

BLOCKCHAIN BASED DECENTRALIZATION TENDER MANAGEMENT - 'FAIRBID'

Ogirala Kishori¹, Muvva Raja Poojitha², Kudala Lakshmi Thirupathamma³

¹ UG Student, Dept of Electronics and Communication Engineering, Vasireddy Venkatadri Institute of Technology, Nambur, Andhra Pradesh, India

² UG Student, Dept of Electronics and Communication Engineering, Vasireddy Venkatadri Institute of Technology, Nambur, Andhra Pradesh, India

³ UG Student, Dept of Electronics and Communication Engineering, Vasireddy Venkatadri Institute of Technology, Nambur, Andhra Pradesh, India

ABSTRACT

Traditional tender management systems often suffer from issues such as opacity, inefficiency, and susceptibility to corruption during the solicitation, evaluation, and awarding of bids. In response to these challenges, 'FairBid' emerges as a groundbreaking blockchain-based decentralized tender management system aiming to transform the tendering landscape. Leveraging blockchain technology, FairBid establishes a transparent, tamper-proof, and trustless environment for overseeing tender processes. Functioning as a decentralized platform, FairBid empowers various organizations, including governmental bodies, to conduct tenders using Hyperledger blockchain technology. This innovative system ensures that organizations are unable to manipulate or access proposed contract amounts submitted by contractors within specified deadlines, thereby instilling fairness and decentralization throughout the entire tender process.

Moreover, FairBid introduces a level playing field for all participants, irrespective of their size or influence, fostering competition and efficiency. By eliminating the need for intermediaries, FairBid streamlines the tendering process, reducing administrative overheads and ensuring cost-effectiveness for all parties involved. Additionally, the decentralized nature of FairBid enhances security and mitigates the risk of data manipulation or fraud, instilling trust in the integrity of the tendering process. FairBid represents a paradigm shift in tender management by seamlessly integrating blockchain technology, thereby guaranteeing fairness, transparency, and trust in the process. With its potential to revolutionize procurement processes across government, corporate, and nonprofit sectors, FairBid stands as a beacon of progress. By eliminating intermediaries and advocating for fairness, FairBid signifies a significant advancement in the realm of tender management.

Keyword: Blockchain, Hyperledger Fabric, Tender Management, Fairbid.

1. INTRODUCTION

In the realm of procurement, tenders serve as pivotal opportunities for businesses to secure work contracts from government agencies and private organizations, facilitating the expansion and growth of their enterprises. However, the traditional tender management process often encounters challenges such as opacity, inefficiency, and susceptibility to corruption, thereby undermining the integrity and fairness of the bidding process. In response to these pressing issues, the innovative 'FairBid' system emerges as a beacon of change, poised to revolutionize the tendering landscape.

In this context, 'FairBid' emerges as a groundbreaking solution, harnessing the transformative potential of blockchain technology to address the inherent shortcomings of traditional tender management systems. By leveraging blockchain's inherent features of transparency, immutability, and decentralization, this system endeavors

to create a tamper-proof and trustless environment for managing tender processes. Through the seamless integration of blockchain technology, It seeks to redefine the tendering process, ensuring fairness, transparency, and trust from solicitation to contract award.

2. EXISTING METHOD

The Existing system of the tender management process is a manual and paper-based system that involves various steps for organizations to publish tenders and for suppliers to submit bids. This process is time-consuming, resource-intensive, and lacks the efficiency and transparency that modern technology can provide

Loopholes in the existing system:-

- 1) Rigged specifications
- 2) Complementary bidding
- 3) Dates are altered to accommodate certain suppliers
- 4) Appointment of suppliers whose scores do not reflect that they are the best applicants

All these actions undermine the principles of fairness, transparency, and equal opportunity within the tendering process. They lead to a lack of genuine competition, inflated prices, potential compromise in the quality of goods or services delivered, and financial losses for the organization or government involved.

Detecting and preventing these loopholes require robust oversight, stringent checks and balances, transparency in the evaluation process, and strict enforcement of laws and regulations governing tender procedures. Independent oversight bodies, clear documentation, and accountability measures can help mitigate these risks and ensure a more transparent and fair tender management system.

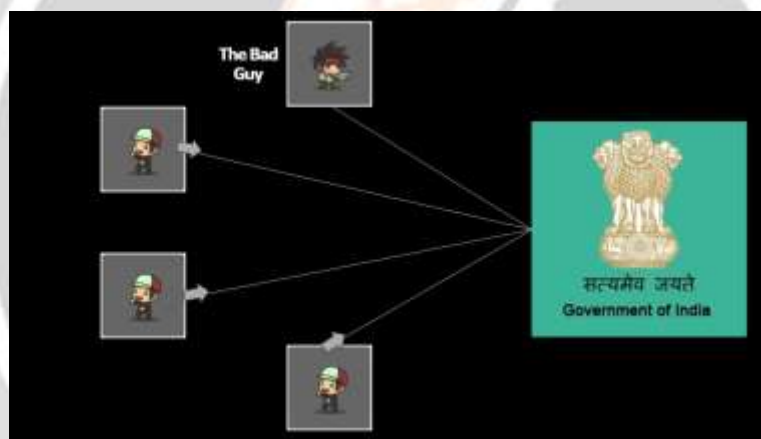


Fig -1:Bidders applying for the tender

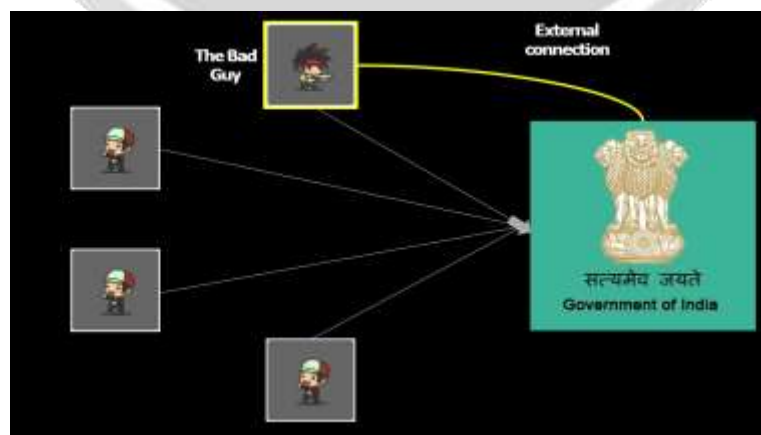


Fig -2:Fraudulent way of applying for the same tender by a bidder

3. PROPOSED METHOD

Advantages of the proposed Block-chain based Tender management system over the traditional system:

3.1 Transparency:

Blockchain technology provides transparency by recording all transactions and changes to the tendering process in a tamper-resistant manner. This transparency enhances trust among stakeholders as they can verify the integrity of the tendering process.

3.2 Immutability:

Once data is recorded on the blockchain, it cannot be altered or deleted, ensuring the integrity and authenticity of tender-related information. This immutability reduces the risk of fraud and manipulation in the tendering process.

3.3 Decentralization:

In a decentralized system, there is no single point of control, reducing the risk of corruption and bias. Decentralization also increases resilience to system failures and ensures that the tender management system remains operational even if some nodes fail.

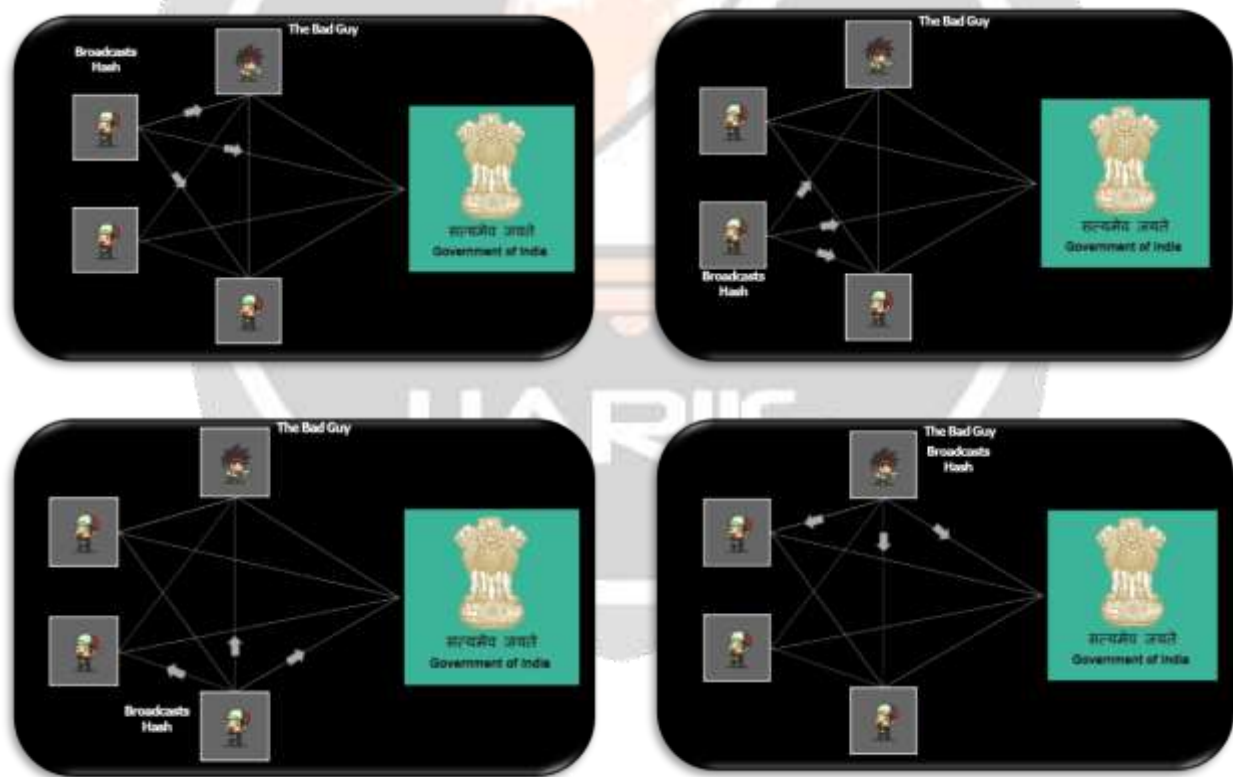


Fig -3: Bidding process in Block-chain based tender management system

3.4 Cost Savings:

By eliminating intermediaries and automating processes, blockchain-based tender management systems can reduce administrative costs associated with traditional tendering systems. This cost savings can benefit both tendering authorities and contractors participating in the tendering process.

3.5 Security:

Blockchain technology uses cryptographic techniques to secure data and transactions, making it resistant to hacking and unauthorized access. This enhanced security ensures the confidentiality and integrity of sensitive tender-related information.

3.6 Global Accessibility:

Blockchain-based tender management systems can be accessed from anywhere in the world with an internet connection, making the tendering process more inclusive and accessible to a wider range of participants.

4. DESIGN METHODOLOGY

4.1 Design Flow

Steps involved in the flow of our decentralized tender management system:

1. Contractor or Evaluator Role Selection:

Users can choose their role as either a contractor or an evaluator within the system using the "ChooseRole" transaction. The chosen role and organization details are recorded on the blockchain to maintain transparency and accountability.

2. Tender Creation:

Authorized users, typically administrators, create tenders by specifying project details, requirements, submission deadlines, and optional token fees and tender details are recorded on the blockchain using the "Tender" asset.

3. Bid Submission:

Contractors interested in participating submit their bids electronically through the system using the "BidSubmission" transaction. Bids include details such as bid amount and submission time, and they are recorded on the blockchain using the "Bid" asset.

4. Bid Evaluation:

Authorized evaluators access submitted bids and evaluate them based on predefined criteria, such as bid amount and the evaluation results are recorded on the blockchain.

5. Contract Award:

The system automatically selects the winning bid, typically the one with the highest bid amount. The winning bid is recorded on the blockchain as part of the tender asset.

6. Transaction Recording :

All transactions related to role selection, tender creation, bid submission, evaluation, and contract award are recorded on the blockchain in a tamper-resistant manner.

7. Participant Role Management:

Participants can only access functionalities based on their roles, ensuring that contractors can only submit bids and evaluators can only evaluate bids.

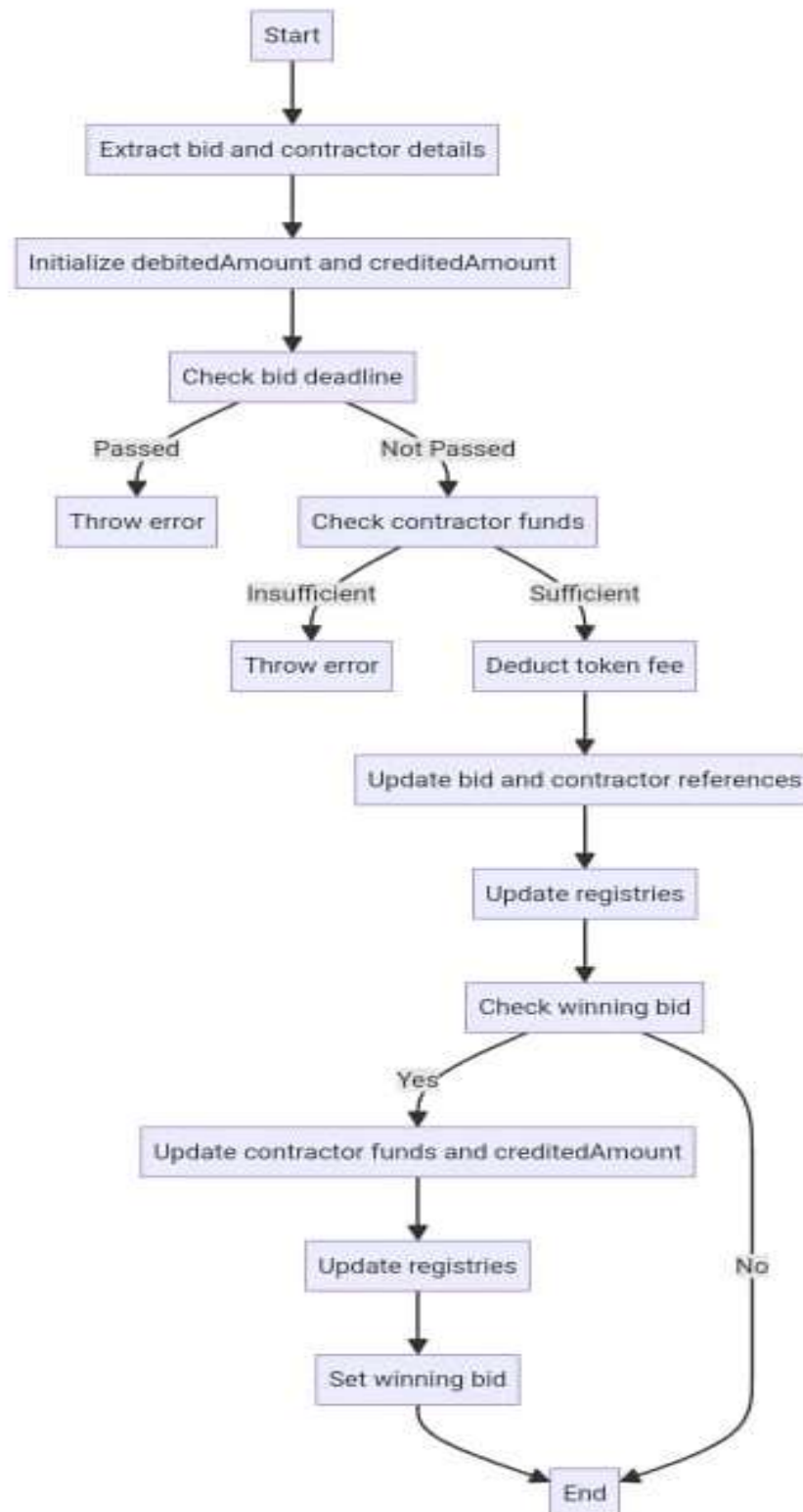


Chart -1: Decentralized Tender Management System Logic Flow

4.2 Steps for Implementation

1. Start by configuring the necessary blockchain components, including Docker, Docker Compose, and Hyperledger Composer, according to project requirements.
2. If any existing setup exists, ensure it is removed to ensure a fresh start.
3. Initiate Hyperledger Fabric to establish the underlying infrastructure for the blockchain network.
4. Create a Peer Admin card to oversee administrative tasks and permissions within the network.
5. Develop and deploy the business network, specifying the regulations and logic governing transactions and interactions.
6. Compile the business network into a Business Network Archive File (BNA) for deployment.
7. Install and deploy the BNA file onto the network to activate the business network.
8. Validate the functionality and integrity of the business network using Hyperledger Composer playground.
9. Generate a REST API server to facilitate communication and interaction with the deployed network.
10. Construct an Angular application that interfaces with the REST API, providing users with a user-friendly interface to engage with the blockchain network

5. RESULTS

We have implemented a REST API server to facilitate seamless interaction with our business network. Leveraging HTTP GET and POST methods, we submit transactions effectively. Additionally, we have crafted an Angular application to streamline the interface with the REST API. Below, we present screenshots displaying transaction statuses.

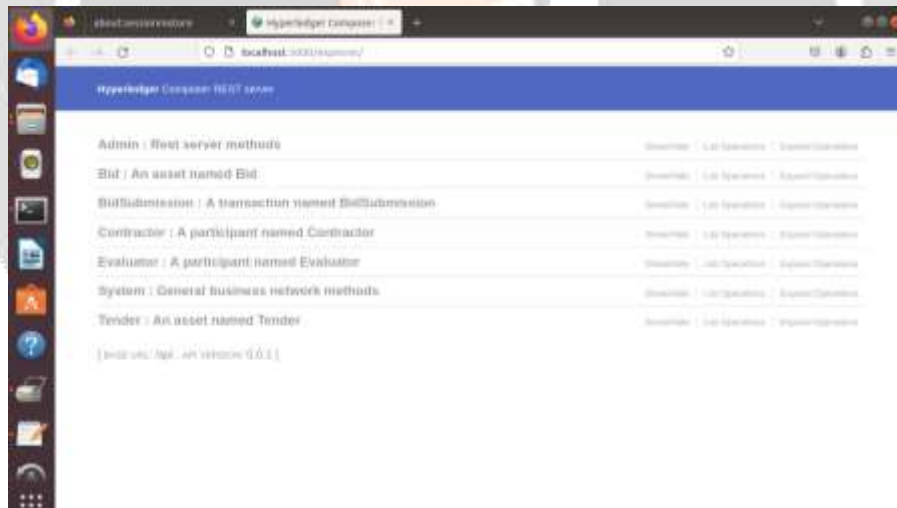


Fig -4: REST Server at localhost 3000

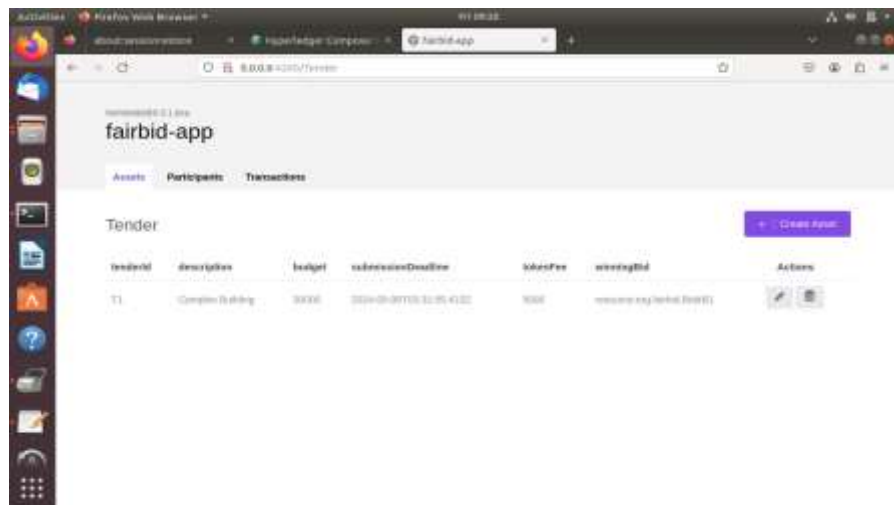


Fig -5: Asset in the network: Tender

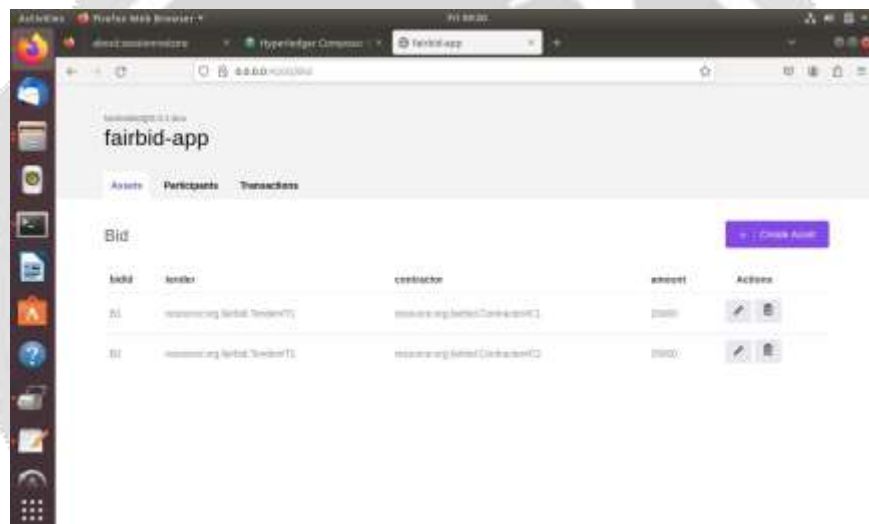


Fig -6: Asset in the network: Bid

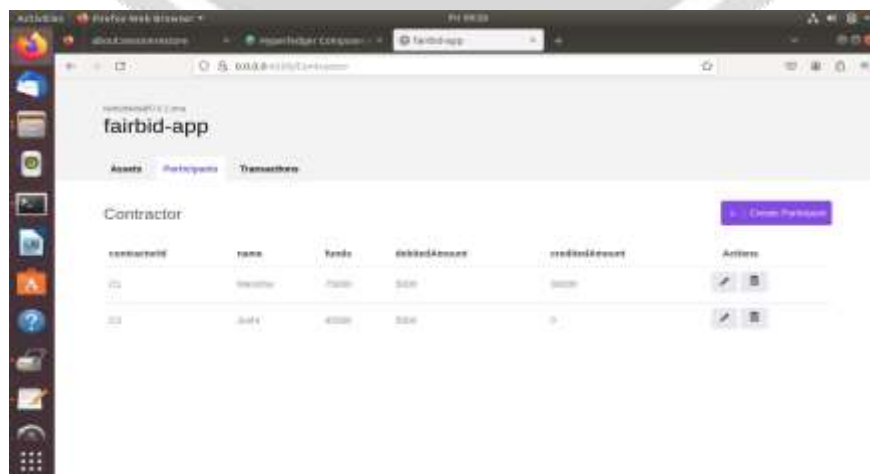


Fig -7: Participant in the network: Contractor

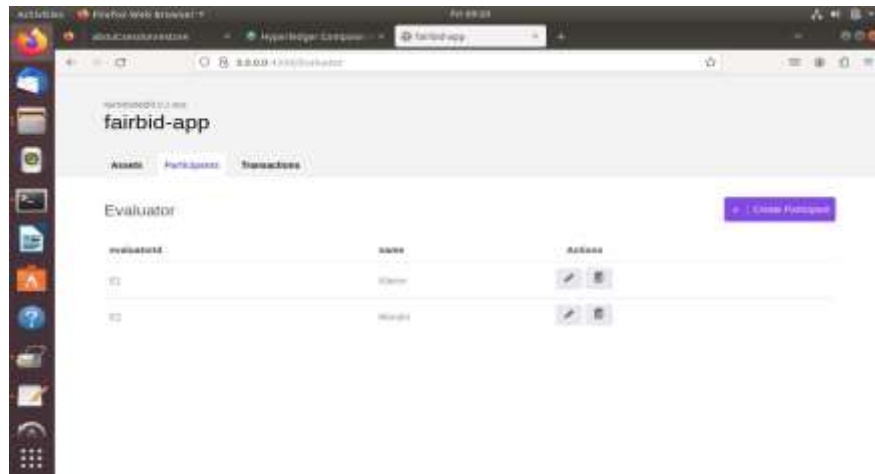


Fig -8: Participant in the network: Evaluator

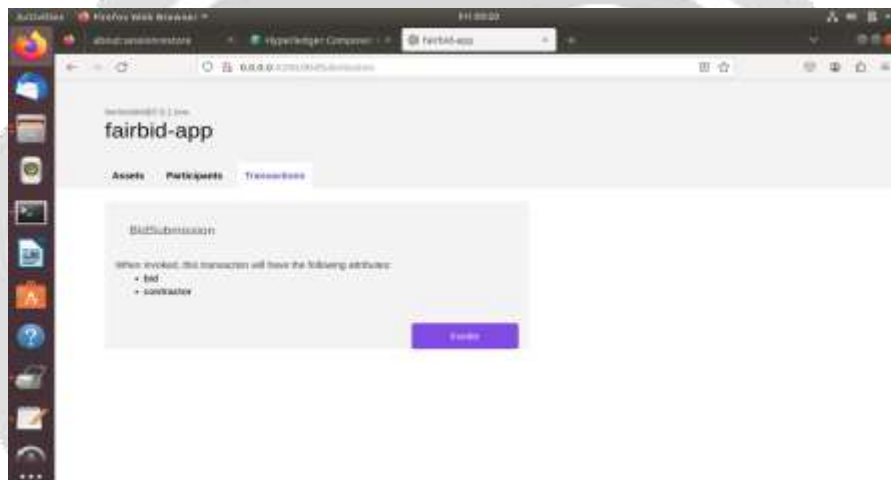


Fig -9: Bid Submission Transaction Function

TRANSACTIONS	Date, Time	Entry Type	Participant	Action
BidSubmission	2024-03-08, 09:04:53	BidSubmission	admin (NetworkAdmin)	VIEW RECORD
BidSubmission	2024-03-08, 09:04:54	BidSubmission	admin (NetworkAdmin)	VIEW RECORD
AddAsset	2024-03-08, 09:04:07	AddAsset	admin (NetworkAdmin)	VIEW RECORD
AddAsset	2024-03-08, 09:03:11	AddAsset	admin (NetworkAdmin)	VIEW RECORD
AddAsset	2024-03-08, 09:02:79	AddAsset	admin (NetworkAdmin)	VIEW RECORD

Fig -10: Transactions recorded in the business network org.fairbid

6. CONCLUSION

In conclusion, our project has successfully implemented a decentralized tender management system, leveraging blockchain technology and a REST API server for seamless interaction. Through role-based access control, users can efficiently participate in the tender process as contractors or evaluators. The system ensures transparency, accountability, and integrity throughout tender creation, bid submission, evaluation, and contract award. With a user-friendly interface and robust blockchain infrastructure, our solution empowers efficient and trustworthy tender management for organizations.

7. REFERENCES

- [1]. <https://docs.docker.com/install/linux/docker-ce/ubuntu/>
- [2]. <https://hyperledger.github.io/composer/latest/installing/installing-prereqs.html>
- [3]. <https://hyperledger.github.io/composer/latest/installing/development-tools.html>
- [4]. <https://www.theserverside.com/blog/Coffee-Talk-Java-News-Stories-and-Opinions/How-to-install-Docker-and-docker-compose-on-Ubuntu>
- [5]. <https://walkingtree.tech/setting-up-the-local-hyperledger-composer/>
- [6]. <https://www.srcmake.com/home/composer>
- [7]. <https://ieeexplore.ieee.org/document/9120890>