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# SIGNORA: A Blockchain-Based Framework for Dataflow Integrity Provisioning in an Untrusted Data Pipeline

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**ABSTRACT:** In a typical data pipeline, the dataflow starts from the first node, where the data is initiated and moves to the last node in the pipeline, where the processed data will be stored. Due to the sheer number of the involved participants, it is crucial to protect the dataflow integrity in the pipeline. While previous studies have outlined solutions to this matter, the solution for an untrusted data pipeline is still left unexplored, which motivates us to propose SIGNORA. The combination of digital signature and hashing algorithm can provide non-repudiation and non-tampering guarantee during data transmission from senders to receivers. At the receiver's end, third-party validators can check the signatures and hash to determine if senders previously transmitted the data and whether receivers have modified the data. Finally, the reputation system can adapt to the history of nodes' activities by increasing their scores when they actively perform honest behavior while reducing their scores when they become inactive. Therefore, SIGNORA can provide a high degree of accountability for participants collaborating in an untrusted environment.

**KEYWORDS:** dataflow integrity, blockchain technology.

## I. INTRODUCTION

Blockchain and smart contract have been widely used as a tool to preserve digital data by anchoring the hash of the data in the blockchain network. This trend rises as the possibility of blockchain being used as a forensically sound legal argument is discussed. Many researchers then leveraged blockchain as trusted platforms in an untrusted environment (e.g., in a crowdsourcing platform or in a decentralized marketplace). Similarly, previous studies have constructed blockchain-based preliminary assessments to make the deploying chain of signatures in an untrusted data pipeline possible. However, those studies assume a more trusted setting, where each participant is always assumed to act honestly when cooperating in the data pipeline. No accountability metrics are available; thus, malicious behaviors are left unpunished. Furthermore, they also do not consider the heterogeneity of the pipeline nodes. This limits the data pipeline to operate only in a closed environment. Our proposal targets a more sophisticated data pipeline environment where (i) several competing and untrusted organizations exist as nodes in the pipeline, and (ii) they can deploy their nodes in a BYOD (bring your own device) fashion. Furthermore, we define several requirements (R) that must be addressed to provide dataflow integrity in such data pipeline blockchain database as the center to upload the data by the user and also have smart contract by generating the hash value with timestamp.

Paper is organized as follows. Section II describes related work of this project using morphological operations, connected component analysis and set of selection or rejection criteria. The flow diagram represents the step of the design of website. After designing a user interface to upload details and dataflow integrity and finally graphical

analysis. By the application of Blockchain Technology, the has code will be generated for secured transaction between each module that is given in Section III. Section IV presents experimental results showing results of images tested. Finally, Section V presents conclusion.

## II. RELATED WORK

Presently, in the existing system Most related studies mentioned identity management in their proposals. Since they utilize block chain in their system, which requires nodes to create a block chain address as identity, this requirement can be easily overcome. We also notice that some researchers take consideration about the cost of block chain operations by providing off-chain solutions to perform chain signature. This indicates that secure and trusted off-chain methods are always preferable to on-chains. Unfortunately, other studies have not considered the diversity of the nodes that can participate in their data pipeline. The work in this paper is divided in two stages. 1) Making available the interface to upload data on this Signora website 2) Connected interface from upload of data to graphical analysis with transaction traceability. Graphs will be plotted based on path of the files in the system. Finally SIGNORA platform for uploading the files with it description and also to provide SIGNORA smart and secure transaction by generating hash code using SHA 256 algorithm.

## III. METHODOLOGY

1)Dataflow Integrity Provisioning: Nodes in a data pipeline can have one of the following roles: (i) generator, (ii) Re layer, or (iii) keeper. The generator node is the one who generates data and becomes the initiator of chain signature by producing genesis chain signature as a proof of origin. The keeper node is located at the other end of the pipeline, storing the received data and chain signature permanently. Mean-while, the re layer is an intermediary node that routes data from the generator to the keeper while extending chain signature along the way as a proof of distribution. When relaying data, nodes can choose whether to retransmit all elements of chain signature (i.e., so-called FULL mode) or only the current and previous element (i.e., PAIR mode) to the next node.

2)Dataflow Integrity Validation: Trusted validators are tasked to verify dataflow integrity on the keeper nodes storage. In particular, they validate whether the data stored in keeper storage are not maliciously altered by checking the corresponding block chain receipts. After that, validators continue verifying each element of chain signatures, starting from the latest to the genesis one.

3)Signora smart contract: SIGNORA smart contract provides valuable on-chain services for (i) identity management, (ii) HMAC (Hash based message authentication code) key distribution, and (iii) a reputation system that further augments the security of the proposed chain of signatures and block chain receipt.

## IV. EXPERIMENTAL RESULTS

Figures shows the results of E-commerce website of agricultural products based on blockchain technology using secure hash 256 algorithm. Fig(a) shows the interfaces of user registration. (b) shows the interface for user login. (c) interface to view the uploaded details of user. (d) shows the interface of user uploaded data and file location (e) shows the interface of user to enter the signature key. (f) shows the interface of user to enter the signature key (g) shows the interface of user to graphically analyze the data. (h) shows the interface of user to download the uploaded file.



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SIGNORA: A BLOCKCHAIN-BASED FRAMEWORK FOR DATAFLOW	
First Name	<input type="text"/>
Last Name	<input type="text"/>
User Id	<input type="text"/>
Password	<input type="password"/>
Mobile Number	<input type="text"/>
Email Id	<input type="text"/>
Gender	<input type="text"/>
<input type="submit" value="SUBMIT"/>	

Fig (a) shows the interface of registration page

SIGNORA: A BLOCKCHAIN-BASED FRAMEWORK FOR DATAFLOW	
USERID	<input type="text"/>
PASSWORD	<input type="password"/>
<input type="button" value="LOGIN HERE"/>	
<input type="button" value="NEW USER"/>	

Fig (b) shows the interface of user login



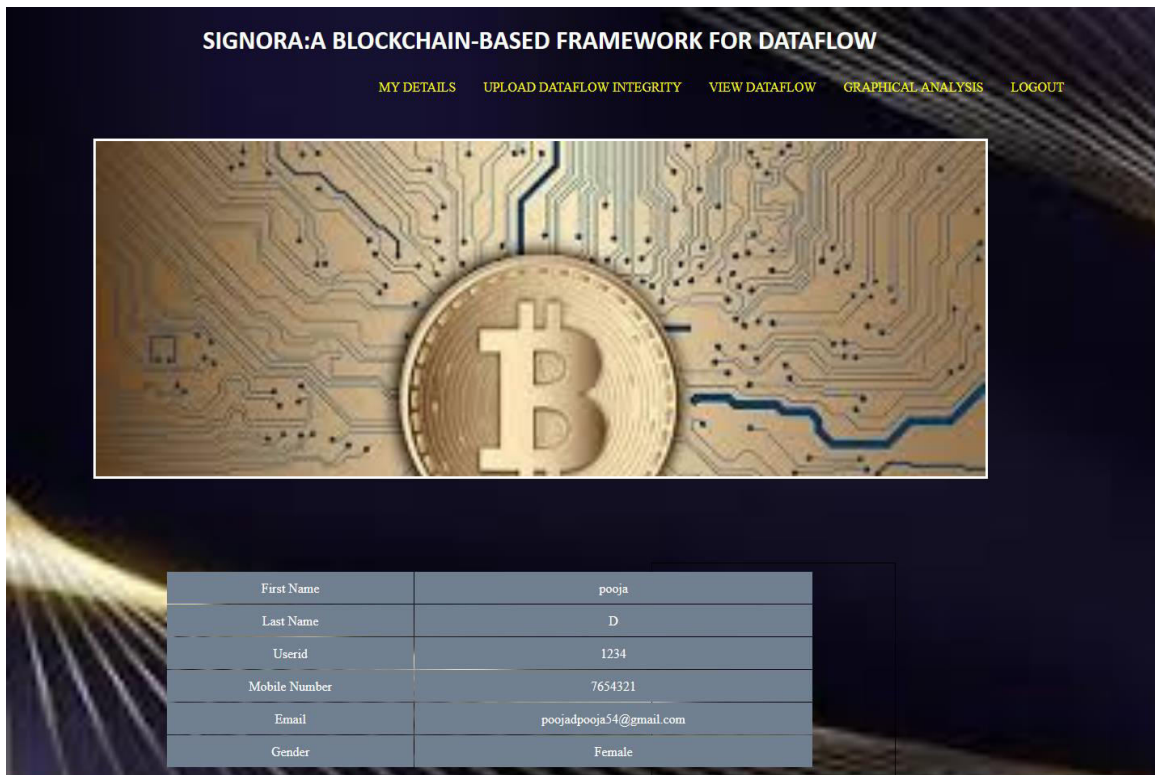


Fig (c) shows the interface to view the uploaded details of the user.

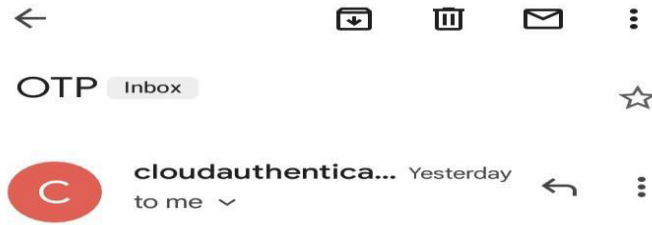


Fig (d) shows the interface of user uploaded data and file location



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Signature Key :6918

HASH CODE :ec4aa3c91c1c094fcbe6287545e9b  
f40f6594450fcfecbe016fa7d66a63ea9cf

Timestamp :2023-05-04 13:59:09.558699



Fig (e) shows the signature key and hash code sent by the system

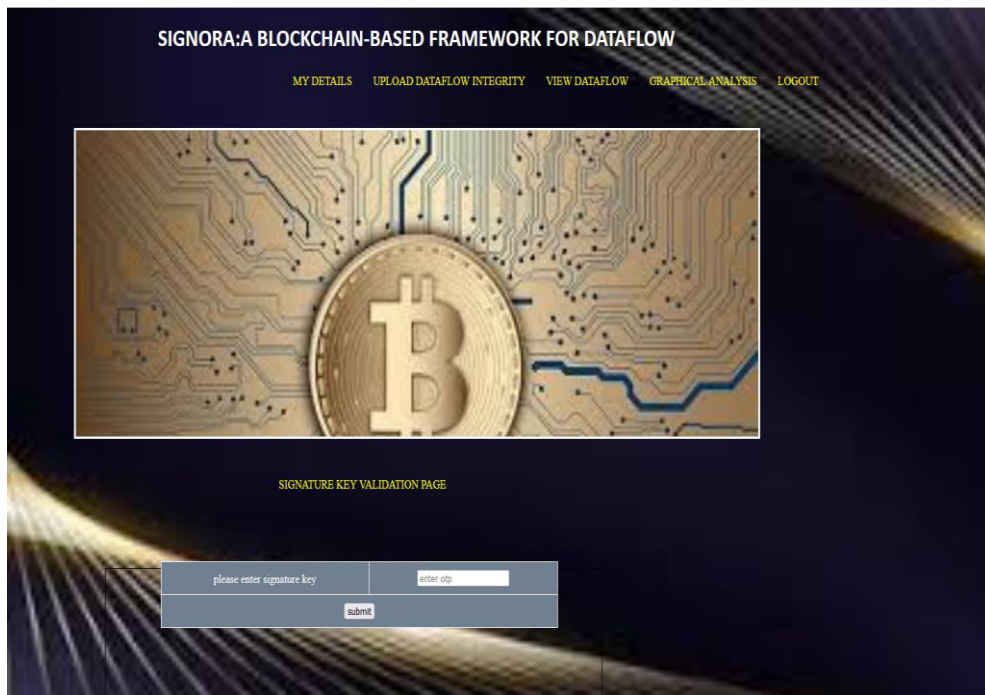


Fig (f) shows the interface of user to enter the signature key

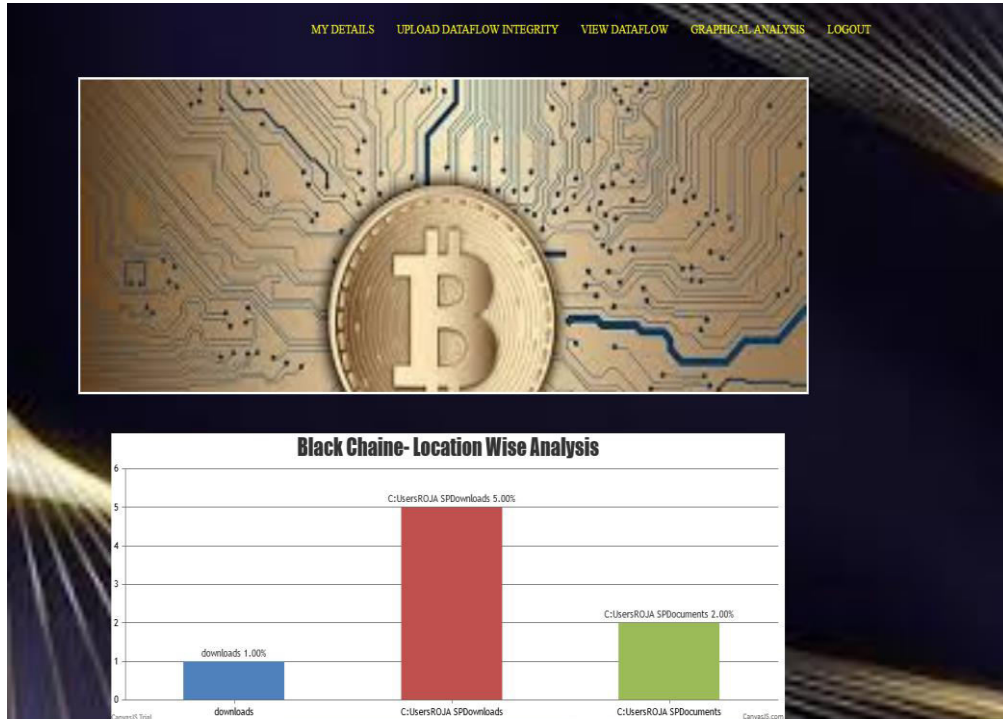


Fig (g) shows the interface of user to graphically analyze the data

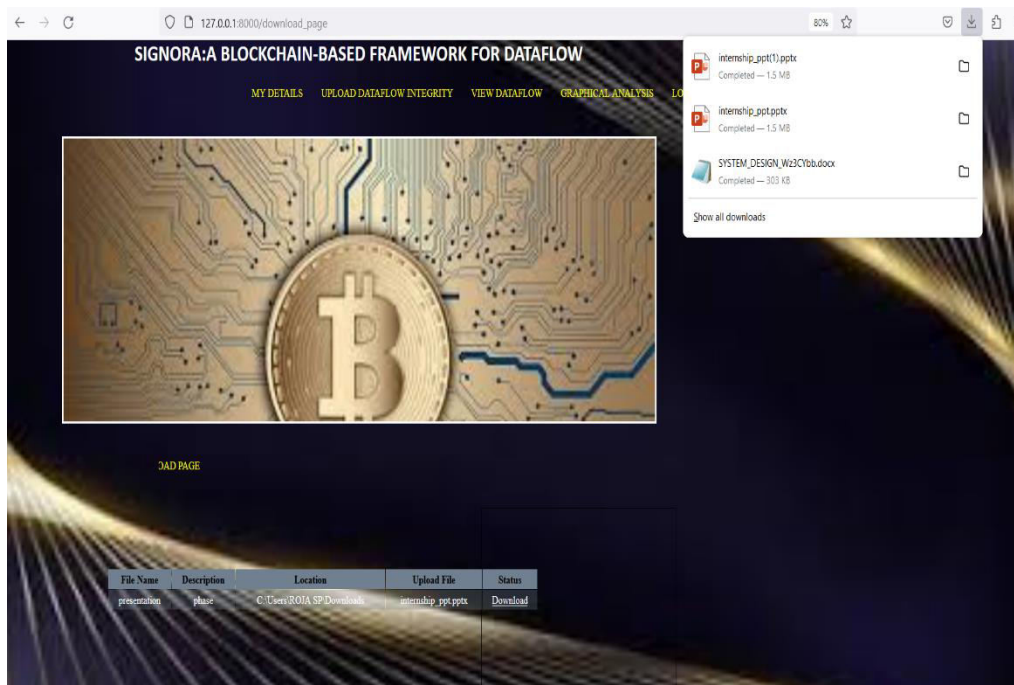


Fig (h) shows the interface of user to download the uploaded file

## V. CONCLUSION

The application of blockchain technology in the field of traceability is increasing, the system uses the blockchain technology to collect, analyze and process the data. Through the results of our experiments, we have shown that



SIGNORA can provide dataflow integrity provisioning in multiple scenarios of data payload size with reasonable overhead. The cost of smart contract methods has also been analysed, and several off-chain solutions have been addressed to reduce costs. Furthermore, we have shown that the reputation system can adapt to the history of nodes' activities by increasing their scores when they actively perform honest behaviour and reducing their scores when they become inactive. Still, developers must make crucial design decisions when deploying SIGNORA in their use case. For example, using a permissioned block chain allows developers to eradicate the cost of storing data in the block chain, but the system becomes more centralized. Furthermore, the chain of signatures should only be employed to provide integrity only on essential dataflow to reduce the overall processing overhead, especially in a high number of pipeline nodes.

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