

# Cloud-Based QR Code Authentication System for Real-Time Vehicle Verification

**Ishwari S. Korde<sup>1</sup>, Vaishnavi G. Sangle<sup>2</sup>, Tanaya S. Bele<sup>3</sup>, Kshitija G. Ande<sup>4</sup>**

*Prof. Deepali R. Gadbail*

*P. R. Pote Patil College of Engineering and Management, Amravati, India, 444604*

**Abstract** – In the contemporary world, ensuring the authenticity and validity of vehicle registration documents is paramount for regulatory bodies like the Regional Transport Office (RTO) and law enforcement agencies. This abstract proposes a cloud-based solution for vehicle authentication verification using QR codes, enabling seamless document verification and enhanced security. In this system, users upload their RTO documents to a secure cloud platform where they are stored in encrypted format. RTO officers verify these documents, and upon validation, a unique QR code is generated and affixed to the vehicle. RTO police can then scan the QR code to automatically retrieve and verify the RTO documents, facilitating efficient and reliable enforcement of regulations.

**Keywords-** Cloud, Cloud Computing, QR CODE User's and Traffic Inspector's web Application, RTO Cloud Server, AES Encryption and Decryption

## INTRODUCTION

In today's fast-paced world, ensuring the authenticity and validity of vehicle documents is essential to prevent fraud, streamline verification processes, and enhance road safety. Traditional methods of document verification, which rely on physical copies or manual checks, are often time-consuming and prone to errors. To address these challenges, this research focuses on developing an online cloud-based web application for vehicle verification using QR codes. The proposed system aims to make the document verification process more efficient and userfriendly by allowing vehicle information to be accessed quickly through QR scans.

The web application will store essential vehicle-related documents securely on a cloud platform, accessible through a QR code attached to the vehicle or shared

digitally. This research also incorporates the Advanced Encryption Standard (AES) algorithm to protect sensitive documents, ensuring that the data remains encrypted and secure from unauthorized access. AES is a symmetric encryption technique known for its robustness and high performance, making it ideal for safeguarding vehicle registration and ownership documents.

In addition to verification, the system will feature a notification module to remind vehicle owners to renew important documents, such as insurance and registration certificates, before they expire. These automated alerts will help ensure compliance with government regulations and reduce instances of expired documentation on the road. By integrating cloud storage, encryption techniques, QR code technology, and a proactive notification system, this solution seeks to simplify vehicle verification processes, enhance data security, and promote better document management practices. The proposed system offers a scalable and modern approach that benefits vehicle owners, regulatory authorities, and law enforcement agencies alike.

In recent years, the rapid growth in the number of vehicles on the road has placed an increased burden on regulatory bodies such as the Regional Transport Offices (RTOs) and law enforcement agencies. Ensuring that vehicles are properly registered and that their associated documents are valid and authentic is crucial for maintaining road safety, preventing theft, and enforcing legal compliance. However, traditional methods of vehicle document verification, which often involve manual inspection of physical documents, are both time-consuming and prone to errors. Furthermore, with the rise in fraudulent practices, such as the forging of registration documents, vehicle theft, and the use of unauthorized vehicles, it has become increasingly difficult for authorities to ensure that every vehicle on the road complies with regulatory standards. These challenges highlight the need for a more efficient, secure, and scalable solution for vehicle authentication and document verification.

One promising solution lies in the integration of cloudbased technology with QR codes, which can revolutionize the way vehicle registration documents are authenticated and verified. Cloud computing has emerged as a powerful tool for managing large volumes of data securely and efficiently, providing real-time access to information from virtually any location. Meanwhile, QR

codes have become widely recognized as a quick and effective means of accessing digital information. By combining these two technologies, a cloud-based vehicle authentication verification system can provide a streamlined, automated process for verifying vehicle registration documents, significantly improving the efficiency and reliability of regulatory enforcement.

## LITERATURE SURVEY

Cloud computing has revolutionized data storage and accessibility. However, it also introduces concerns such as privacy, access control, and data integrity. Patil and Dharmik (2016) investigated these issues, particularly in service architectures like SaaS, PaaS, and IaaS. Their work highlighted that security measures such as confidentiality, privacy, and authentication are crucial for protecting sensitive user information in cloud-based applications. For vehicle verification systems, these concerns are particularly relevant, as the integrity of documents like vehicle registration and insurance needs to be ensured.[1]

Authentication methods such as one time Passwords (OTPs) have been proposed to secure access to cloud systems. Sediynono et al. (2013) discussed how OTPs can be used for secure login in cloud environments, using the MD5 hash algorithm to enhance security. This technique could be useful for authenticating users in a cloud-based vehicle verification system, ensuring that only authorized personnel can access sensitive vehicle information.[7]

Cryptographic algorithms play a vital role in securing cloud-stored data. Karale et al. (2015) surveyed various cryptographic methods, including DES, 3DES, RC4, and AES, all of which are designed to protect data on cloud servers from unauthorized access. AES, in particular, is highly efficient for encrypting large volumes of data and could be instrumental in ensuring the security of vehicle documents stored on the cloud. [5][2]

QR codes have emerged as a fast and reliable method for data transmission. Khedekar and Kale (2016) emphasized the advantages of QR codes over traditional

passwordbased systems. QR codes can store large amounts of data in a compact, secure format, making them ideal for applications like vehicle verification. In the proposed system, QR codes generated by cloud servers can be scanned by traffic authorities to verify the authenticity of vehicle documents in real time. [9][3]

1

While QR codes offer significant advantages, they are vulnerable to hacking and corruption. Zhang (2014) proposed using chaotic algorithms to create noisy QR codes that are difficult to replicate or alter, enhancing security. Applying such techniques in a cloud-based vehicle verification system would prevent tampering and unauthorized access to vehicle documents.[10]

## METHODOLOGY

The Cloud-Based Vehicle Verification System using QR Code Identification is designed to streamline the vehicle verification process using cloud computing, QR code authentication, AES encryption, and automated notifications. The system follows a structured approach involving multiple stakeholders, including Cloud Admin, RTO Admin, RTO Police, and Vehicle Owners.

The system is developed using the following key components and workflow:

**1. Cloud-Based Web Application Development** A centralized web-based platform is developed to manage vehicle registration, verification, and document storage.

The system is deployed on a cloud infrastructure to ensure scalability, accessibility, and secure data management.

### 2. QR Code-Based Vehicle Verification

Each registered vehicle is assigned a unique QR code containing encrypted vehicle details. RTO police officers can scan the QR code using a mobile device to fetch and verify vehicle details in real-time.

The QR code ensures quick and tamper-proof verification of vehicle documents.

### 3. AES Encryption for Secure Document Storage

Vehicle-related documents (registration, insurance, pollution certificates, etc.) are

2

encrypted using AES (Advanced Encryption Standard) before storing them on the cloud.

Only authorized users (RTO admins, police officers, and vehicle owners) can decrypt and access documents using OTP-based authentication.

#### 4. Multi-Level User Access Control

**Cloud Admin:** Manages RTO offices, cloud services, and usage reports.

**RTO Admin:** Registers vehicles, approves applications, and verifies documents.

**RTO Police:** Scans QR codes, verifies vehicle details, and issues challans for invalid or missing documents.

**Vehicle Owner:** Registers vehicles,

uploads documents, and receives renewal alerts.

#### 5. Automated Renewal Notification System

The system automatically tracks document expiration dates and sends email/SMS notifications to vehicle owners before expiry.

This feature ensures timely renewals, reducing expired documents and legal penalties.

#### 6. Real-Time Verification and Compliance Enforcement

Upon QR code scanning, the system retrieves encrypted vehicle details and validates them against the stored records.

If any document is invalid or missing, the system alerts RTO police to issue a challan to the vehicle owner.

Logs of verification activities are stored for audit and compliance tracking.

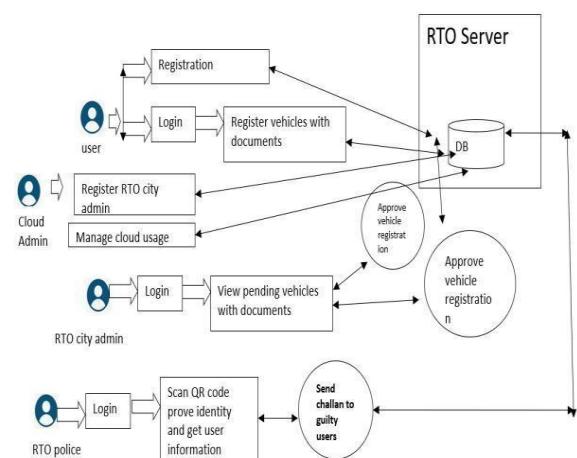


Fig. System Flow

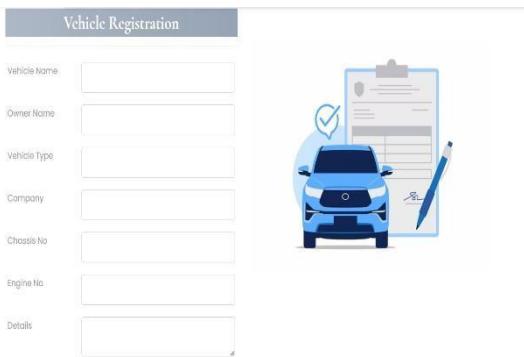
## RESULTS



Fig(a) Home Page



Fig(b) User's Home Page



This screenshot shows a vehicle registration form. On the left, there are input fields for 'Vehicle Name', 'Owner Name', 'Vehicle type', 'Company', 'Chassis No.', 'Engine No.', and 'Details'. To the right of the form is a cartoon illustration of a blue car with a clipboard and a checkmark, symbolizing a registration or verification process.

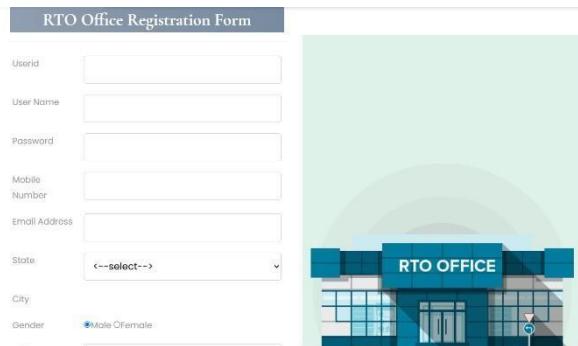
Fig(c) Vehicle Registration Page



This screenshot shows a 'CLOUD BASED VEHICLE VERIFICATION USING QR CODE' interface. At the top, there are navigation links: HOME, RTO OFFICES, VIEW USERS, CLOUD REPORTS, CHANGE PASSWORD, and LOGOUT. Below this is a dashboard with a blue background featuring a cloud icon and the text 'Logged in as cloudadmin (cloudadmin)'. A table titled 'Registered Offices' lists three entries:

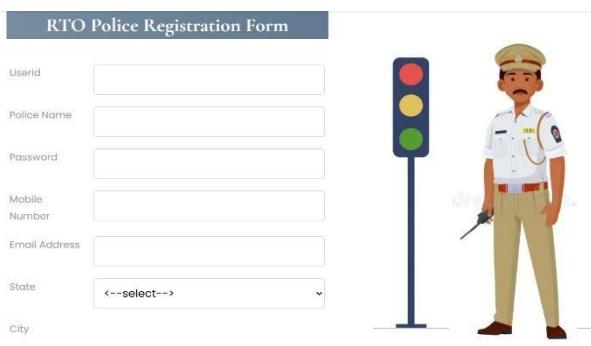
Userid	UserName	Usertype	Userstatus	Address	Pincode	Mobile	City	State
akola_no	akola	officer	active	ekola	444001	991065654	Akola	Maharashtra
amt_STO	Remote Bots	officer	active	Comp	444607	981065654	Amravati	Maharashtra
rto_nagpur	Sachin Pandit	officer	active	nagpur	440001	9996767656	Nagpur	Maharashtra

Fig(d) Cloud Admin Page



This screenshot shows an 'RTO Office Registration Form'. It includes fields for 'Userid', 'User Name', 'Password', 'Mobile Number', 'Email Address', 'State' (a dropdown menu), 'City', and 'Gender' (radio buttons for Male or Female). To the right of the form is an illustration of a blue and white RTO office building with the text 'RTO OFFICE' on it.

Fig(e) RTO Officer Registration Page



This screenshot shows an 'RTO Police Registration Form'. It includes fields for 'Userid', 'Police Name', 'Password', 'Mobile Number', 'Email Address', 'State' (a dropdown menu), and 'City'. To the right of the form is an illustration of a police officer in uniform standing next to a traffic light.

Fig(f) RTO Police Registration Page

## REFERENCES

- 1) Strength of QR Code over Design and Implementation of verification system System" Lokesh S. Khedekar and Prajakta S. Kale ,IEEE(ICCSP), 2016, pp .21902193.
- 2) Wengang Hou , "A Fast Image Encryption Scheme Based on AES Yong Zhang, Xueqian Li ", IEEE(2nd ICIVC), 2017, pp .624-628.
- 3) Mr. Nilesh R. Patil and Prof. Rajesh Dharmik "Secured Cloud Architecture for Cloud Service Provider" IEEE (WCFTR'16) , 2016.
- 4) P. Kieseberg M. Leithner, M. Mulazzani, L. Munroe, S. Schrittwieser, M. Sinha, and E. Weippl, "QR code security," in Proc. 8th Int. Conf. Adv. Mobile Comput. Multimedia (MoMM), vol. 10, 2010, pp. 430–435.
- 5) S. Geetha P. Punithavathi, A. M. Infanteena, and S. S. S. Sindhu, "A literature review on image encryption techniques," Int. J. Inf. Secur. Privacy, vol. 2, no. 3, pp. 42–59, 2018
- 6) S. Yokata "QR Code Overview & Process of QR Code Applications". pp. 1–50. Accessed: Aug. 30, 2019. [Online]. Available: <http://www.gs1jp.org>.
- 7) S. Deepika and P. Pandiaraja , "Ensuring CIA triad for user data using collaborative filtering mechanism," 2013 International Conference on Information Communication and Embedded Systems (ICICES), 2013, pp. 925-928, doi: 10.1109/ICICES.2013.6508262.
- 8) S. Saravanan, T. Abirami and P. Pandiaraja "Improve Efficient Keywords Searching Data Retrieval Process in Cloud Server," 2018 International Conference on Intelligent Computing and Communication for Smart World (I2C2SW), 2018, pp. 219-223, doi: 10.1109/I2C2SW45816.2018.8997131
- 9) Mr. Nilesh R. Patil Prof. Rajesh Dharmik," Secured Cloud Architecture for Cloud Service Provider" IEEE (WCFTR'16), 2016
- 10) Mr. Niteen Surv, Mrs. Jayshree Katti , "Framework for Client Side AES Encryption Technique in Cloud Computing " ,IEEE(IACC),2015, pp .525-528.

- 11) Qui Zhang ,” Study on Image Encryption Algorithm Based on Chaotic Theory “,IEEE(ICISCCC),2014, pp .635-639.
- 12) Rajesh K, Waranalatha SS, Reddy KVM, Supraja M. QR Code-Based Real Time Vehicle Tracking in Indoor Parking Structures. 2018 Second International Conference on Intelligent Computing and Control Systems (ICICCS). 2018;p. 11–17. Available from: <https://doi.org/10.1109/ICCONS.2018.8663210>
- 13) P. Churi, "Performance analysis of data encryption algorithm," International Journal of Recent Technology and Engineering (IJRTE), vol. 8, no. 3, pp. 3230-3235, 2019. doi: 10.35940/ijrte.C5775.098319.
- 14) O. Pal and B. Alam, "Key management scheme for secure group communication," in Advances in Information and Communication Technology, vol. 5, Singapore: Springer, 2020, pp. 225-234. doi: 10.1007/978-981-15-0694-9\_17.
- 15) U. Patel, A. Patel, F. Suthar, and A. Patel, "The study of digital signature authentication process," in Proc. 2019 4th Int. Conf. Advances in Computing, Communication and Control (ICAC3), 2019.
- 16) M. Ahamed and H. Mustafa, "A secure QR code system for sharing personal confidential information," in Proc. 2019 4th Int. Conf. Computing, Communication and Automation (IC4ME), Noida, India, 2019, pp. 1-4. doi: 10.1109/IC4ME247184.2019.9036521.