ISSN (Online): 2583 648X

I J I R I D

International Journal of Ingenious Research, Invention and Development

Volume 1 | Issue 4 | June 2023

Scientific Journal Impact Factor (SJIF 2023): 3.647

DOI: 10.5281/zenodo.7417467

www.ijirid.in

Vehicle Document Verification and Monitoring System using BLE Beacon

Vijay S. Gulhane[1], Sagar D. Padiya[2]

[1] *Professor, Sipna College of Engineering and Technology, Amravati, India*

[2] *Research Scholar, Sipna College of Engineering and Technology, Amravati, India*

Abstract: An Automated Vehicle Verification and monitoring System (AVV&MS) presents an IOT application for checking the validation of vehicle documents and their lost report status and maintaining a record of vehicle monitoring without stopping on roads. The verification officers of the Ministry of Road Transport & Highways (MORTH) generally, for verification of the documents, ask each vehicle to stop and carry out their verification manually which is a tedious process resulting in lower productivity for the verification officers. The AVV&MS automatically verify respective vehicle documents and their lost report status and provides the result. In case of any discrepancy, it undergoes for suspicion test and the officer issues an auto-generated memo for the respective offence. The faulty vehicles are not allowed to pass the checking booth without a memo, while the fair vehicle can pass without stopping the vehicle. This system is useful for authorities to perform verification & and monitoring more effectively and efficiently.

Keywords: IoT, BLE Beacon, Wireless Network, Eddystone Vehicle Monitoring, Vehicle Document Verification.

I. INTRODUCTION

The present system is directed to automated verification of vehicle documents issued by governmental departments of motor vehicles and other authorities. In particular, the system provides an automated method for organizations that require vehicle wireless identity for quick verification of vehicle documents without stopping on roads and monitoring that vehicle. The MORTH, a branch of the Government of India, is an apex organization under the Central Government and is entrusted with the task of formulating and administering, in consultation with other Central Ministries/Departments, State Governments/ UT Administrations, organizations and individuals, policies for Road Transport, National Highways and Transport Research with a view to increasing the mobility and efficiency of the road transport system in the country. This ministry has two wings: the Road Wing and the Transport Wing. [1]

1. **ROADS WING:**
   The road wing has the responsibilities regarding the development and maintenance of the National Highway, for the same it must perform planning, development, and maintenance of roads [1]
2. **TRANSPORT WING:**
   The transport wing has responsibilities regarding road transportation such as motor vehicle legislation, administration of the Motor Vehicles Act, taxation of vehicles, administration of the Road Transport Corporations Act, and evolution of road safety standards [1]

As per the provisions of the Motor Vehicles Act, 1988 and rules made thereunder, the Motor Vehicle Department (MVD) has been set up in every state of India as per Section 213 of the Motor Vehicle Act 1988. Following are some functionalities assigned to every MVD. [2]

1. To enforce the statutory provisions of Motor Vehicles, Act & Rules made there under.
2. To collect the taxes & and fees as per the rules from the vehicles.

ISSN (Online): 2583 648X

I J I R I D

International Journal of Ingenious Research, Invention and Development

Volume 1 | Issue 4 | June 2023

Scientific Journal Impact Factor (SJIF 2023): 3.647

DOI: 10.5281/zenodo.7417467

www.ijirid.in

According to the above definition, there are some parameters framed out for the vehicle by MVD. It is mandatory for all vehicles to issue all these documents, such as 1) Registration Certificate (RC), 2) Insurance Certificate, 3) Permit Certificate, 4) Fitness Certificate, 5) Pollution Certificate, 6) Road Tax Certificate, 7) Professional Tax Certificate, etc. This document needs to be up to date and without any discrepancies. As per the defined responsibilities of the Transport Wing of MORTH and MVD, there are some rules and regulations are framed out to verify the vehicle. It is mandatory for all vehicles to issue all these certificates. If any one of the certificates is not issued or not renewed it is considered an offence. Based on these functions MORTH and MVD are divided into two departments for every district. [3-5]

1. **Regional Transport Office (RTO):**
   The RTO has a responsibility to maintain the record of vehicles for its own region. In its presence, it performs manual documentation for the above-defined norms. The documents provided to the owner are in paper form/smart card, which are very difficult to handle for a long time and carried all-time in the vehicle by the user. There are no documents recorded to the RTO, provided by an external agency like PUC, Insurance, etc.

2. **Vehicle Verification & Monitoring Office (VV&MO):**
   The department has a responsibility to verify the vehicle documents and monitor them. The VV&MO generally, for verification of the documents asks each vehicle to stop and carry out their verification manually which is a tedious process resulting in lower productivity of the verification officers. At present no system to verify the vehicle with the “Lost Vehicle Records” at the central level and message system as a reminder to issue/renew the documents.

Currently using a paper document verification system, a smart card-based verification system, asking to stop each vehicle on the road that requires more time for manual verification nullifies the objective of rapid verification and causes a traffic jam on the road. There have been several technologies directed to vehicle verification systems, but none have been directed to verification without stopping vehicles to a rapid verification system. Such a system would be a great assistance in preventing identity theft and fraud.

II. OBJECTIVES OF THE SYSTEM

It is an objective of the present system to provide a system that provides the ability to rapidly obtain an indication of whether the identification indicia is valid or invalid and to monitor each movement vehicle on the road. It is a further objective of the present system to provide a short messaging service to the vehicle owner to remind them about the issue/renewal of vehicle documents before expiry and for any required communication. It is still a further objective of the present system to provide a system wherein the identity of a stolen vehicle can be verified. These and other objectives of the present system will become apparent from the detailed description which follows.

III. PROPOSED SYSTEM

Referring to the summary of the system, the present system is now described in detail. The present system is broadly directed to a system for the automated verification & and monitoring of vehicles such as vehicle document validation, the status of lost vehicles and the status of the grace period. In particular, the present system is directed to a system and method for governmental organizations and entities that require rapid document verification & and monitoring of vehicles running on roads. The verification of all running vehicles on any road is not possible, because the current method asks to stop each vehicle for verification on the roads and must perform manual documents/smart card verification.

ISSN (Online): 2583 648X

IJIRID

International Journal of Ingenious Research, Invention and Development
Volume 1 | Issue 4 | June 2023
Scientific Journal Impact Factor (SJIF 2023): 3.647
DOI: 10.5281/zenodo.7417467

www.ijirid.in

The manual verification required more time, hence to stop each vehicle on the road is not possible due to heavy traffic. The manual verification nullifies the aim of verifying & and monitoring every vehicle.
In particular, the present system comprises three parts.
1) "Regional Transport Office" (RTO),
2) "Automated Vehicle Verification & Monitoring System" (AVV&MS),
3) "Automated Vehicle Verification & Monitoring Office" (VV&MO)

1) RTO: The RTO has a responsibility to maintain the record of vehicles for its own region. The web portal provides individual login to each RTO within the country. After successful login to the portal, on the RTO Home Page, five menus are available as shown in Figure 02 and in the detailed data flow of operations by the RTO department in Figure 03.

1. New Registration **16**:
   On the new purchase of the vehicle by the user, the local RTO register this vehicle. The first form with the name "Certificate of Registration (Form No. 01)" and the second form is named "Certificate of Registration (Form No. 02)". Form No. 01 contains the total information of the vehicle Chassis Number, Color, weight, Fuel Type, CC, HP, Seating Capacity, Engine Number, Period of Validity, etc. and owner like Name, Address, Contact detail, etc. (Total 21 Fields). Form No. 02 contains the information of issue date, expiry date and amount paid off vehicle documents required for the different parameters like Road Tax Certificate, PUC, Permit Certificate, Insurance Certificate, Professional Tax Certificate, etc. (Total 06 Fields). For the next three operations, the RTO can only renew, transfer, or view the details of those vehicles registered under it or transferred to it.

2. Renewal of Documents **17**:
   It provides a modal to search the vehicle for passing its registration number. After passing the registration number Form No. 01/02 will be available for the renewal of documents. In case any document is renewed by an external agency like an Insurance Certificate, then that agency submits its details to its home RTO for the update.

3. Transfer of Vehicle **18**:
   It provides a modal to search the vehicle for passing its registration number and the RTO Code where the vehicle must transfer. After passing first it checks all the document expiry dates from the database, if any document is not valid it does not allow the transfer, otherwise, Form No. 01 is available for the update of new owner information. A new entry is created in the database with the new RTO code and information of the new vehicle owner. The entry of the last RTO blocks.

4. View Documents **19**:
   It provides a modal to search the vehicle by passing its registration number. After passing, Form No. 01 and Form No. 02 are available to view.

5. Report of Lost **20**:
   On the missing case of any vehicle, on the FIR by the vehicle owner, the RTO can set an alarm by passing the vehicle Registration Number. This complaint is considered during the automated verification & monitoring.

ISSN (Online): 2583 648X

I J I R I D

International Journal of Ingenious Research, Invention and Development

Volume 1 | Issue 4 | June 2023

Scientific Journal Impact Factor (SJIF 2023): 3.647

DOI: 10.5281/zenodo.7417467

www.ijirid.in

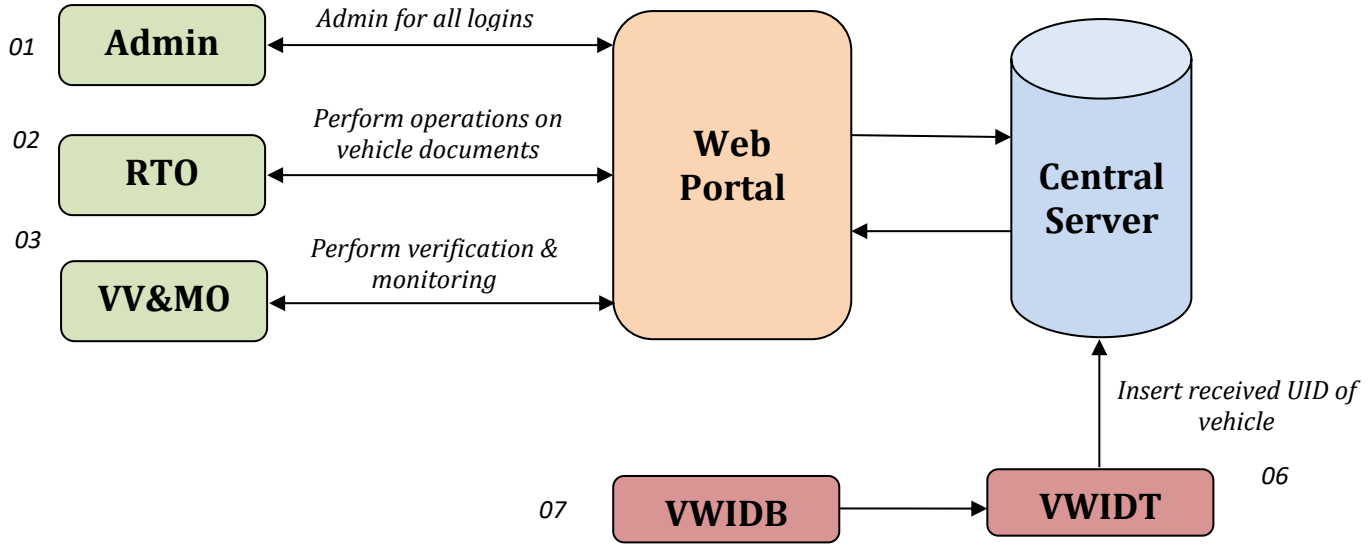

Figure 01: Proposed System Architecture

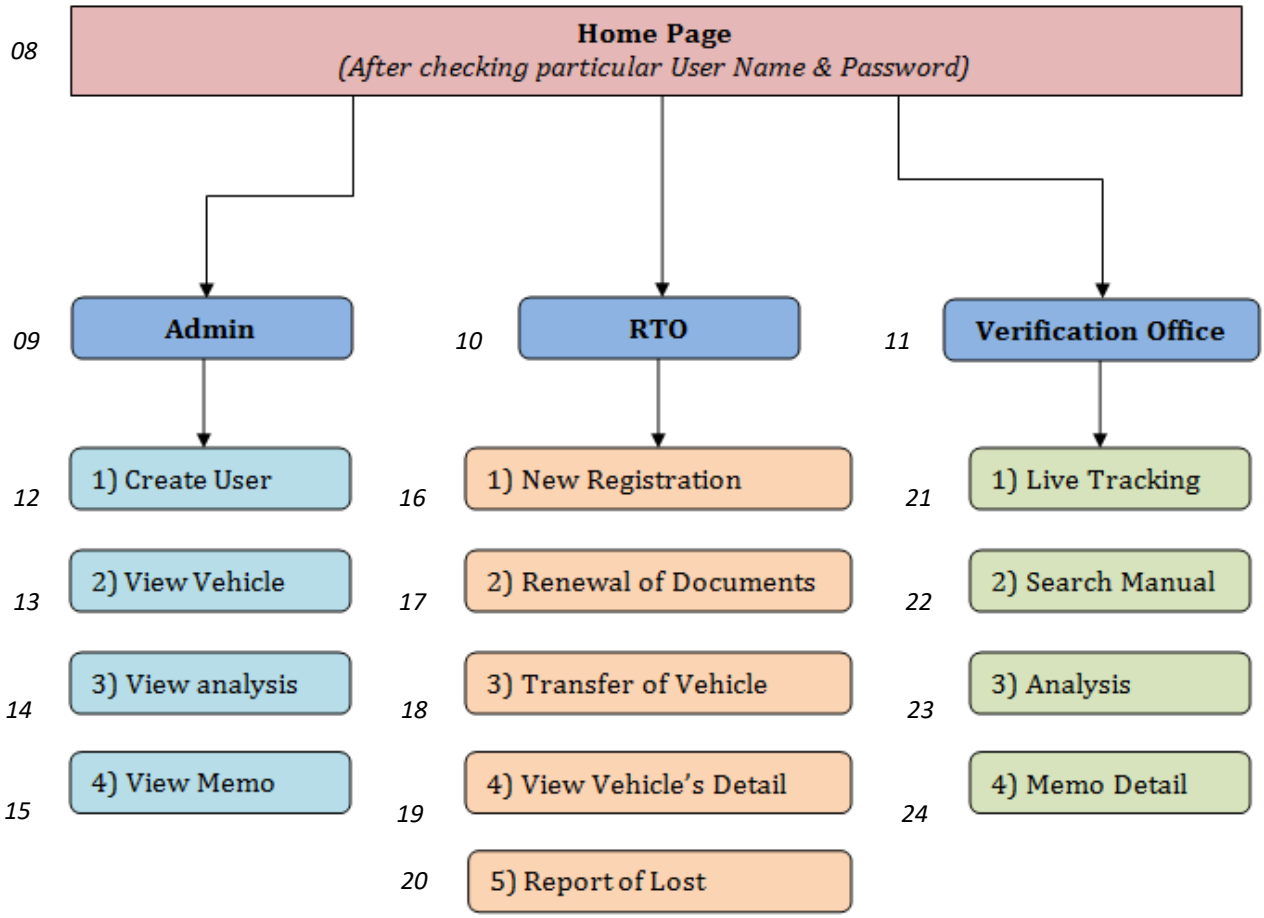

Figure 02: Proposed System Webpages Flowchart

ISSN (Online): 2583 648X

I J I R I D

International Journal of Ingenious Research, Invention and Development

Volume 1 | Issue 4 | June 2023

Scientific Journal Impact Factor (SJIF 2023): 3.647

DOI: 10.5281/zenodo.7417467

www.ijirid.in

2) VV&MS: The department has a responsibility to verify the vehicle documents and monitor them. As shown in Figure 01, this part comprises three basic elements: Automated Vehicle Verification & Monitoring Web Portal (AVV&MWP) **04**, Vehicle Wireless Identity Broadcaster (VWIDB) **07**, and Vehicle Wireless Identity Transceiver (VWIDT) **06**.

The AVV&MWP **04** is a central web portal that provides login to all: 1) RTOs and 2) AVV&MOs. This web portal provides facilities to RTO, to create, maintain and store vehicle records on the central server and facilities to AAV&MO for automated verification & and monitoring of vehicles. This web portal has the capability to fetch and store the UID of vehicles transmitted by VWIDT to the database.

The "VWIDB**" 07** is a small computer device that broadcasts over the wavelength of Bluetooth 4.0 Smart. It is a 32-bit ARM® Cortex M0 CPU accompanied by a 2.4 GHz radio using Bluetooth 4.0 Smart. The broadcasting advertising time is set to two seconds **(2s)** with the uniform broadcasting message.

The "VWIDB**" 07** is designed which work on an open Bluetooth 4.0 protocol 'Eddy stone UID' from Google, this device has the provision of connections to connect to an external power supply of the vehicle battery. In case of failure of the vehicle battery, it also contains an internal LI-PO Rechargeable Battery of 350mAh that makes the life of the device 3 years. It has a range of up to **70 meters (230 feet)**, but during testing, it resulted in, a range of 50 meters.

The "VWIDT**" 06** is a transceiver that is held on the road a kilometre from both sides of verification offices. The transceiver is designed by using a Raspberry Pi 3.0 with functionalities of Bluetooth 4.0 Smart and Wi-Fi. The "VWIDT" **06** is connected to the internet by using LAN/Wi-Fi. It performs continuous scanning of Bluetooth devices "VWIDB" running on the road. It does not require pairing, capable of directly fetching the broadcasted UID of all devices. The "VWIDT" transmits fetch UIDs to the central server in real time and cleans memory every 30 seconds. It required 3V power provided by an external connection.

3) AVV&MO: The "VV&MO" is verification booths on roads with facilities of Computer Machines containing internet connection, printer, mice, speakers, etc. The "VV&MO" module on the web portal contains basic four fields as shown in Figure 02 and in the detailed data flow of operations by the AVV&MO in Figure 04.

1. Live Tracking **21**: The field fetches UIDs from the database transmitted by VWIDT and verified detailing from the database. The field verifies the document expiry, status of the Lost Report and Grace Period. As per the result, it categorized respective vehicle registration numbers into two: 1) Valid Vehicles and 2) Invalid Vehicles. The Green Monitoring Officer monitors the vehicles from a list of "Valid Vehicles", and confirms their entry without stopping. The Red Monitoring Officer monitors and asks to stop each vehicle. It fined the vehicle by providing an automated generated memo for the concern offence.
2. Search Manual **22**: In case, the vehicle is not equipped with VWIDB or due to any technical problem VWIDB is not detected. The vehicle must move to the RED lane, where, an officer finds out details by passing its registration number.
3. Analysis **23:** The portal provides facilitates officers to generate booth analysis as per entered dates. The report contains a vehicle registration number, booth name, date, and time.
4. Memo Detail **24:** The portal provides facilitates officers to generate memo records as per entered dates. The report contains the vehicle registration number, memo title, fine amount, booth name, date, and time.

IV. STRUCTURE OF PROPOSED SYSTEM

As shown in figure 04, the initial part of this system is an entry of vehicles, the vehicles equipped with VWIDB enter the range of VWIDT during the running on roads **25**. The VWIDB of each vehicle broadcasts its UID per two seconds. The VWIDT continuously scans for the Bluetooth frequency; if the frequency is recognized, it fetches UIDs and transmits to the central server **26**.

ISSN (Online): 2583 648X

IJIRID

International Journal of Ingenious Research, Invention and Development

Volume 1 | Issue 4 | June 2023

Scientific Journal Impact Factor (SJIF 2023): 3.647

DOI: 10.5281/zenodo.7417467

www.ijirid.in

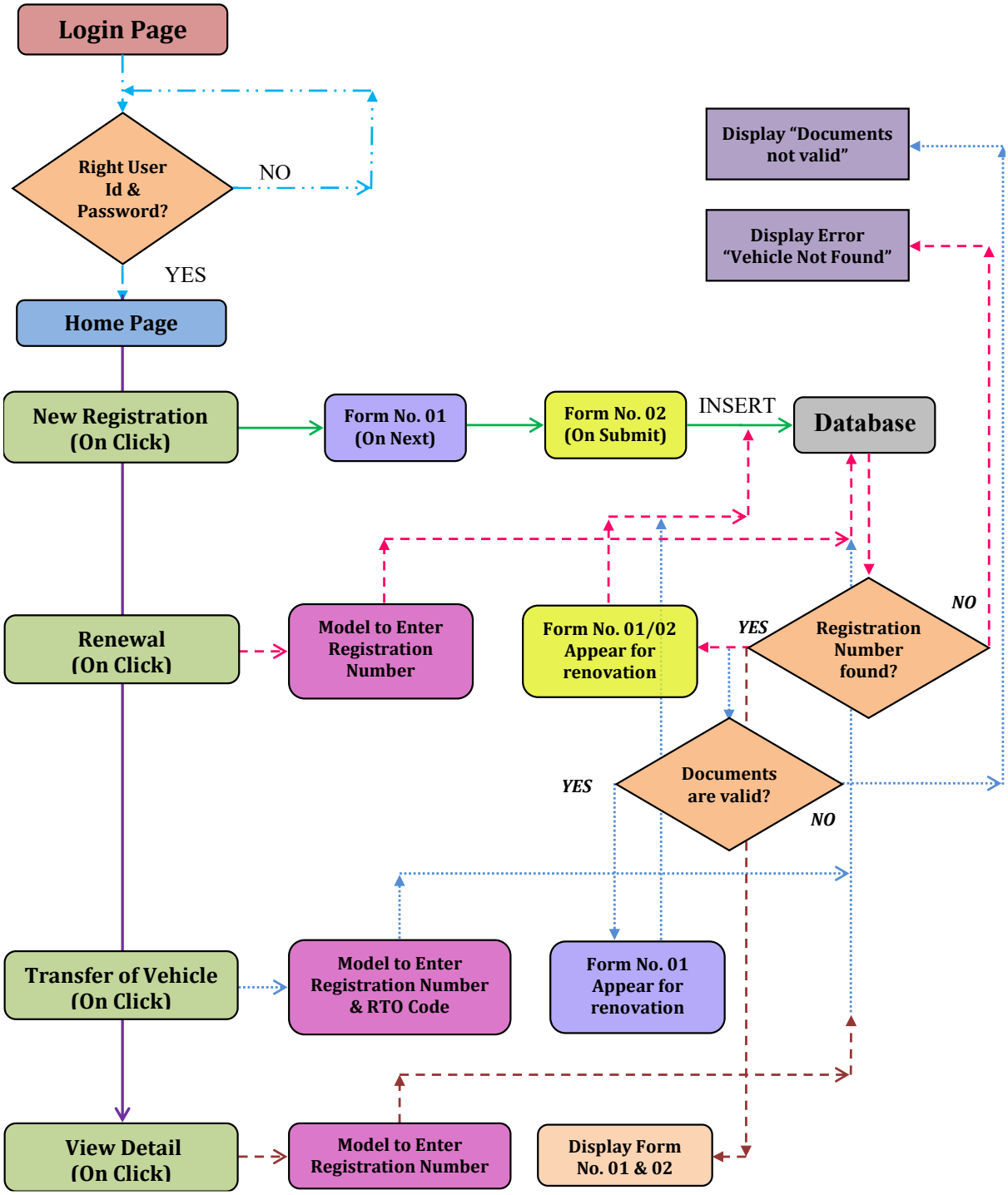

Figure 03: Flow diagram for RTO Web Portal

If any vehicle is not equipped with VWIDB or due to any technical problem, it is not recognized, the driver must follow RED Lane for verification **27**. The central server stored all UIDs transmitted by VWIDT to the database. The portal fetches UID from the database and verifies its status with the database of the RTO. It verified three conditions from database records.

ISSN (Online): 2583 648X

IJIRID

International Journal of Ingenious Research, Invention and Development

Volume 1 | Issue 4 | June 2023

Scientific Journal Impact Factor (SJIF 2023): 3.647

DOI: 10.5281/zenodo.7417467

www.ijirid.in

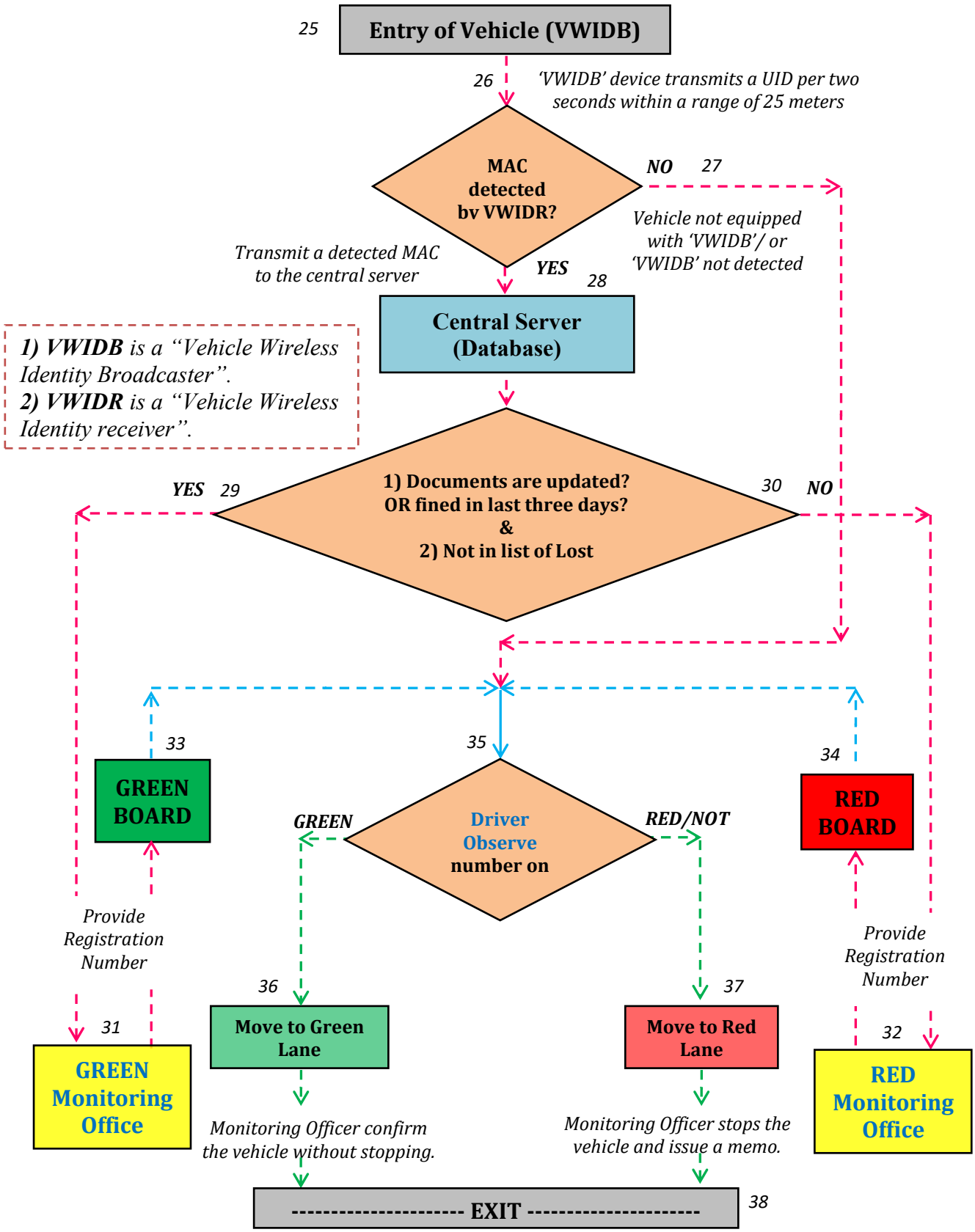

Figure 04: Flow diagram of Automated Vehicle Verification & Monitoring System

ISSN (Online): 2583 648X

I J I R I D

International Journal of Ingenious Research, Invention and Development

Volume 1 | Issue 4 | June 2023

Scientific Journal Impact Factor (SJIF 2023): 3.647

DOI: 10.5281/zenodo.7417467

www.ijirid.in

1) Documents are updated? OR 2) Fined in the Last three days? & Not On the list of Lost Vehicles? If the decision is true **29**, the vehicle registration number is displayed in the list of "Valid Vehicles" of Live Tracking, While the decision is false **30**, it displays the vehicle registration number in the list of "Invalid Vehicles" of Live Tracking. The same numbers are displayed on the display boards on roads, some distance from the booth. The driver observes his own vehicle registration number **35** If the vehicle registration number is displayed on GREEN Board **33**, the driver follows the GREEN Lane **36** but if the vehicle registration number is displayed on RED Board or not available on any board **34**, the driver follows the RED Lane **37**. The Green Monitoring Officer, validate the vehicles from the list of "Valid Vehicles," and confirms their entry without stopping. The Red Monitoring Officer asks to stop each vehicle. It fines the vehicle by providing an automated generated memo for the concerned offences. If the vehicle number is not available, the officer can verify it by passing its registration number in Search Manual **22**. After the payment against the fine, the vehicle can move **38**.

V. ADVANTAGES OF THE PROPOSED SYSTEM

The present system has the following advantages over an existing paper document-based and smart card-based verification system.

1. **Benefits to the RTO:**
   i) Function to prepare and maintain a computerized and online record of vehicles. ii) Function to prepare the list of vehicles as per the required parameters from time to time automatically. iii) Function to verify the record of the vehicle automatically at the time of the renovation or transfer of the vehicle. iv) Function to trace the information of any other RTOs registered vehicle and its owner. V) Function to share the report of a vehicle in case of theft to the other RTOs throughout the country.
2. **Benefits to the Vehicle Owner:**
   i) No need to maintain the paper documents for a long time of 15-20 Years. ii) No need to always carry original paper documents along with the vehicle. iii) Easy to complete the procedure for the transfer of the vehicle to the other RTO. iv) Automated verification of the vehicle without paper documents to the verification authority. v) The short messaging service by RTO helps to remind for the issue/renewal of documents before expiry.
3. **Benefits to the Vehicle Verification Office:**
   i) Offices can verify the documents of each vehicle automatically without stopping them on the road, which can fulfil the aim of rapid and all vehicle verification. ii) No need to verify the paper documents or number plate manually. iii) The centralized data facilitate cross-verification. iv) It is easy to identify the specific vehicle and capture its details in case of an accident, fraud, crime, robbery, etc. automatically by detecting its UID or by just passing the vehicle registration number. v) It is easy to identify the specific vehicle and its owner details on roads. vi) The monitoring of vehicles maintains the records of vehicles passed through the AVV&MO.

VI. CONCLUSION

An Automated Vehicle Verification & Monitoring System (AVV&MS) presents an IOT application for checking the validation of vehicle documents and their lost report status and maintaining a record of vehicle monitoring without stopping on roads. The verification officers of the Ministry of Road Transport & Highways (MORTH) generally, for verification of the documents, ask each vehicle to stop and carry out their verification manually which is a tedious process resulting in lower productivity for the verification officers. The AVV&MS automatically verify respective vehicle documents and their lost report status and provides the result. In case of any discrepancy, it undergoes for suspicion test and the officer issues auto auto-generated memo for the respective offence.

ISSN (Online): 2583 648X

IJIRID

International Journal of Ingenious Research, Invention and Development

Volume 1 | Issue 4 | June 2023

Scientific Journal Impact Factor (SJIF 2023): 3.647

DOI: 10.5281/zenodo.7417467

www.ijirid.in

The faulty vehicles are not allowed to pass the checking booth without a memo, while the fair vehicle can pass without stopping the vehicle. This system is useful for authorities to perform verification & and monitoring more effectively and efficiently.

REFERENCES

[1] Department of Motor Vehicle Records Online Directory (http://www.mvronline.com/state-DMV.html)

[2] Research Journal of Applied Sciences Year: 2012 | Volume: 7 | Issue: 4 | Page No.: 234-239 DOI: 10.3923/rjasci.2012.234.239.

[3] MANET: International Journal of Emerging Technology and Advanced Engineering Website: www.ijetae.com (ISSN 2250-2459, ISO 9001:2008 Certified Journal, Volume 3, Issue 1, January 2013)

[4] Monika, Mukesh Kumar and Rahul Rishi. Article: Security Aspects in Mobile Ad Hoc Network (MANETs): Technical Review. International Journal of Computer Applications 12(2):37–43, December 2010. Published By Foundation of Computer Science.

[5] The Infrastructure Wireless Network Computer Science Essay (http://www.ukessays.com/essays/computer-science/the-infrastructure wireless-network-computer-science-essay.php)

[6] (Jakubiak and Koucheryavy, 2008; Yousefi et al., 2006; Nekovee, 2005) (Yousefiet al., 2006; Toor et al., 2008)

[7] Parker J, Undercover J, Pinkston J, Joshi A. (2004). "On Intrusion Detection and Response for Mobil Ad Hoc Networks", in Proceeding IEEE International Conference on Performance Computer and Communications, Workshop on Information Assurance, pp 747-52.

[8] Khairul Azmi Abu Bakar and James Irvine "Contribution Time-based Selfish Nodes Detection Scheme" ISBN: 978-1-902560-24-3 © 2010 PGNet.

[9] Dipali Koshti, Supriya Kamoji "Comparative study of Techniques used for Detection of Selfish Nodes in Mobile Ad hoc Networks", (IJSCE) ISSN: 2231-2307, Volume-1, Issue-4, September 2011.

[10] S. Marti, T. Giuli, K. Lai, and M. Bakar, "Mitigating routing misbehaviour in mobile ad hoc networks," in. 6th Annual Int. Conf. on Mobile Computing and Networking (MobiCom'00), August 2000, pp. 255–265.

[11] Q. He, D. Wu, and P. Khosla, "Sori: A secure and objective reputation-based incentive scheme for ad-hoc networks," in WCNC 2004, 2004.

[12] S. Buchegger and J. L. Boudec, "Performance analysis of the confidant protocol: (cooperative of nodes - fairness in dynamic ad hoc networks)," in Proc. IEEE/ACM Workshop on (MobiHoc'02), June 2002, pp. 226–336.

[13] P. Michiardi and R. Molva, "Core: A collaborative reputation mechanism to enforce node cooperation in mobile ad hoc networks," in (CMS'02), September 2002.

[14] S. Banal and M. Baker, "Observation-based cooperation enforcement in ad hoc networks" Stanford University, Tech. Rep., 2003.

[15] K. Liu, J. Deng, P. K. Varshney, and K. Balakrishnan, "An acknowledgement-based approach for the detection of routing misbehaviour in manets," in IEEE Transactions on Mobile Computing, 2006, pp. 536–550.

[16] K. Paul and D. Westhoff, "Context-aware detection of selfish nodes in dsr based ad-hoc networks," in Proceedings of IEEE Vehicular Technology Conference 02, 2002.

[17] Constrained IoT Devices, IEEE Access (Volume: 5), Electronic ISSN: 2169-3536, Page(s): 16393 – 16405, 2017.