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Crime Registry Platform using Blockchain Ethereum and web3

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Abstract: ***Criminal activities in India are on the rise, with many incidents going unreported. Despite the availability of an online portal for storing the First Information Reports (FIRs) handwritten FIRs always will remain common due to some of the traditional methods and practices. And probably in most cases, the complainants should personally visit the police stations in order to file a offense report.***
Crime and Criminal Tracking Network and Systems (CCTNS) was launched in 2010 for national wide e-governance, it will operates on a centralized system and it is particularly limited to some individual states. Therefore, there is a need for the decentralized solution in order to ensure failure of a single point and secure managing of criminal complaints from the unauthorized access.
Our project aims to address all this by depicting blockchain technology. Whatever the FIRs that are filed by police will be encrypted and stored on the InterPlanetary File System (IPFS), with the hash code or the hash value added to the blockchain network. This approach will provides strong and proper evidence against any attempts from the police to ignore or to the denial of the complaints. Storing records on an blockchain database which is immutable and it eliminates the risk of tampering, ensuring transparency and accountability in managing FIRs and NCRs.
Keywords: FIR, CCTNS, IPFS, NCR, CRYPTOGRAPHY

I. INTRODUCTION

In India, generally the legal system divides offenses into two main categories: There are some offenses where police have an authority to arrest without any warrant in another case relatively police cannot make an arrest without a warrant. This captivates the crimes like murder, theft, kidnapping, and rape, among others. According to Section 2 (c) the police have the authority to arrest the suspect without any type of warrant. Then the inspector can begin the investigation process without the need of courts they can figure out there self. In some cases of cognizable offenses, the (FIR) is registered at the police station, which can be filed by any individual who is either a victim or a witness to the offense. The FIR contains crucial details such as the complainant's name and address, the date and time of the incident, the location, and also a description of the facts. Following the registration of the FIR, the police officer handling the case compiles a chargesheet report.

II. RELATED WORK

A. E-Cops is an innovative online Crime ReportingManagement:

E-Cops an online platform designed for the Cities, addressing concerns about visiting police stations. It allows people to report crimes conveniently and securely from their devices, offering anonymity if desired. Its main goal is to strengthen the connection between citizens and law enforcement, enabling easier sharing of information and evidence. This digital solution enhances collaboration, helps track criminals, and improves crime reporting accessibility and efficiency in that place.

B. FIR Registration and Tracking through Android Application:

The E-Police System is a modernization initiative within the Indian Police Department to replace outdated manual processes with digital solutions. Traditionally, filing complaints and tracking cases involved physically visiting police stations, which is no longer efficient given the current volume of cases. To address this, an Android application is being developed to facilitate the registration of First Information Reports (FIR) and track cases. This application collects complainant data and transmits it to the police department's web portal, enabling seamless information exchange. The goal is to improve efficiency and transparency in the complaint registration and tracking process by leveraging digital technology.

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C. Implementation of an E-Police System

The police system in India, a country with a population of around 1.3 billion, is facing significant challenges marked by degradation and a surge in criminal activities such as murder, theft, robbery, assassinations, and corruption. In order to address all these issues, the growing focus on implementing electronic policing (E-police) systems, with the emerging Internet technologies. E-police, adopted by law enforcement agencies across all over the world, aims to enhance the delivery of law enforcement services to people. However, the Internet technology and electronic-based systems a large infrastructure with some initial costs and rapid development of the application capabilities.

III. METHODS AND EEXPERIMENTAL DETAILS

A. Designing a Data Model

Choose a better blockchain platform for designing a data modelyou can choose platforms like Ethereum corda etc., Now Createthe structure and schema for storing crime-related information in blockchain. This involves specifying which kind of data to be included in platform with necessary metadata.

B. Developing the Smart Contracts

1) *Setting Up Development Environment:* Set up a development environment using tools like Truffle or Remix IDE. Use the Solidity programming language in order to a smart contract that will defines the structure and functionality of the crime registry platform define functions for adding new crime reports, updating the status of existing reports, retrieving crime data, and managing access control
2) *Testing, Storing in IPFS and Compilation:* Test the smart contract thoroughly using Truffle's testing framework or Remix IDE. Compile the smart contract code into bytecode using the Solidity compiler.
3) *Deployment:* Use Truffle or command-line interfaces provided by Ethereum to deploy the compiled smart contract onto the Ethereum blockchain network.

C. Integration with Web3 and Ethereum

1) *Connecting to Ethereum Node:* Choose an Ethereum node provider (e.g., Infura) and obtain an API key or connection URL. Initialize Web3 instance in your web application using the connection URL.

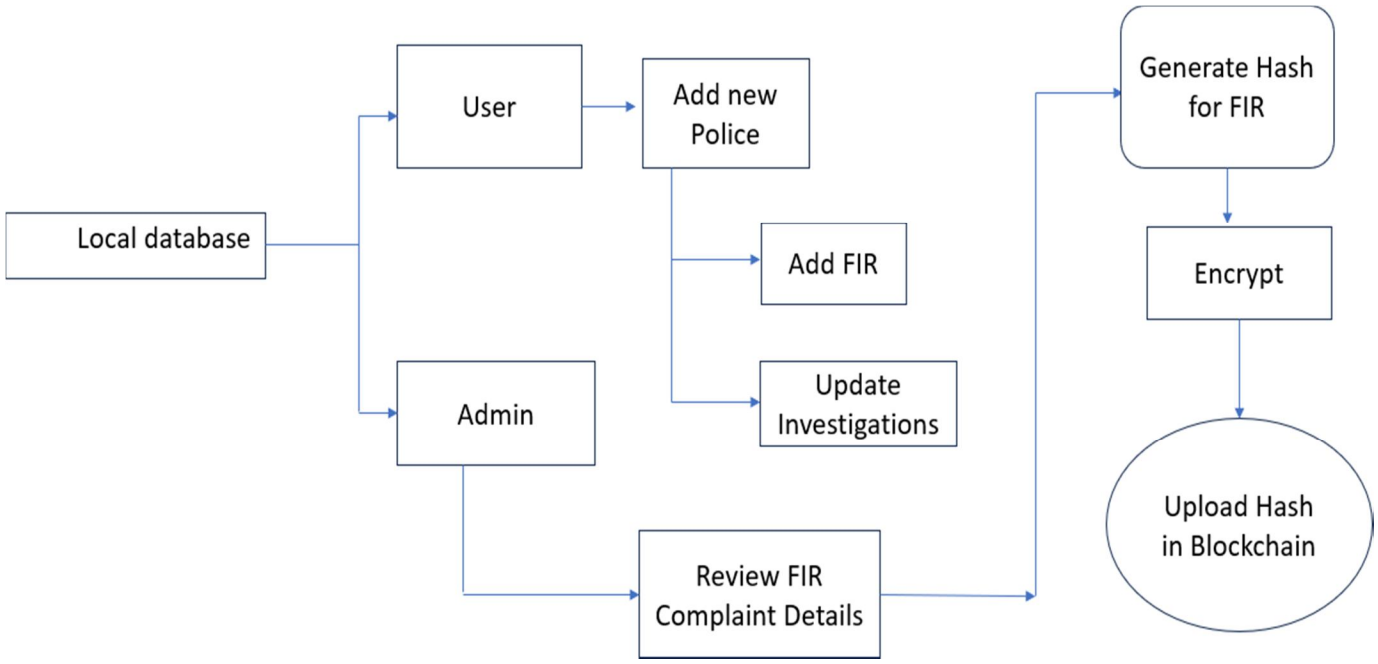


Fig-1 Block Diagram of crime registry platform using blockchain

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D. UI Integration

Integrate Web3.js it will calls into the UI of the web application and also it is used to allow users to interact with the crime registry platform.

Display the crime data that has retrieved from the smart contract on the UI. And then deploy the web application to a hosting server.

E. Algorithm 1(SHA 256 Algorithm)

1) Input: Data: The input data has to be hashed
2) Output: Hash: The resulting SHA-256 hash value
3) Procedure:
a) Initialize the SHA-256 hash function.
b) Convert the input data into a binary representation.
c) Pad the binary representation to ensure its length is a multiple of 512 bits.
d) Break the padded binary data into 512-bit blocks.
e) Initialize the eight working variables (a-h) with the initialhash values.
f) Prepare the message schedule array (W[0..63]) from theblock.
g) Initialize working variables (a-h) with the previous hashvalue.
h) Perform 64 rounds of hashing using a set of bitwiseoperations and constant values.
i) Update working variables (a-h) based on the results ofeach round
j) Compute the final hash value by concatenating thevalues of (a-h) in the specified order.
k) Return the resulting hash value.

F. Algorithm 2 (ECDSA)

1) Input: Message: The message to be signed
2) Output: Signature: The resulting digital signature
3) Procedure:
a) Generate a random value k (nonce) that is a positiveinteger less than the order of the curve's basepoint.
b) Calculate the point (x1, y1) = k * G, where G is the basepoint of the elliptic curve.
c) Calculate r = x1 mod n, where n is the order of theelliptic curve's base point.
d) If r = 0, go back to step 1 and choose a different valuefor k.
e) Calculate s = (k^-1*(Hash(Message) + PrivateKey * r))mod n, (e.g.,SHA-256).
f) If s = 0, go back to step 1 and choose a different valuefor k.
g) The resulting pair (r, s).
h) Return the signature.

IV. RESULT AND DISCUSSIONS

The implementation of a crime registry platform using the blockchain technology it represents an important step to forward in improving the security, and efficiency of criminal information. By acknowledging the decentralized nature of the blockchain, this platform will ensures that the criminal data will stays tamper-proof and instilling good positive trust among the people, government officers, and the public.

This heigh-level of security is not only protects the integrity and scalability of crime records but also manages the risk of unauthorized modifications, and thereby boosting the reliability of the information stored on theplatform.

However, the adoption of blockchain technology for managing criminal records also raises important considerations, particularly regarding privacy issues, legal and regular compliance, and the usability of the platform.

Addressing all these challenges it requires an implementation of robust privacy measures, such as encryption and access control mechanisms, to protecting sensitive information while ensuring compliance with particular related data and regulations. Additionally, user-friendly interfaces and seamless integration with existing systems are essential for facilitating widespread adoption and usability among stakeholders.

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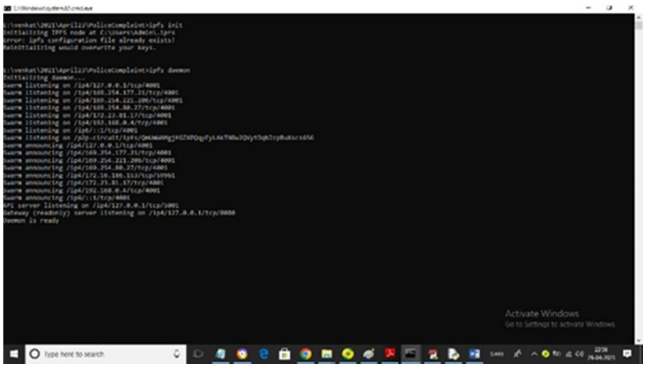


Fig-2 Starting IPFS Server



Fig-3 Admin Login Screen



Fig-4 Police Personnel Screen

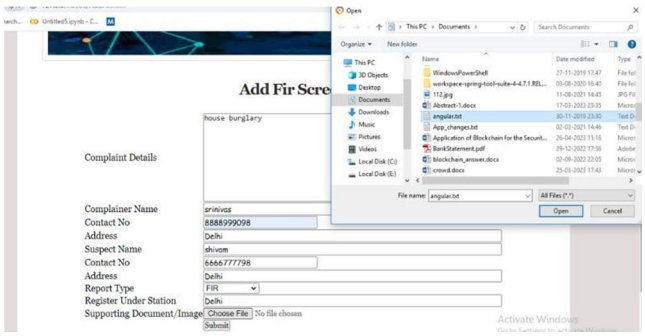
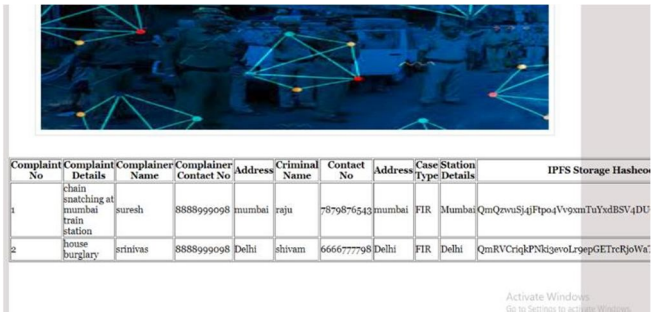


Fig-5 Adding FIR files



Complaint No	Complaint Details	Complainer Name	Complainer Contact No	Address	Criminal Name	Contact No	Address	Case Type	Station Details	IPFS Storage Hashco
1	chain snatching at mumbai train station	suresh	8888999098	mumbai	raju	7879876543	mumbai	FIR	Mumbai	QmQzwuSj4jFtpo4Vv9xmTuYxdBSV4DU
2	house burglary	srinivas	8888999098	Delhi	shivam	6666777798	Delhi	FIR	Delhi	QmRVCrjqkPNki3evoLr9epGETrcRjoWa

Fig-6 Adding Files into Blockchain

V. PERFORMANCE ANALYSIS

The table presents a comparative analysis of the performance of two prominent blockchain platforms, Ethereum and Hyperledger, focusing on their transaction processing capabilities and support for smart contracts.

S.No	Blockchain Platform	Type	Smart contract	Tps
1	Ethereum	Public/private	5	30Tps
2	Hyperledger	private	0	80Tps

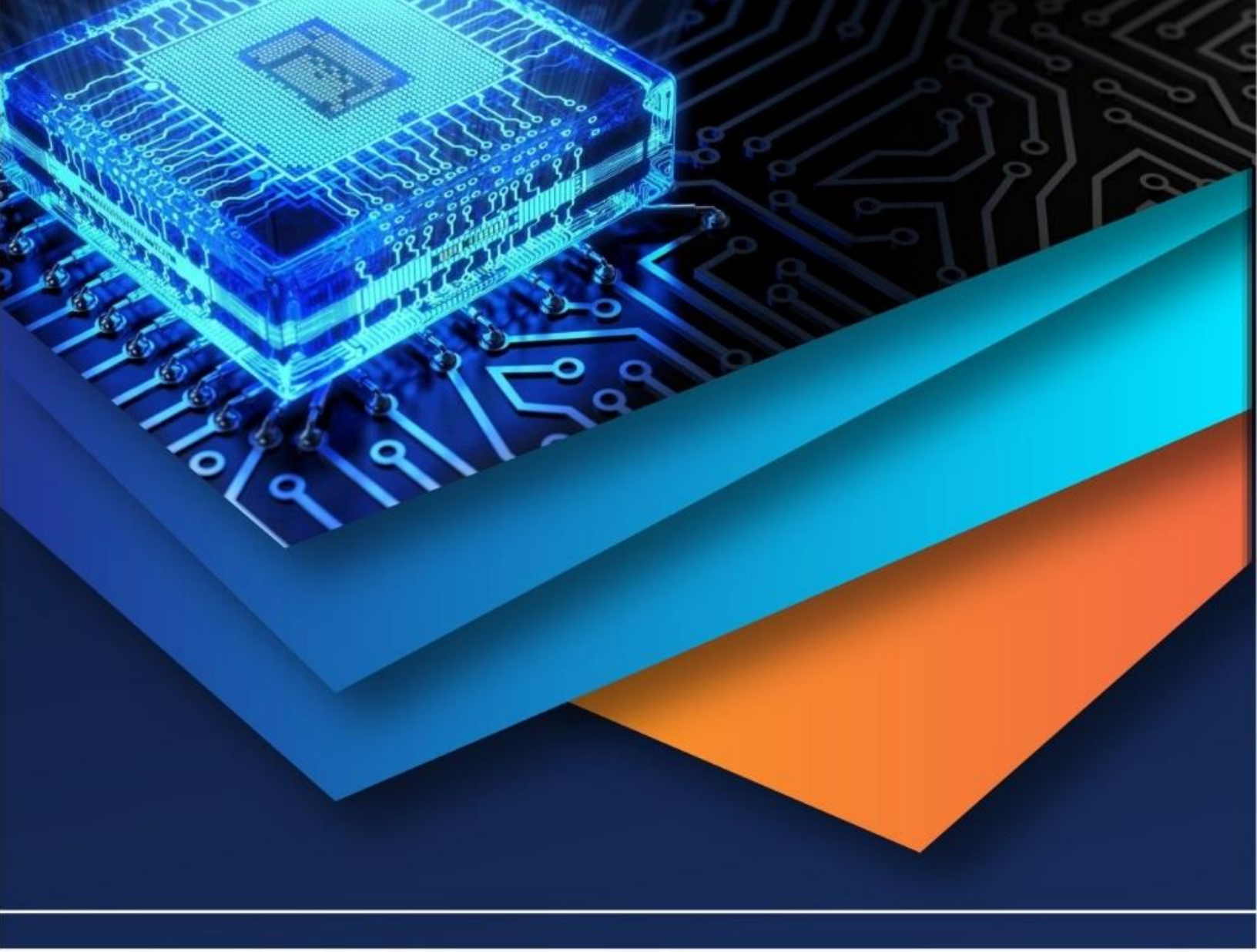
VI. CONCLUSION

In conclusion, the Indian Police Services play a vital role in our nation, handling over 50 lakh complaints relatedto cognizable crimes annually. Despite the availability of online systems for managing complaints, there persists a reliance on handwritten reports, and societal apprehensions hinder the filing of complaints. Efficiently managing police complaints iscrucial due to the sensitivity of the data involved.

The proposed system aims to address these challenges byoffering transparency and ensuring the confidentiality of storeddata. It is anticipated to encourage individuals to report complaints with the confidence, knowing that their concerns will not be overlooked. Additionally, the system aims to streamline the reporting process for police officers, reducing theburden of tasks like filing FIRs. By adopting a decentralized network, the proposed system minimizes reliance on trust factors among stakeholders. Overall, the system is designed to safeguard against corrupt police activities, ensuring justice is served from the outset

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