**Data Flow Diagram (DFD) for VehicleVerified**

**Version: 2.0**

**Date: July 14, 2025**

**1. Introduction**

**This document illustrates the flow of data within the "VehicleVerified" application. The primary goal of this system is to address the real-world problem of traffic congestion and time wastage caused by manual document checks. By digitizing documents into a scannable QR code, the app aims to make the verification process instantaneous, thereby saving time for both citizens and police officials. This DFD shows how information is input, processed, stored, and outputted to achieve this goal.**

**Level 0 DFD (Context Diagram)**

**This diagram provides the highest-level view of the system. It shows the entire "VehicleVerified System" as a single process and its interaction with external entities.**

* **External Entities:**
* **Vehicle Owner**
* **Traffic Police**
* **Process:**
* **0.0 VehicleVerified System**

**+--------------------------+  
                               |                          |  
(Vehicle Owner) <------------->|   0.0                    |<-------------> (Traffic Police)  
                               |   Vehicle Verified       |  
                               |   System                 |  
                               |                          |  
                               +--------------------------+**

**Data Flows:**

* **Vehicle Owner to System:**
* **Registration/Login Credentials**
* **New Vehicle Details & Document Info**
* **Profile Update Information**
* **Service Booking Request**
* **System to Vehicle Owner:**
* **Authentication Status (Success/Fail)**
* **Generated QR Code**
* **Document Expiry & Service Notifications**
* **Service Confirmation Prompts**
* **Traffic Police to System:**
* **Login Credentials**
* **Scanned QR Data (Vehicle ID)**
* **Manual Vehicle Number Input**
* **System to Traffic Police:**
* **Authentication Status**
* **Detailed Verification Result (Owner, Vehicle, & Document Status)**

**Level 1 DFD (Detailed Flow Diagram)**

**This diagram breaks down the "VehicleVerified System" into its major functional processes and shows how they interact with data stores.**

* **Processes:**
* **1.0 User Management**
* **2.0 Vehicle & Document Management**
* **3.0 Verification Management**
* **4.0 Service Management**
* **5.0 Notification Management**
* **Data Stores:**
* **D1: Users (Firestore Collection)**
* **D2: Vehicles (Firestore Collection, including documents and serviceHistory sub-collections)**
* **D3: Document Files (Firebase Storage)**

**(Vehicle Owner) ---Reg/Login Info---> [1.0 User Mngmt] ---Login Info---> (Traffic Police)  
      ^                                      |    ^                          |  
      |                                      |    | Auth Status              |  
      +------------Profile Details-----------+    +--------------------------+  
                                                 |  
                                                 v  
                                           +----------+  
                                           | D1: Users|  
                                           +----------+  
                                                 ^  
                                                 | User Role  
                                                 |  
(Vehicle Owner) ---Vehicle/Doc Data--> [2.0 Vehicle & Doc Mngmt] ----+  
      ^                                      ^         |               |  
      |                                      |         |               v  
      +------------QR Code/Vehicle List------+         |         +------------+  
                                                       |         | D2:Vehicles|  
      (Owner) ---Doc File--> [Uploads to] ---> +----------------+  | & History  |  
                                             | D3: Doc Files  |  +------------+  
                                             +----------------+         ^  
                                                                        |  
(Traffic Police) <--Verification Result-- [3.0 Verification Mngmt] <----+--Vehicle/Doc Details  
      ^                                                  ^  
      |                                                  |  
      +------------------QR Data/Veh. No-----------------+  
  
  
(Owner) <---Service Reminders/Expiry Alerts--- [5.0 Notification Mngmt] <----Expiry/Service Dates---- (D2)  
      ^  
      |  
      +----Service Booking Request---> [4.0 Service Mngmt] --Booked Service--> (D2)**

**Level 2 DFD (Expanded View of Verification Management)**

**This diagram provides a more detailed look into Process 3.0 Verification Management.**

* **Sub-Processes:**
* **3.1 Receive Verification Request**
* **3.2 Fetch Vehicle Data**
* **3.3 Fetch Owner Data**
* **3.4 Fetch Document Status**
* **3.5 Assemble & Display Result**
* **Data Stores:**
* **D1: Users**
* **D2: Vehicles**

**+------------------+  
(Traffic Police) --Scan/Search Query--> [3.1 Receive Request] --Vehicle ID/Reg No.--> [3.2 Fetch Vehicle Data] --Reads--> | D2: Vehicles     |  
       ^                                                                             +------------------+  
       |                                                                                    ^      |  
       +----------------------------------Fetched Details----------------------------------+      |  
                                                                                                   |  
                                                                                                   |  
(Traffic Police) <--Verification Result-- [3.5 Assemble Result] <---All Details--- [3.3 Fetch Owner Data] <--Reads-- (D1)  
       ^                                                                                   ^  
       |                                                                                   |  
       +-----------------------------------------------------------------------------------+  
                                                                 [3.4 Fetch Docs] --Reads--> (D2 Sub-collection)**

**Data Flow Descriptions (Level 2):**

1. **Receive Verification Request (3.1): The Traffic Police submits a Scan/Search Query. This process receives the request and extracts the Vehicle ID or Registration No..**
2. **Fetch Vehicle Data (3.2): This process uses the Vehicle ID/Reg No. to query the D2: Vehicles data store and retrieves the main details of the vehicle (e.g., make, model, ownerID).**
3. **Fetch Owner Data (3.3): Using the ownerID obtained from the previous step, this process queries the D1: Users data store to get the Owner Name.**
4. **Fetch Document Status (3.4): This process uses the Vehicle ID to read the documents sub-collection from D2: Vehicles. It checks the expiryDate of each document to determine its current status (Valid, Expired).**
5. **Assemble & Display Result (3.5): This final process gathers all the fetched details (Vehicle Details, Owner Name, Document Status), formats them into a comprehensive Verification Result, and displays it to the Traffic Police.**