



SECP2613 SYSTEM ANALYSIS & DESIGN

SEMESTER II 2024 / 2025

Phase 3:

Analysis and Design

Lecturer:

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- Group 8 -

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TABLE OF CONTENTS

SYSTEM ANALYSIS

| | |
|--|-----|
| 1.0 Functional and Non-Functional Requirement..... | 1-2 |
| 2.0 Logical DFD (TO-BE) System | |
| Context Diagram..... | 3 |
| Diagram 0..... | 4 |
| Child Diagram..... | 5-7 |

SYSTEM SPECIFICATIONS

| | |
|--|------|
| 3.0 Identification of Process Specification..... | 8-16 |
|--|------|

SYSTEM DESIGN

| | |
|---------------------------------|-------|
| 4.0 Physical DFD (TO-BE) System | |
| Diagram 0..... | 17 |
| Child Diagram..... | 18-19 |
| Partitioning..... | 20-21 |
| CRUD Matrix..... | 22 |
| Event Response Table..... | 23-26 |
| Structure Chart..... | 27-28 |
| System Architecture..... | 29 |

SYSTEM WIREFRAME

| | |
|--------------------------------|----|
| 5.0 Non-Working Prototype..... | 30 |
| 6.0 Input Design..... | 31 |
| 7.0 Output Design..... | 32 |

1.0 Functional and Non-Functional Requirement

Functional Requirement

- **Manage Profile**
Customers can create or update their profiles with personal and license details, while admins can access, manage, and confirm profile records.
- **Manage Car Rental**
Customers can search, book, and pay for available cars, while admins and partners can add, edit, manage car listings and monitor bookings.
- **Manage Insurance**
Customers can select insurance options during booking, and the system calculates fees and generates insurance documents, which admins can review in system.
- **Manage Payment**
Customers can make payments using various methods, and the system processes them, generates receipts, and allows admins to manage refunds and transactions.
- **Manage Feedback Form**
Customers can submit feedback after using the rental service, which is stored in the system, and admins can review and analyze customer feedback.
- **Manage Report**
The system generates a report based on the customer's rental history and achievements, and admins can edit and approve the final version before download.
- **Manage Reward**
The system tracks customer milestones and automatically assigns badges or rewards, with admins able to view and manage the reward system.
- **Dashboard**
Customers, admins, and partners access a tailored dashboard view showing profile details, booking history, rewards, and system activity

Non-Functional Requirement

Performance

- System response time - Core functions like booking and payment should respond in under 2 seconds to ensure smooth user experience.
- High availability - The system must remain accessible 24/7, with downtime only during planned maintenance periods.
- Scalability - The platform should support at least 1000 users simultaneously without slowing down or crashing.
- Data backup - The system must automatically back up data daily to prevent information loss.
- Mobile compatibility - The interface should be mobile-friendly with a responsive design that works on all device types.

Control

- Authentication - All users (admin, partner, customer) must securely log in with verified credentials.
- Authorization - Access should be controlled by user roles—admins can manage content, while users have limited access.
- Data integrity - Input validation must be enforced to ensure all data entered is complete and accurate.
- Data security - Sensitive data such as passwords and payment details must be encrypted during storage.
- Audit trail - The system must record logs of all key actions like bookings, refunds, and insurance transactions for traceability.

2.0 Logical DFD (TO-BE) System

Context Diagram

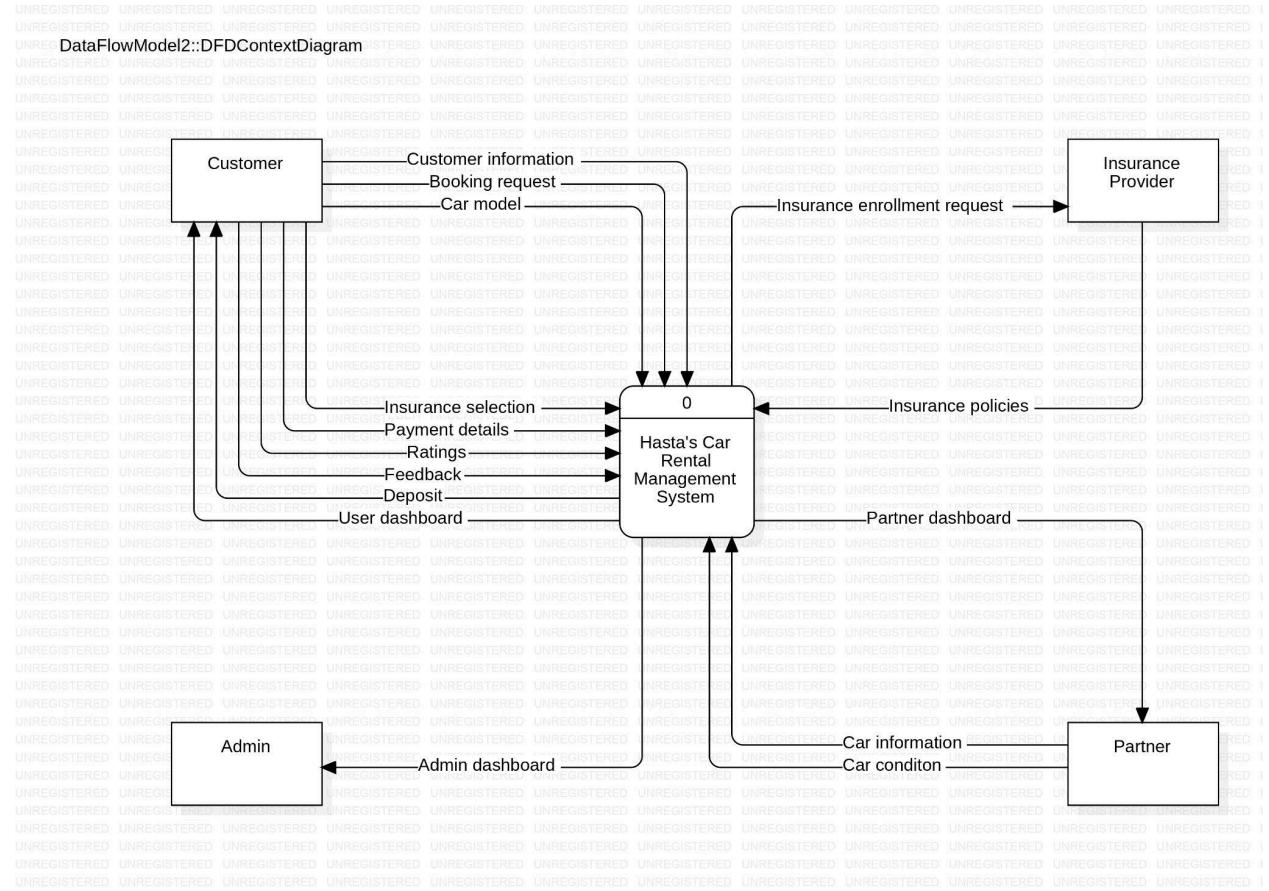


Figure 1: Context Diagram for Hasta's Car Rental Management System

Diagram 0

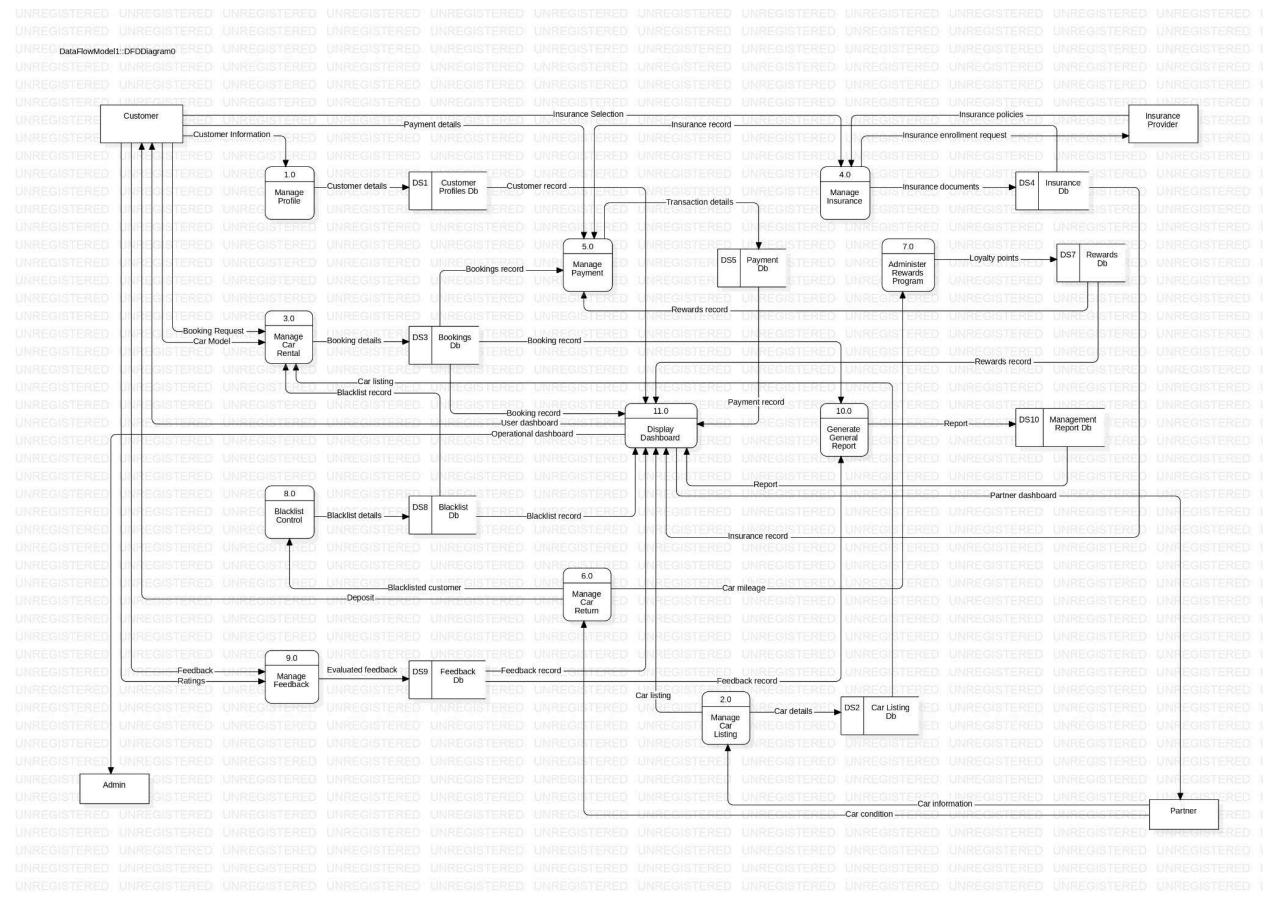


Figure 2: Diagram ‘0’ for the Hasta’s Car Rental Management System

Child Diagram

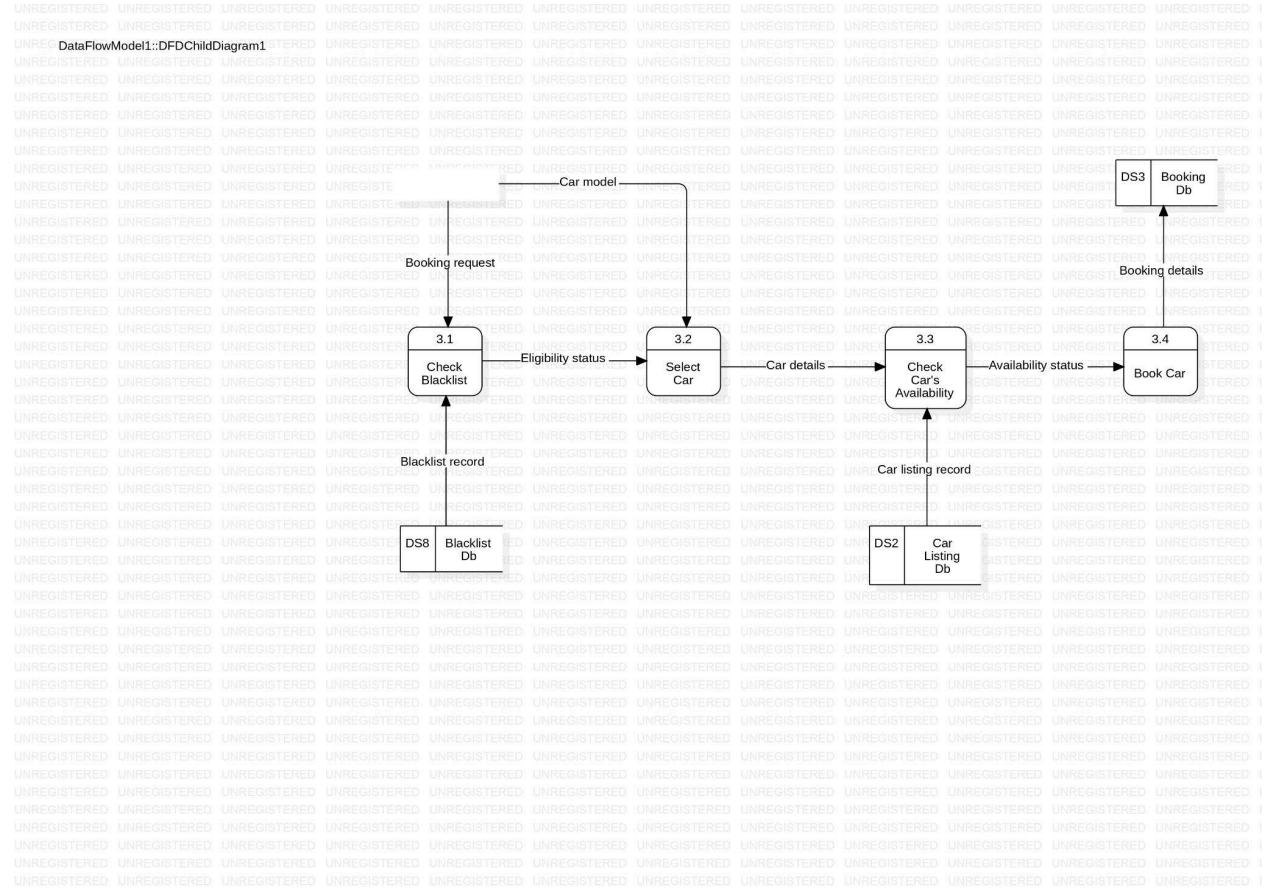


Figure 3: Child Diagram for the Manage Car Rental Process

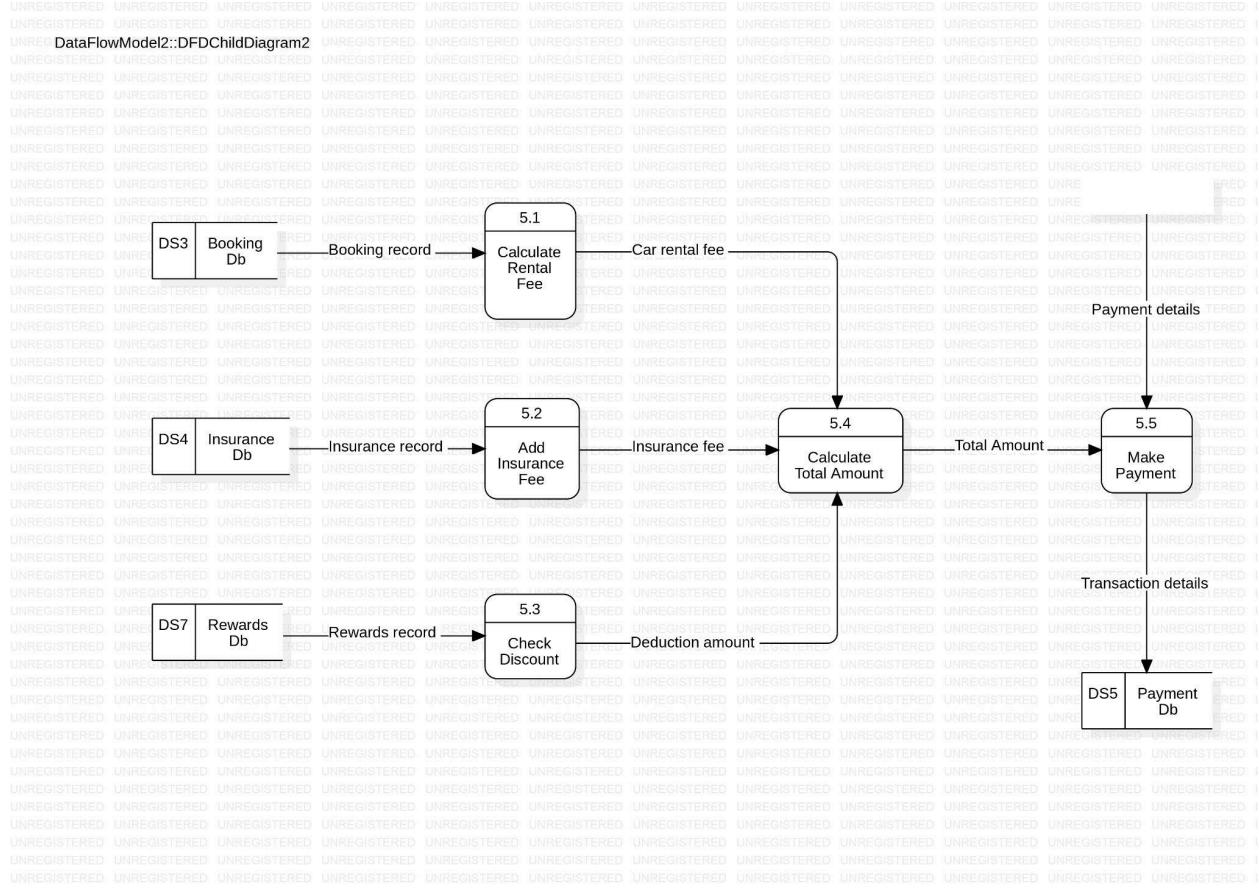


Figure 4: Child Diagram for the Manage Payment Process

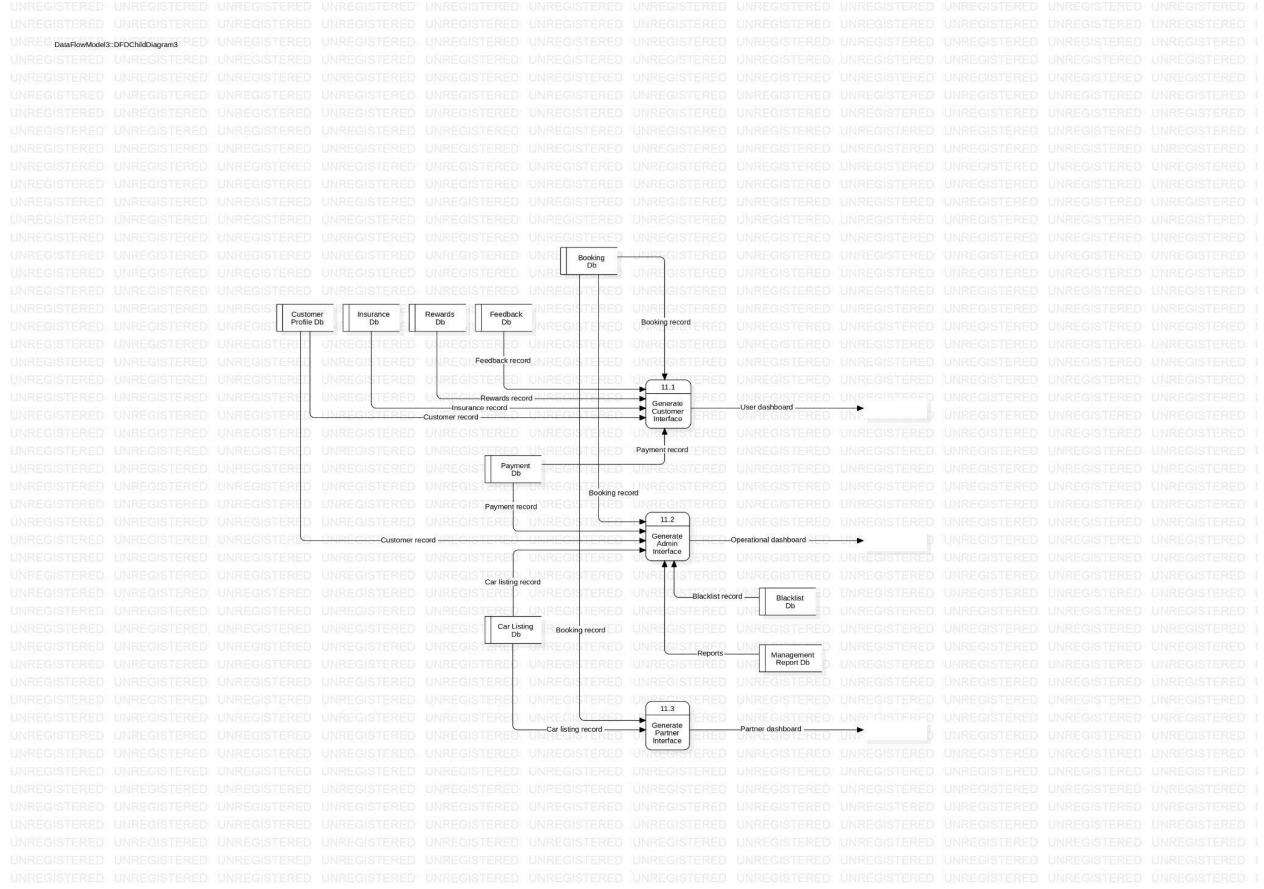


Figure 5: Child Diagram for the Display Dashboard Process

3.0 Identification of Process Specification

For the process specification of the proposed system, we used structured English to specify the process. Here is the process specification for each process of the proposed system:

Proses 1.0 Manage Profile

DO

IF create new profile

IF customer

 THEN ENTER customer details

 VALIDATE customer details

 STORE to *Customer Profiles DB*

ELSE IF admin/staff

 THEN ENTER admin/staff details

 VALIDATE staff details

 STORE to *Staff Profile DB*

ENDIF

ELSE IF update existing profile

 THEN SEARCH profile in *Customer Profiles DB*

IF profile found

 THEN UPDATE personal and license details

 STORE updated data to *Customer Profiles DB*

ELSE

 SHOW profile not found message

ENDIF

ENDIF

ENDDO

Process 2.0 Manage Car Listing

DO

IF add new car listing

 THEN ENTER car model details

 ENTER car price

 ENTER car availability count

 ENTER car condition

 STORE car details into *Car Listing DB*

ELSE IF update existing car listing

 THEN SELECT car model from *Car Listing DB*

ENDIF

IF car model found

 THEN UPDATE car price

 UPDATE car availability count

 UPDATE car condition

 STORE updated details into *Car Listing DB*

ELSE

 SHOW car model not found

ENDIF

ENDDO

Process 3.0 Manage Car Rental

DO

RECEIVE booking request from customer

GET car model from *Car Listing DB*

CHECK customer status in *Blacklist DB*

IF customer is blacklisted

 THEN REJECT booking request

 SHOW blacklist notification

ELSE

 CHECK car availability in *Car Listing DB*

ENDIF

IF car is available

 THEN GET booking details (date, duration, location)

 CALCULATE booking price

 STORE booking record in *Bookings DB*

 UPDATE car availability count

 SHOW confirmation to customer

ELSE

 SHOW car not available message

ENDIF

ENDDO

Process 4.0 Manage Insurance

DO

SHOW insurance selection options to customer

GET selected insurance type

GET customer booking record from *Bookings DB*

GENERATE insurance enrollment request

SEND insurance enrollment request to Insurance Provider

RECEIVE insurance document and policy from Insurance Provider

STORE insurance document into *Insurance DB*

LINK insurance policy with booking record

SHOW insurance confirmation to customer

ENDDO

Process 5.0 Manage Payment

DO

GET booking record from *Bookings DB*

SHOW payment options to customer

SHOW QR code for payment

WAIT for proof of payment (receipt upload)

GET receipt from customer

VALIDATE payment amount against booking fee

IF payment amount matches booking fee

 THEN STORE payment details into *Payment DB*

 GENERATE e-invoice

 SEND payment confirmation to customer

ELSE

 SHOW error message: "Incorrect payment amount"

ENDIF

ENDDO

Process 6.0 Manage Car Return

DO

RECEIVE return request from customer

GET booking record from *Bookings DB*

GET car record from *Car Listing DB*

CHECK return date and time

INSPECT car condition

COMPARE returned condition with original condition

IF damages found

 THEN RECORD damages

 UPDATE car condition in *Car Listing DB*

 CALCULATE damage fee

 NOTIFY customer with damage report

ELSE

 UPDATE car status to "Available"

ENDIF

GET mileage reading

UPDATE mileage in *Car Listing DB*

PROCESS deposit return

STORE return record in *Return DB*

SHOW return confirmation to customer

ENDDO

Process 7.0 Reward Program

DO

GET customer booking history from *Bookings DB*

GET total payment amount from *Payment DB*

IF customer is eligible for rewards

 THEN CALCULATE loyalty points based on total amount spent

 UPDATE loyalty points in *Rewards DB*

 NOTIFY customer of updated points

ENDIF

IF customer redeems points

 THEN VALIDATE redemption eligibility

 DEDUCT redeemed points from *Rewards DB*

 APPLY discount or benefit to next booking

 NOTIFY customer of successful redemption

ENDIF

ENDDO

Process 8.0 Blacklist Control

DO

GET customer activity records from *Bookings DB* and *Feedback DB*

CHECK for violations (E.g. frequent late returns, unpaid fees, car damage)

IF violation threshold is exceeded

 THEN ADD customer to *Blacklist DB*

 NOTIFY admin of blacklist action

 RESTRICT future bookings for blacklisted customer

ENDIF

IF admin reviews blacklist

 THEN SELECT customer from *Blacklist DB*

 REVIEW violation history

ENDIF

IF admin approves removal

 THEN REMOVE customer from *Blacklist DB*

 RESTORE booking access

ENDIF

ENDDO

Process 9.0 Manage Feedback

DO

PROMPT customer to submit feedback after car return

GET feedback rating and comments from customer

VALIDATE feedback input

STORE feedback into *Feedback DB*

UPDATE car record with average rating

NOTIFY admin/partner of new feedback

IF feedback is negative

 THEN FLAG feedback for admin review

ENDIF

ENDDO

Process 10.0 Generate General Report

DO

GET data from *Bookings DB*, *Payment DB*, *Feedback DB*, and *Rewards DB*

IF admin requests report

 THEN SELECT report type (e.g., monthly, yearly, custom)

 FILTER data based on selected period

 AGGREGATE statistics (e.g., total bookings, revenue, feedback scores)

 GENERATE report document

 STORE report into *Management Report DB*

 SHOW report to admin

ENDIF

ENDDO

Process 11.0 Display Dashboard

DO

IDENTIFY user type (Admin / Customer / Partner)

IF Admin

THEN RETRIEVE system statistics (total bookings, payments, feedback)

RETRIEVE report summaries from *Management Report DB*

DISPLAY admin dashboard with graphs and insights

ELSE IF Customer

THEN RETRIEVE customer booking history

RETRIEVE loyalty points from *Rewards DB*

DISPLAY car availability and booking status

ELSE IF Partner

THEN RETRIEVE partner car listings and booking data

DISPLAY earnings, car status, and feedback received

ENDIF

ENDDO

4.0 Physical DFD (TO-BE) System

Diagram 0

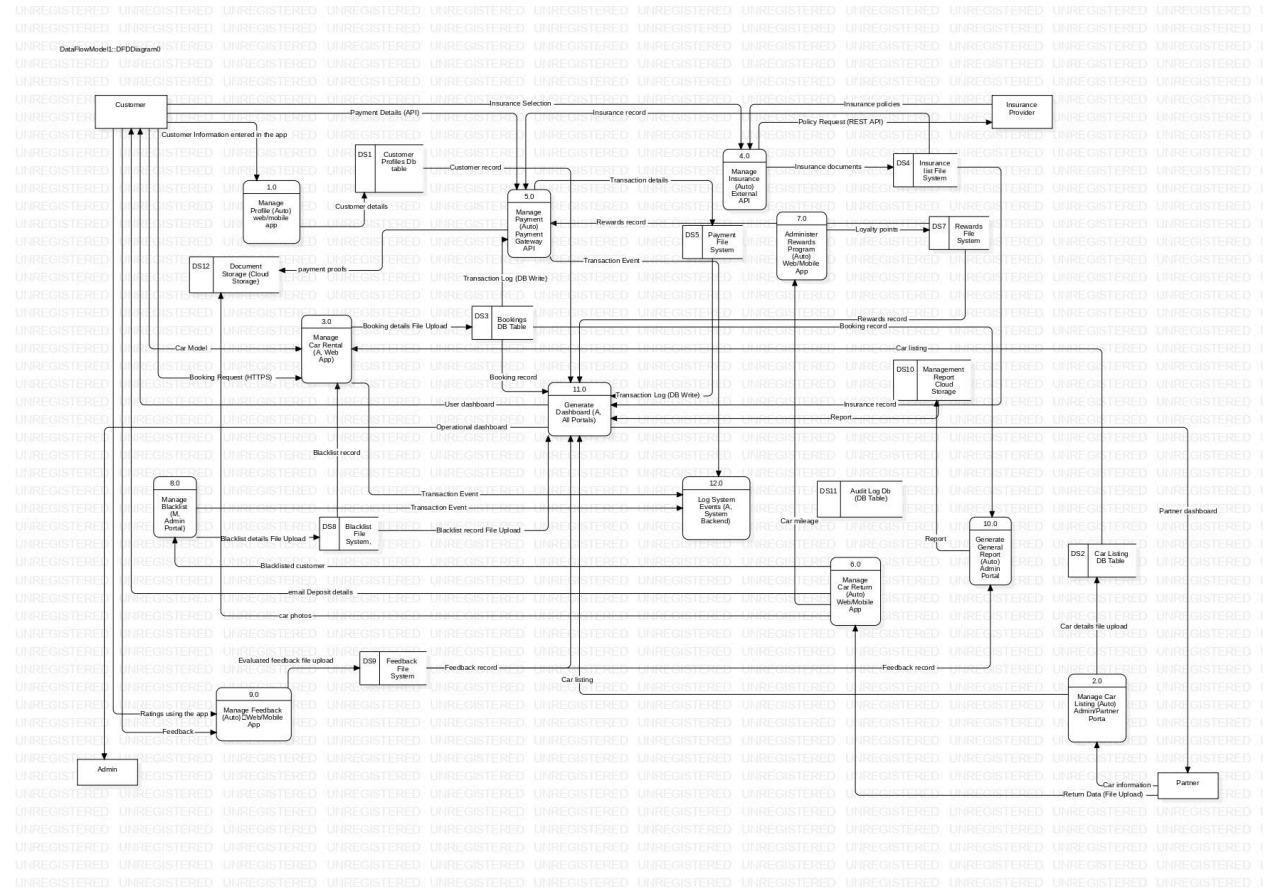


Figure 6: Physical Diagram ‘0’ for Hasta’s Car Rental Management System

Child Diagram

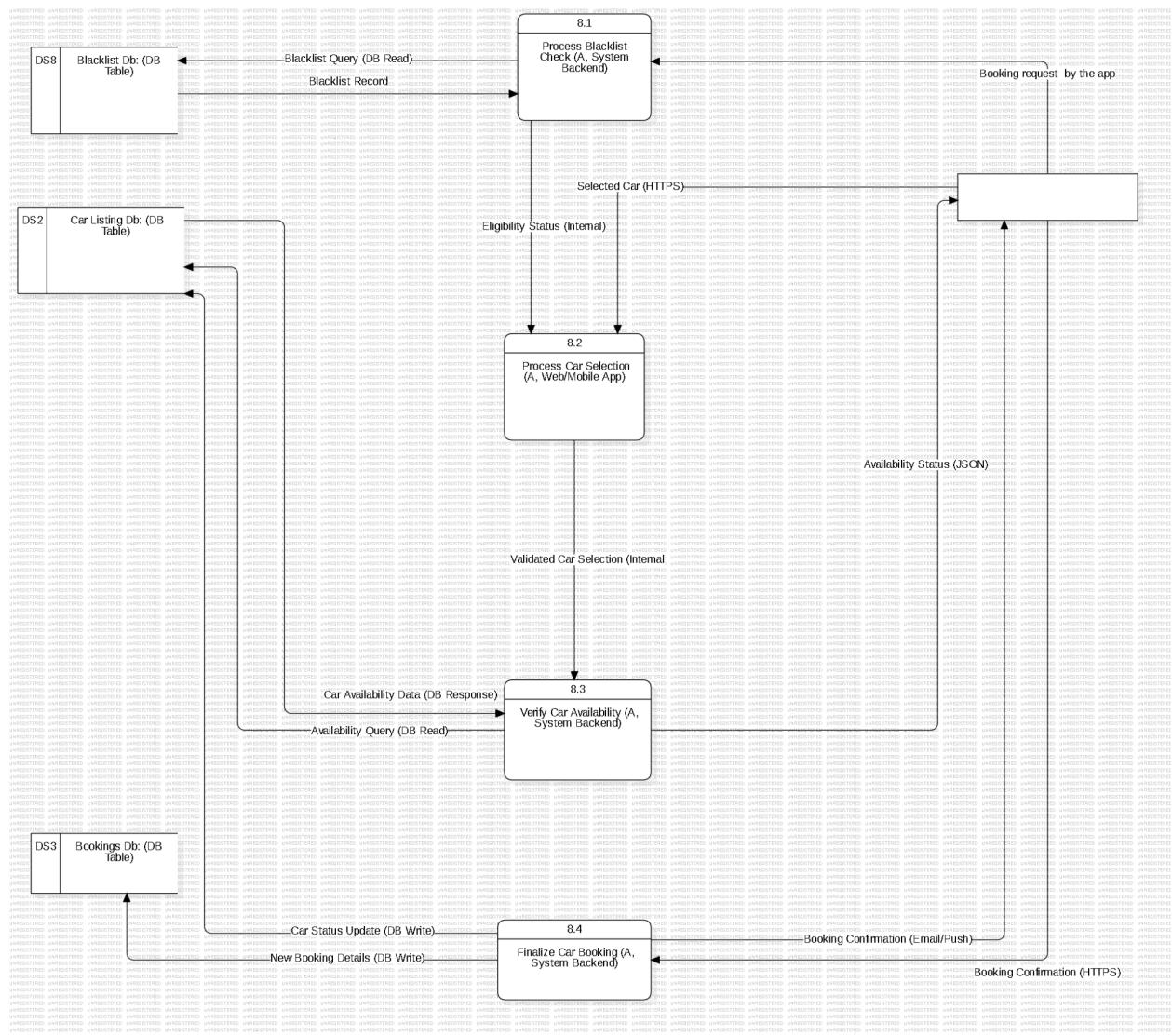


Figure 7: Child Diagram for the Manage Car Rental Process

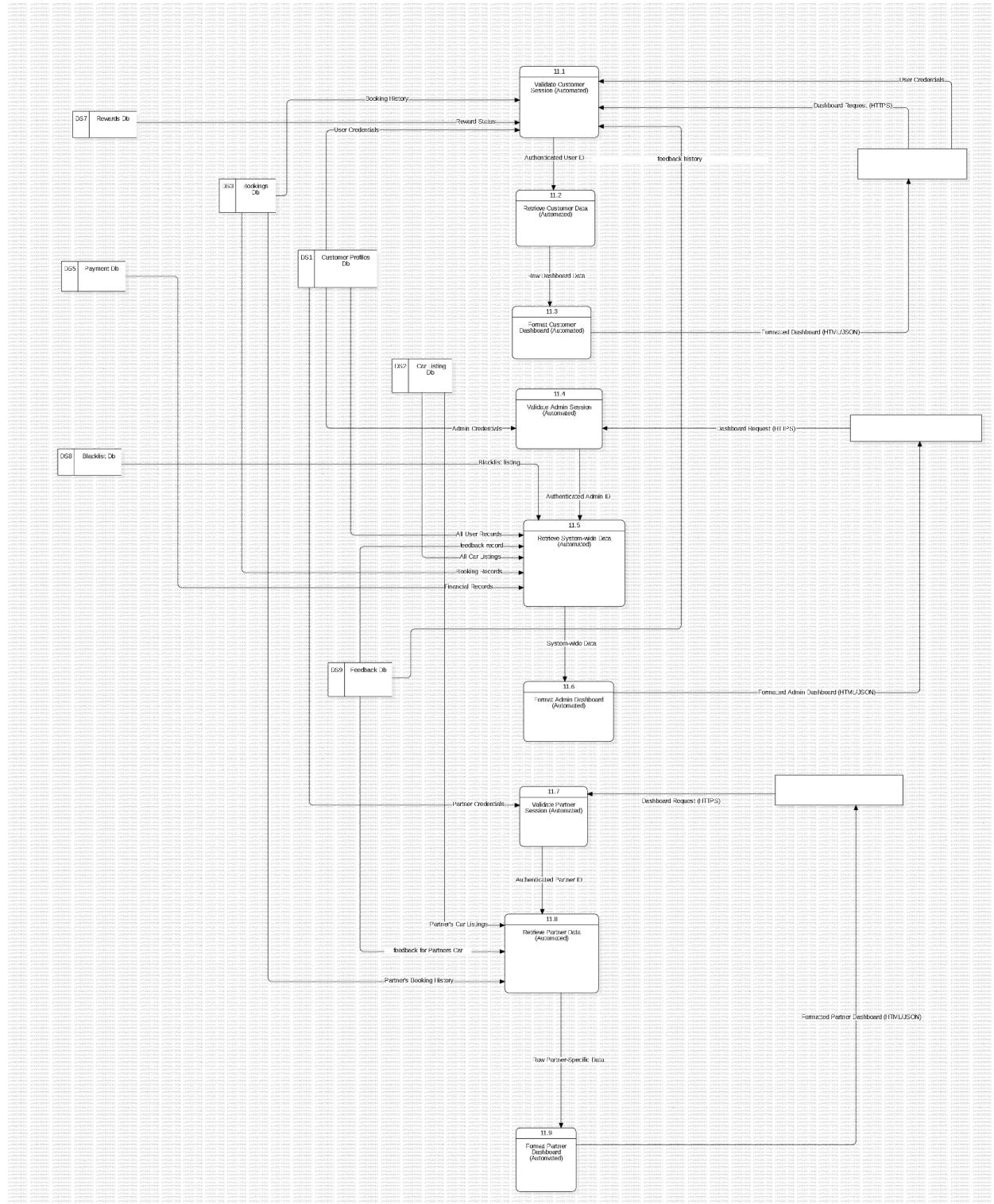


Figure 8: Child Diagram for the Manage Payment Process

Partitioning

Diagram 0

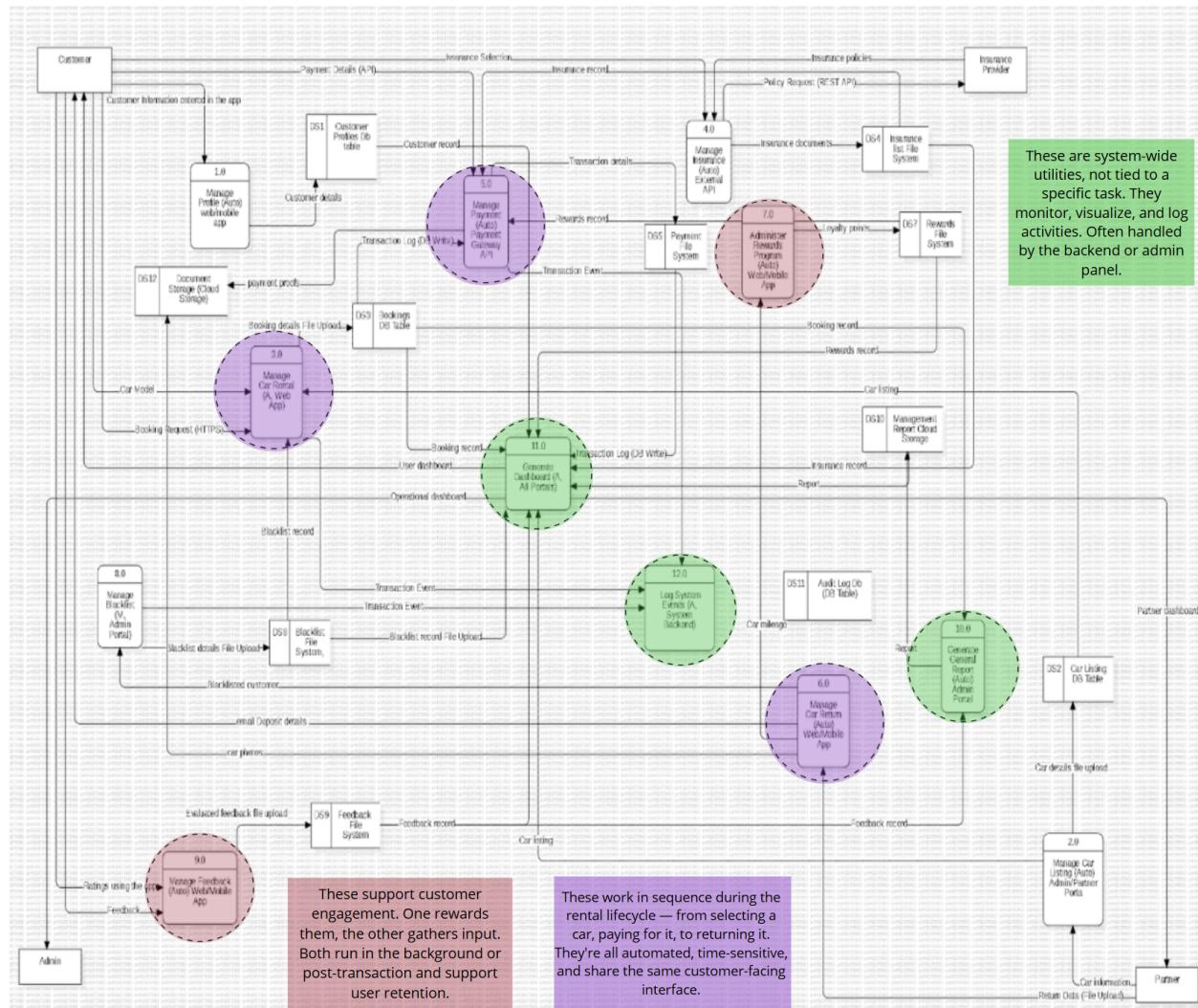


Figure 9: Partition of Diagram ‘0’ for Hasta’s Car Rental Management System

Child Diagram

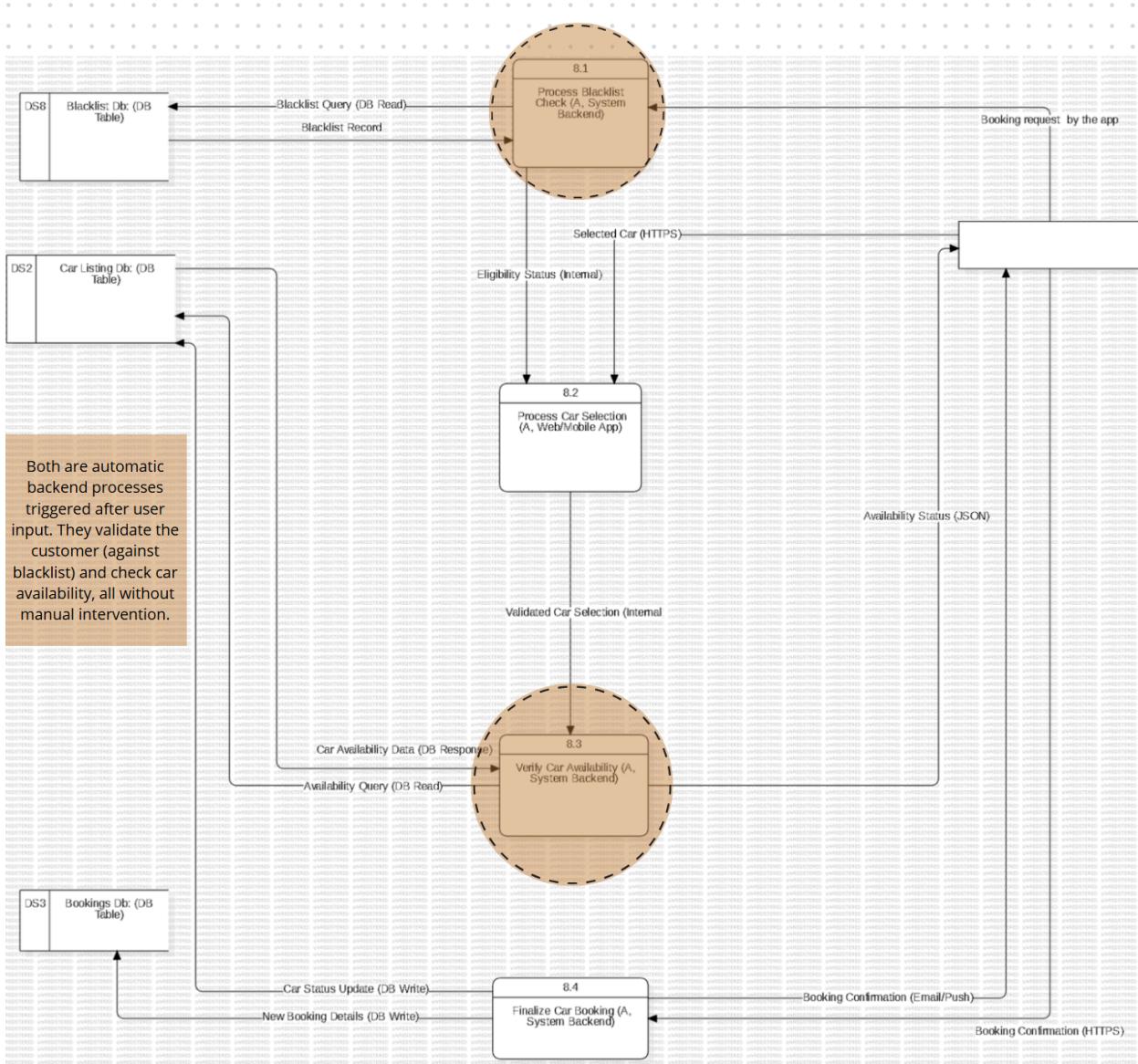


Figure 10: Partition of Child Diagram for the Manage Car Rental Process

CRUD Matrix

Table 1: CRUD Matrix for Hasta's Car Rental Management System

Event Response Table

Table 2: Event Response Table for Hasta's Car Rental Management System Physical DFD

| Event | Source | Trigger | Activity | Response | Destination |
|-------------------------|----------|------------------------|---|--------------------------------------|-------------|
| Register new customer | Customer | Submit sign-up form | System validates input, hashes password, and inserts record into Customer table | Account created confirmation message | Customer |
| Upload license document | Customer | Upload file | System checks file type/size, saves it to file server, and updates license path in Customer table | Upload success message | Customer |
| Edit customer info | Customer | Submit updated profile | System updates fields in Customer table and logs the change in Profile Update Log table | Profile updated message | Customer |
| View customer profile | Admin | Select customer record | System retrieves data from Customer, License, and Flag tables and renders them on admin dashboard | Full profile display | Admin |
| Search for cars | Customer | Submit search filters | System queries Car Listing and Availability tables via filter engine | Matching car list returned | Customer |

| | | | | | |
|-------------------------|-----------------|----------------------------------|---|--|-----------------|
| Book a car | Customer | Select car and confirm | System creates record in Booking table, updates Availability, and links to customer ID | Booking confirmation page | Customer |
| Verify car availability | System | Customer submits booking request | System checks selected car's availability against existing bookings and rental window | Booking request allowed to proceed or rejected with "Unavailable" status | System |
| Cancel a booking | Customer | Click "Cancel" on booking | System updates Booking status to "Canceled" and adjusts availability in Car Inventory table | Cancellation confirmed message | Customer |
| Add new car listing | Admin / Partner | Submit car details | System inserts new record into Car Listing table and links to partner ID | Car listing added confirmation | Admin / Partner |
| Update car listing | Admin / Partner | Submit updated info | System updates fields in Car Listing table for the selected vehicle | Listing updated message | Admin / Partner |
| Remove car listing | Admin / Partner | Click "Remove" | System sets Car Listing status to Inactive (soft delete) | Listing deactivated notice | Admin / Partner |

| | | | | | |
|-------------------------|----------|-------------------------------|--|----------------------------------|----------|
| Select insurance option | Customer | Choose during booking | System links insurance ID to booking in Booking Insurance table and updates booking total | Booking summary updated | Customer |
| Calculate insurance | System | After booking is confirmed | System runs pricing formula and updates Insurance Cost in Booking table | Insurance cost added | Customer |
| Make payment | Customer | Submit payment info | System sends data to payment gateway API and stores transaction in Payment table if successful | Payment receipt and confirmation | Customer |
| Handle failed payment | System | Payment gateway returns error | System logs error in Payment Log table and prompts retry | Error message with retry option | Customer |
| Submit feedback | Customer | Fill and send feedback form | System stores entry in Feedback table with rating, comment, and timestamp | Feedback received message | Customer |
| View feedback | Admin | Apply filters on dashboard | System queries Feedback table based on filter criteria | Feedback list rendered | Admin |

| | | | | | |
|--------------------------|----------------|---------------------------------|---|-------------------------------|----------------------------|
| Generate customer report | System | Triggered after rental activity | System aggregates from Booking, Feedback, and Reward tables and compiles PDF | Downloadable report generated | Customer |
| Approve report | Admin | Click “Approve” with notes | System updates Report Status and saves admin note in Report History | Report marked as approved | Admin |
| Track customer rewards | System | Customer hits milestone | System checks conditions and inserts reward into Reward Log table | Reward badge or points shown | Customer |
| Adjust reward criteria | Admin | Submit new rules | System updates Reward Criteria table in settings database | Reward logic updated | Admin |
| Blacklist a user | Admin / System | Violation or manual action | System adds or updates record in Blacklist DB | User flagged as blacklisted | Admin / System |
| View dashboard | Any user | Login to account | System loads data from various tables (Bookings, Feedback, Profile, Rewards) and displays dashboard | Personalized dashboard shown | Customer / Admin / Partner |

Note: Table 2 presents the complete list of events and corresponding system responses across the physical DFD, from customer interactions to automated backend processes.

Structure Chart

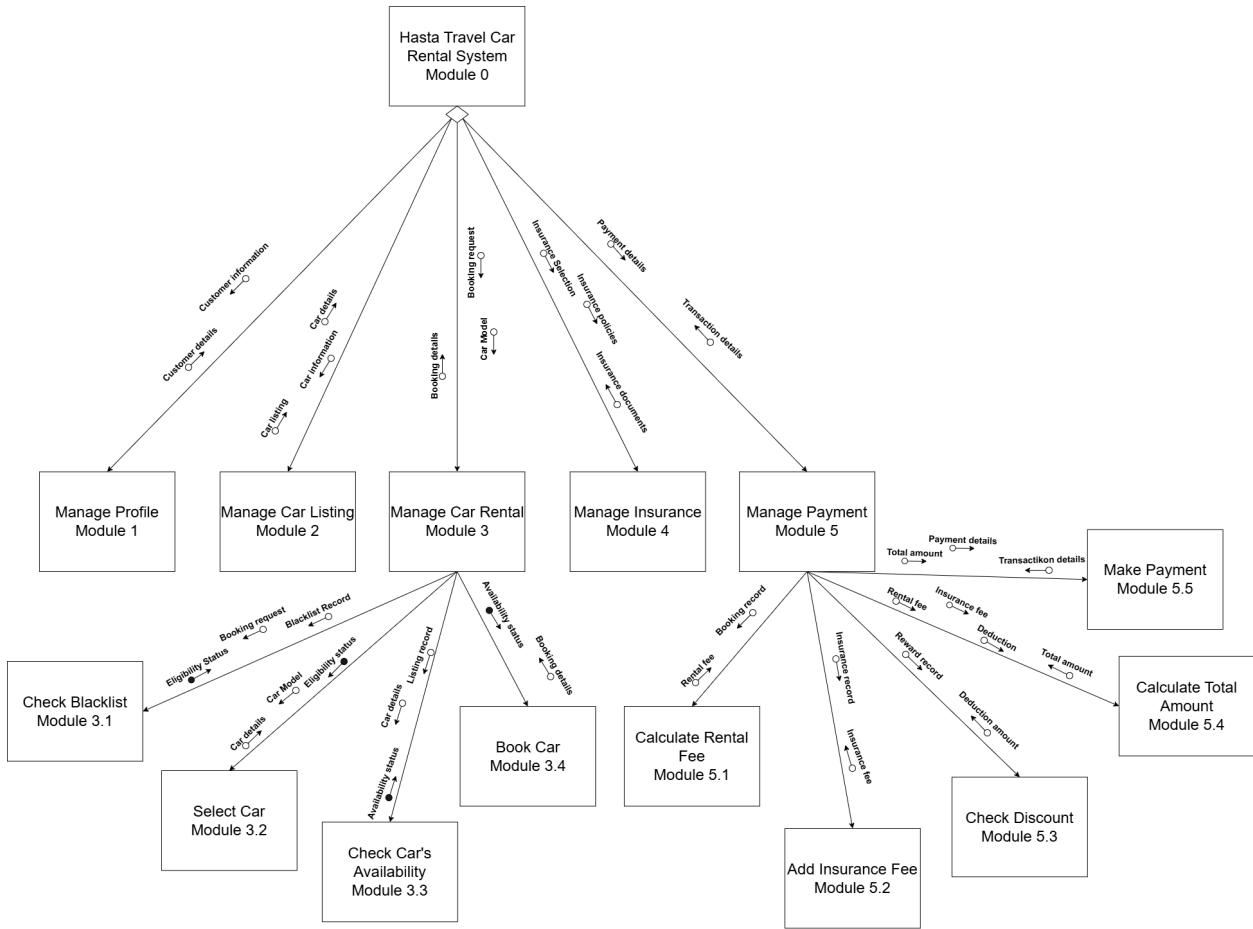


Figure 11.1: Structure Chart (Part 1) for the Hasta's Car Rental Management System

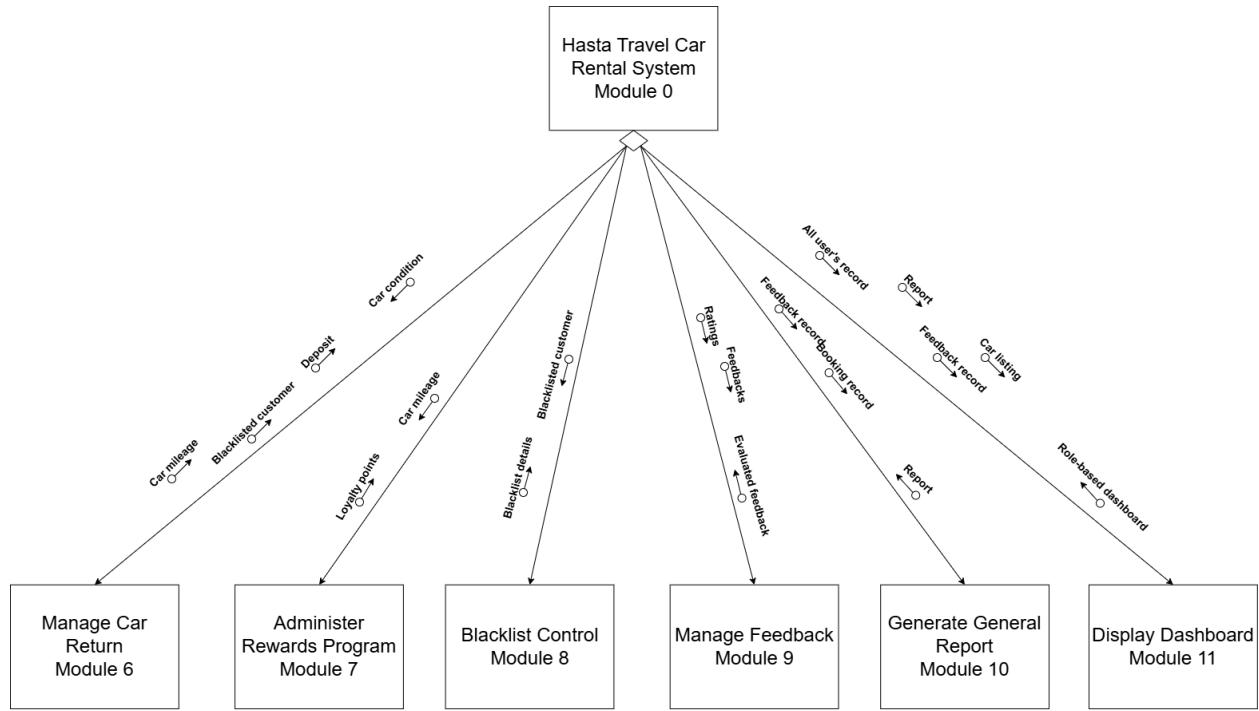
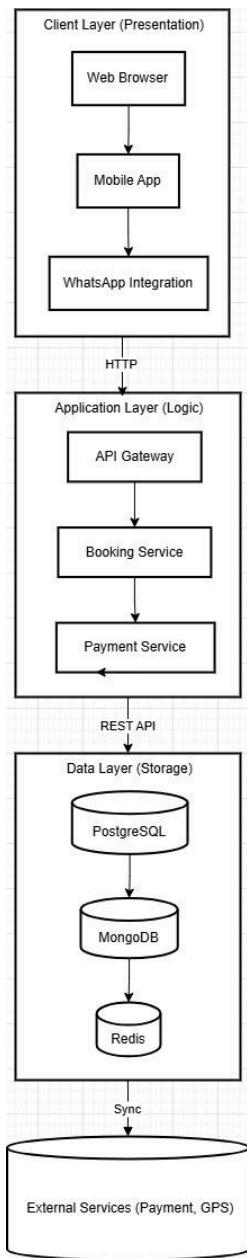


Figure 11.2: Structure Chart (Part 2) for the Hasta's Car Rental Management System

System Architecture



5.0 Non-Working Prototype

Figma Link:

<https://www.figma.com/design/0SpsqcnyzDzRLIFHIdphY8/SAD-24252?node-id=69-1397&t=9ObOSYer0HJvye99-1>

6.0 Input Design

KYC Verification

MyKad

Driving License

Let's get started!

Username
type your username here

Password
type password here

Sign up

Already have an account? [Log In](#)

Verify my details

Booking for Later

June

| Mon | Tue | Wed | Thu | Fri | Sat | Sun |
|-----|-----|-----|-----|-----|-----|-----|
| | | | | | 1 | |
| 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| 16 | 17 | 18 | 19 | 20 | 21 | 22 |
| 23 | 24 | 25 | 26 | 27 | 28 | 29 |
| 30 | | | | | | |

Pick-up Time 10:00

Return Time 17:00

Book

Booking Confirmation

Perodua Myvi 2020

Overview

Start 28 June 2025

End 29 June 2025

HastaProtect

Add full coverage for as low as RM8/trip.
Reduce your liability to RM0 in case of accident, theft, or damage. Drive worry-free – we've got you back.

Payment

FPX Online Banking

Pay RM165.00 Now

Complete Return

Profile

Muhammad Khairil Hakim bin Ismail

+60 17-179252

khairihakim@graduate.utm.my

This user is **KYC and Driver License** verified

[See more details](#)

Log Out

Home **Book Car** **My Bookings** **Profile**

Returning Car

Make sure to return the car key to the administrator at the office. Thank you!

Leave your ratings!

How was your experience?

★★★★★

Write a review

Great experience! The rental process was smooth and the staff was helpful. The vehicle was clean, well-maintained, and ready on time. Would definitely rent again.

Complete Return

Home **Book Car** **My Bookings** **Profile**

7.0 Output Design

HASTA

- Dashboard**
- Bookings
- Notifications
- Settings

- Report
- Payment Details
- Car Listing
- Reward Report
- Blacklist Report
- Insurance

Logout

Todays Statistics

Thu, 26 June, 2025

Income week

RM 3450.00 ↓ 1.5%

Compared to RM3520 last week

Car Availability

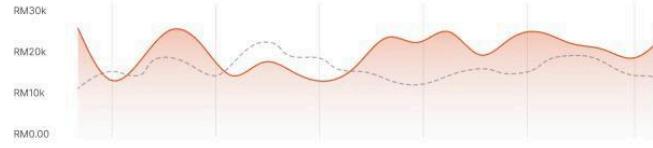
Car number June 26, 2025 10 AM

Live Car Status

No. Car no. Driver Status Earning

| | | | | |
|----|------|---------------|-----------|----------|
| 01 | 0001 | Khairil Hakim | Completed | RM165.00 |
| 01 | 0003 | Sun Hong | Completed | RM120.00 |
| 01 | 0006 | Cheng | Completed | RM135.00 |

Earning Summary Jan 2025 - June 2025



HASTA

- Dashboard**
- Bookings
- Notifications
- Settings

- Report
- Payment Details
- Car Listing
- Insurance

Logout

Car Availability

Car number June 26, 2025 10 AM

Live Car Status

No. Car no. Driver Status Earning

| | | | | |
|----|------|---------------|-----------|----------|
| 01 | 0001 | Khairil Hakim | Completed | RM165.00 |
| 01 | 0003 | Sun Hong | Completed | RM120.00 |
| 01 | 0006 | Cheng | Completed | RM135.00 |

Add Car Listing