

The trifecta of security: Hyperledger fabric in blockchain, cloud computing and digital evidence

Ashvini k Butani

Department of computer science & (It)
Gujarat technological university
Ahmedabad, India

Dr. Ravirajsinh S. Vaghela

School of cyber security and digital forensics
National forensic science university
Gandhinagar, India

Abstract— Now a days Blockchain is booming everywhere their decentralized ledger, immutable and smart contract functionality working with cloud computing and IoT. but data security in cloud computing are always raising issue in cloud computing and also authentication and authorized access problem are their mainly issue so its suffering with internal or external cyber-attacks. With help of blockchain Hyperledger fabric it's given secure modulation, secure data accessibility and scalability. Hence in this paper study of blockchain framework which existing in recent research and what is they drawbacks, and in future scope and also future implantations framework with Hyperledger fabric environment data access in secure way in cloud computing and its give confidentiality of data transactions.

Keywords—Blockchain, Cloud Computing, digital Evidence, Security, IoT, Hyperledger fabric

i. INTRODUCTION

Cloud computing uses increases day by day with providing huge storage, decentralized infrastructure, integrity and many more. With blockchain and IoT it provides customer flexibility, security and data privacy growing in smart industrial area and further software define network provide to improve robustness. Load balancing of the cloud computing data [1] blockchain technology provide ,immutability, and Decentralized network in this with help of smart contract we would take evidence and other criminal investigation in this not to need third party involvement so it easy to check out all details[2]with the cloud computing ,blockchain and IoT its gives an conditional roll on digital platforms IoT and cloud computing play awesome roll in health sectors vie internet its gives all the patients data online at their place[3] help of blockchain multilayer frameworks facility it's also use in reduce waste food with cloud computing code and reinforcement learning[5]smart contract also help in reduce

road accident with digital evidence record help in to investigation IoT base ecosystem [6]

Blockchain and cloud computing give facility of data sharing, any time anywhere, it's also provided privacy protection, authenticity, secure analysis with proxy re encryption it provides better experience in data sharing and network capabilities [7] block chain smart contract facility also works with network its deliver fastest speed network facility to media and entertainment [9] blockchain is trending and new technology its more beneficial for health era, professional, stakeholder's and also academic too this also use for ERP(Enterprise resource planning)for decision making process help provide[8,10]

Blockchain is decentralized and fast technology it stores data in small block sequences link with each other let's see proper structure of blockchain technology

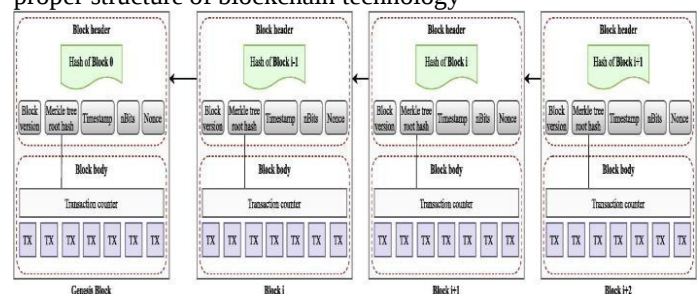


Figure 1. structure of blockchain technology [3][9]

As shown fig 1, there is no any parent block, blockchains header (80 byte long) which indicate meta data blockchain version (4 byte) it provides keep change and update throughout protocol. markable tree root hash (32 byte) it creates transaction, time stamp (4 byte) it stores every second recorded permanently which occurs, bit (4 byte) this manage and adjust the block, Nonce (4 byte) its start with 0 and increase with every hash calculations., parent hash block (32 byte) its links with previous block and secure the chain [3]

there are two types of blockchain permission or permissionless the whole transaction are depends on size of block[12]blockchain mainly three type public blockchain, private blockchain, consortium blockchain[14] Cloud computing provide flexibility for anytime anywhere use with blockchain its works to gather it provide trustful environment working very well protected framework robust design and authentication control [18]

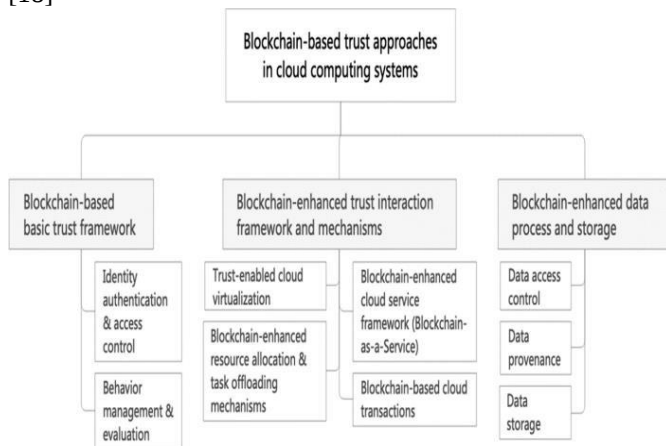


Figure 2. blockchain based cloud computing system [18]

With help of permission blockchain profit in brand name companies for their consumer or suppliers that's also help in inexperienced consumer for quality production of a production [20] blockchain are popularity increase with supply chain in sustainability its help in food safety and health nutrition in Wal-mart food supply chain and IBM food trust [21]

Cloud computing and blockchain technology also use for digital evidence that's provide decentralization, data integrity, and using of smart contract and polygon blockchain create decentralized model for evidence protection its working process are as follow [2]

it defines step by step process digital evidence management process in this first one Evidence acquisition that's gather data, then after evidence base investigation or examination the data process, and then Analysis on it then create systematic report

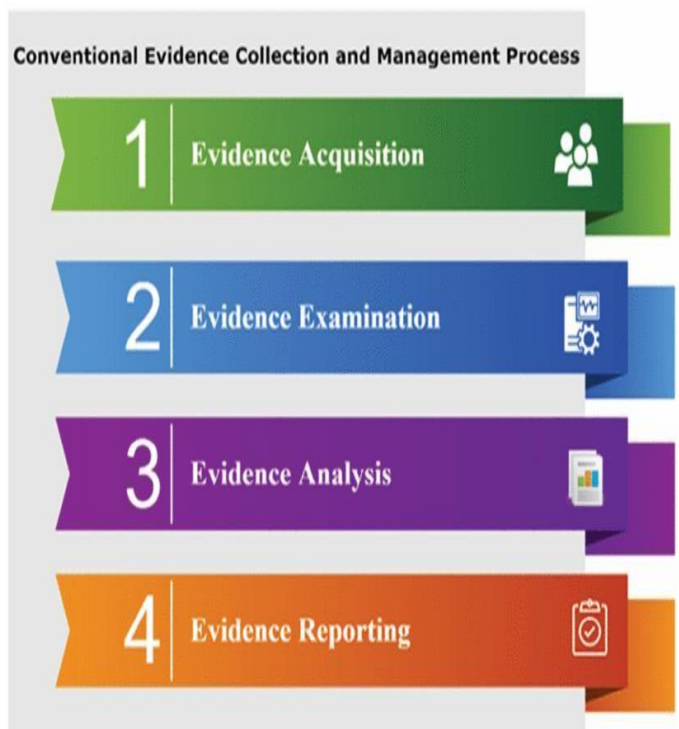


Figure 3. evidence collection and management process [2]

This process provides criminal investigation management its one type of life cycle of collecting witness, analysis, crime investigation by police judge or jury member it provides transparency, authority access base report [25]

The following section 2. describe the literature review about blockchain technology with IoT and cloud computing and digital evidence section 3. proposed methodology/Design and 4. finally concluded in this section.

ii.

RELATED STUDY

Use of distributed blockchain technology, IoT, indicate software define network which provide security, integrity confidently, especially for industrial era they proposed DistB-SD Cloud architectures[1] decentralized model layer 2 blockchain polygon using smart contract create digital evidence which help to provide security of digital evidence there is no need for centralized authority but its enable to secure this digital evidence data need to more privacy which protect from the unauthorized access[2]using of AI,QR and blockchain based cloud computing create framework SmartNoshwaste application web 3.0 in smart city which use for reduce waste food its work on real data[5]smart contract based digital evidence framework also use in road accident reduce with help of cctv investigation and stakeholders' but

they need more investigation with other hyper ledger and private network[6]

Blockchain technology are trading in healthcare industry with help of cloud computing and IoT based they did cancer therapy use of private blockchain also smart hospital, smartphone medical network EEG data and many more [17]double blockchain using of cloud computing are safe for the data in this data leakage chance are low its provide trust management framework with dole blockchain[18]cloud computing now a days popular in not only business era but also in education, medical health, school system also use for data security purpose that time relational database security needs use of SHA-256 based on blockchain technology enhanced self-verification mechanisms blockchain based relational database[22]cloud as a service investigation and forensic analysis purpose blockchain cloud framework login which use digital investigation which use in cloud eco system[24]blockchain based lawful- evidence that's provide which prevent witness data also protect from external attacks[25]many of companies ,industries and banks are also using blockchain technology because of its one of the trustworthy system its provides better transactions reports with improve data privacy and security access[28]

Blockchain network security work with NAVAIR air system that's provide traceability with supply chain its help for pilot phase [30]

iii.

LITERATURE REVIEW

Table 1. Study of Blockchain

Ref no				
	Objective	Blockchain Framework	Result	Advantage/Disadvantage Framework
Anichur Rahman a ,et al., [2023][1]	For cloud and IoT security proposed architecture	Distributed framework	Need to improve security, privacy, reliability in cloud, it beneficial of IoT user	Using with different application for Fog and Edge computing more with trusted environment
SUMIT KUMAR	Decentralize	Layer 2	Layer2 polygon	Need to vast storage for

RANA 1 , et al.,[2023][2]	Model for evidence data security	polygon blockchain	blockchain with smart contract work very well for evidence and verification	evidence handle and also use cutting edge cryptographic
Abin Oommen Philip, et al., [2022][6]	Internet of vehicle accident investigation	Smart contract	More memory required for access	Implemented with private blockchain and Hyperledger its more reliable for its
Zhen Wei Chen , et al., [2021][29]	Blockchain public key encryption scheme with multi-keyword search	Smart contract	Its sufficient to work search keyword	Compare with other scheme and work with it
Simon Joseph Aquilina, et al., 2021][31]	Digital investigation on Ethereum attacks	Indicators of compromise	Indicators of compromise provide better security with	Create another standardized framework for forensics investigation, Ethereum virtual machine
P. Velmurugadas, et al., [2020][32]	Blockchain security in cloud computing evidence collection, analysis and reporting	Cloud based software define network, SHA 256 cryptography algorithm	It provides better performance and accuracy, security	In future create light weight algorithm which indicate low throughput
Waleed Rashideh et al., [2020][44]	Blockchain for tourism market	-	It reduces time and cost of user it provides better guideline	Its sufficient for tourism market
Wenqi Yan, et al.,	Blockchain	Protocol and	Its well provide	It protects from authorized

[2020][47]	based digital evidence of custody	BLS signature	security traceability for digital evidence	access
Dr. Manish Kumar1, et al., [2020][54]	Distributed intrusion detection system for cloud computing and blockchain	-	It's takes more loading data on proposed architecture	There are still many issues communication delay, overheads, implementation cost
Marijn Janssen, et al., [2020][55]	Analysis based on blockchain	Conceptual framework	It's some limitation with framework	In future work with practical study and explore the new framework design
MEHRAN POURVAH AB et al., [2019][61]	Digital architecture proposed with SDN and blockchain to collect evidence from IaaS cloud environment	Software define network	it provides better result with java and ns-356	introduce new network for forensic study for secure architecture

Flowchart of secure payment system using Hyperledger fabric in cloud computing:

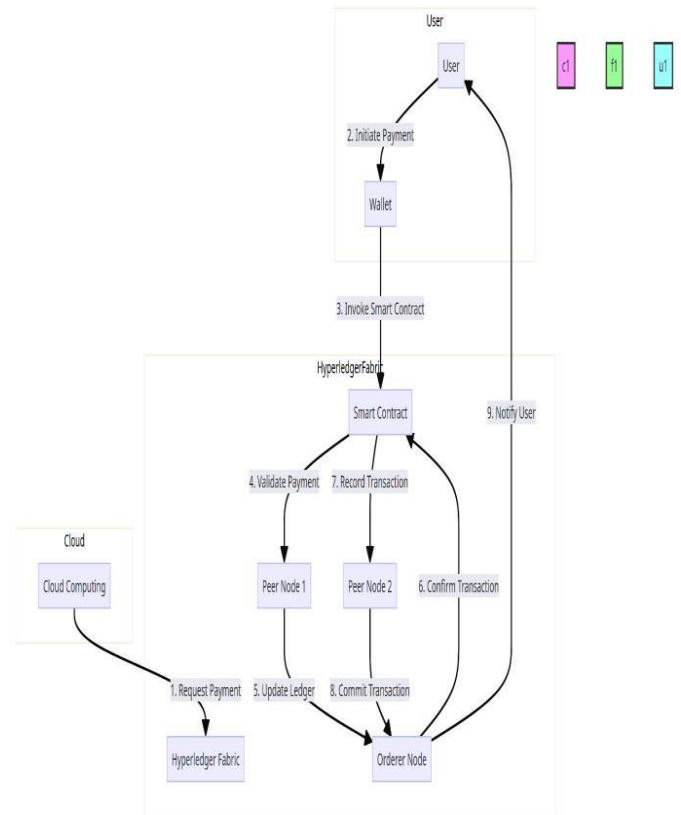


Figure 4. secure payment system architecture flow

In this paper we purpose illustrate architecture of secure payment system with Hyperledger fabric blockchains in cloud computing in this chain code has important role in performance there are also validate payment and record transaction and confirm record in peer node 1 and 2.

We also consider class diagram for the transaction of secure payment system in there are different parameter working with gather in relationship conformation based on object-oriented manner define the different class following

- Hyperledger fabric: it defines the network id, submit transactions their return type void () and query ledger store the ledger entry
- Ledger entry: its return the user entry and detail about the transactions detail time or date
- Transaction: in transaction all about the end user detail which timestamp and transaction id and how many amount to transfers and other detail
- Query: in this query id and transactional query detail
- Certification authority: in this user certification details when they issue participant etc

- Merchant: it defines merchant detail about merchant id, his/her balance information
- Participant: in this also detail about participant id and his/her certification
- End user: it gives detail about the user id, wallet balance, make payment detail, received payment

CONCUSION & DISCUSSION

Cloud computing is on demand technology day by day its increases uses but still a date some areas it suffering with external or internal attacks with the help of blockchain technology layer Hyperledger fabric give secure infrastructure. Study in all the review paper cloud computing need secure architectural framework which help to protect data security, to make confidential environment, need more privacy and reliability. with help of this permission block chain, we create cloud computing secure and robust frame work they provide authenticated access there are no need of any third-party involvement and provide strong authentication, secure from hygiene attacks or malicious attacks and protects our sensitive data. After the study of blockchain technology layer in different review paper we find out till a date a date database is not secure transaction and data integrity, data security more need in cloud computing

In future work with Hyperledger fabric its help in digital investigation, secured accessibility of the data, legal access of user and their credential without proof no handle database. so, we create secure, scalable and modular blockchain frameworks for cloud computing which help in robust security for user.

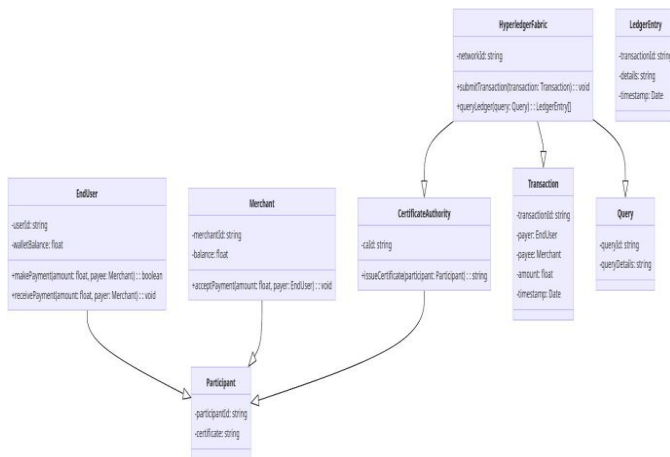


Figure 5. Class diagram payment system

Hyperledger fabric is permissioned distributed ledger [13] without permission or membership no anyone can access the data, and it has own modular architecture. Membership service provider (MSP) read the data from access list control 2) step validation process request to endorse to conform membership 3) after that the simulated the transaction 4) then verify with signature and give the permission of ordering step 5) after the they give authentication rights 6) ordering for create node or block 7) peer the validate transaction clear and give green flag to user 8) at last commit the process of Hyperledger fabric.

In future with help of this permission block chain we create cloud computing secure and robust frame work they provide authenticated access there are no need of any third-party involvement and provide strong authentication, secure from hygiene attacks or malicious attacks and protects our sensitive data. After the study of blockchain technology layer in different review paper we find out till a date a date database is not secure transaction and data integrity, data security more need in cloud computing.

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