[120px] px-4 py-1.5 h-full text-slate-700 dark:text-white placeholder-slate-300 bg-white dark:bg-gray-950 border border-gray-300 dark:border-gray-900 outline-none focus:border-primary-500 focus:outline-none focus:z-10 disabled:bg-slate-50 disabled:dark:bg-slate-950 disabled:cursor-not-allowed first:rounded-s transition-all">*
6	*<!-- Separator -->*
7	*to*
8	*<!-- End Date Input -->*
9	*<input type="text" placeholder="dd/mm/yyyy" name="endDate" id="endDate" class="block flex-grow min-w-[120px] px-4 py-1.5 h-full text-slate-700 dark:text-white placeholder-slate-300 bg-white dark:bg-gray-950 border border-gray-300 dark:border-gray-900 outline-none focus:border-primary-500 focus:outline-none focus:z-10 disabled:bg-slate-50 disabled:dark:bg-slate-950 disabled:cursor-not-allowed transition-all">*
10	*<input type="hidden" id="csrfToken" value="{{ csrf_token() }}">*
11	*<!-- Export Button -->*
12	*<button type="button" class="inline-flex items-center justify-center last:rounded-e px-4 h-full border border-primary-300 dark:border-primary-800 text-primary-600 bg-primary-100 dark:bg-primary-950 hover:bg-primary-600 hover:dark:bg-primary-600 hover:border-primary-600 hover:dark:border-primary-600 hover:text-white active:bg-primary-700 active:dark:bg-primary-700 transition-all duration-300" id="exportButton">*
13	*<em class="ni ni-download text-base me-2"> Export*
14	*</button>*
15	*</div>*
16	*</div>*
17	*</div>*

9. System Efficiency and Weaknesses

The implementation of a web-based integrated data management system offers various efficiencies in terms of budget, personnel, and workload. From a budget perspective, the system can reduce operational costs such as purchasing stationery and fixing errors from manual record keeping. Although there are initial expenses for development and hosting subscriptions, including VPS, domain, and

MySQL, the system is still considered cost-effective in the long run as most processes are automated. In terms of personnel, whereas previously two to three people were needed to manually record vehicle data, now a single operator can handle the entire process since recording and reporting have been computerized. Workload is also reduced, as the system automatically manages repetitive tasks such as data entry, report generation, and data retrieval, allowing operators to focus more on strategic and productive tasks. However, the main drawback of this system is its dependence on an internet connection, meaning that if the network is unavailable, the system cannot operate optimally.

CONCLUSION

Based on the research findings, it can be concluded that the developed system successfully manages vehicle, driver, route, and other administrative data in a centralized and efficient manner by utilizing MySQL as the database, which supports consistent and real-time Master Data management. The integration of QR Code and GPS technology enables automatic, accurate, and traceable recording of operational activities through interactive map visualization using Leaflet. The developed web client features facilitate vehicle status monitoring, data management, trip report generation, and data export to Excel format for reporting purposes. For future development, it is recommended that the system be equipped with a dedicated driver interface, vehicle maintenance monitoring and scheduling features, integration with additional security systems, and the capability to import data from external files to simplify bulk initial data entry and ensure validation to prevent duplication.

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