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Hyperledger Fabric Based Blockchain Cross Border Fund Transfer Application

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Abstract: Purpose of this application is to design, build and deploy a Hyperledger Fabric based Blockchain application namely “CBFT Application” having the ability to query from the banks network’s data that is available as part of the blockchain (Reading bulk data from the Blockchain), query any one of the banks network’s data that is available as part of the blockchain (reading individual record or data from the blockchain), add a new bank, customer, forex value data and verify that these values get added successfully into the blockchain (writing new records into the blockchain and its verification) and pay from any one of the banks’ customer account to any other bank’s customer account across the available banks in the network effectively using the applicable forex rates without any third-party involvement (cross border fund transfer (CBFT)). further verifying the successful transfer of the fund across the customer accounts.

Keywords: Blockchain, Hyperledger Fabric, Cross Border Fund Transfer, Bank, Forex.

I. INTRODUCTION

As more people and corporations participate in international commerce and investment, cross-border fund transfers are becoming more common. Transferring money internationally has become simpler, quicker, and cost efficient than ever before, due to the expansion of digital technology and fintech solutions. Bank wire-transfers, online payment platforms, and remittance services are some of the most frequent means of cross-border financial transmission. The phrase "distributed network" describes a network structure for which data, programs, and programming code are scattered and interconnected across several nodes (computer systems). The blockchain is a growing collection of records known as "blocks" that are linked together (chained) via encryption. A decentralized, distributed, and immutable ledger is used to hold digital transactions. Peer-to-peer networks are used to maintain its databases, which are the key challenge in this type of network design since they treat all nodes equally. The nodes use the consensus mechanism for communicating and transacting. Blockchains is a self-contained digital ledger that is impenetrable and difficult to manipulation because they lack a single repository and, in many cases, a central authority, for instance a bank, company, or government. They function by allowing a group of users to write transactions in a shared ledger, such that no transaction can be modified after it has been recorded as long as the block-chain is operational.

This document offers an in-depth overview of block-chain technology. The purpose is to explain how blockchain technology works to readers. Hyperledger Fabric is an open-source platform for building blockchain applications. As it is modular, scalable, and versatile, it is suited for a wide range of usage scenarios. The following are the key features of Hyperledger-Fabric: The modular architecture of Hyperledger-Fabric enables developers to swiftly plug in multiple components and tailor blockchain solutions to their specific requirements. Hyperledger-Fabric is a permissioned-blockchain platform, which means that all of its users know one another and have been authorized access to the network. This makes it a suitable fit for use cases needing a high level of safety and privacy, such as supply-chain management, banking transactions, and health records.

ts primary characteristics include a pluggable consensus system, private transactions, a customizable governance approach, and support for distributed applications and smart contracts through chain-code. Organizations can specify their own criteria for network membership and transaction validation, and developers can modify the network to fit special requirements. Chain-code combines external sources of information and services, automates the execution of intricate business processes, and enables the deployment of distributed systems. All things considered, the advantages of using Hyperledger Fabric for Cross-Border Fund Transfers include lowering the cost of transferring funds around the world, enabling faster processing, providing transparency between all parties involved, improving accessibility and interoperability, and thus improving the overall customer experience.

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II. PROBLEM STATEMENT

In order for people and businesses to move money across different nations and currencies, cross-border fund transfers are a vital component of commerce and trade worldwide. Yet, the existing cross-border fund transfer procedure is frequently complicated, expensive, and ineffective, providing serious difficulties and constraints for financial companies and their customers. The existing system's reliance on middlemen, such correspondent banks, to conduct cross-border payments, is one of its main flaws. These middlemen frequently impose exorbitant fees and cause delays in the transactional process, increasing prices and extending processing times. The existing process's lack of openness and traceability is another drawback. Tracking the status of cross-border payments is frequently challenging for banking institutions and their clients, which can result in disagreements, misunderstandings and pay way to unwanted delay. The safety and reliability of cross-border payments are also significantly at danger due to the current process's propensity for fraud and cyberthreats. Overall, these issues underscore the need for a cross-border financial transfer procedure that is more effective, secure, and transparent and can handle the unique needs and difficulties of global trade and business.

III. LITERATURE SURVEY

This study pinpoints the shortcomings of existing cross-border fund transfer platforms and suggests a method that could address some of these problems and considerably increase the output as well as efficiency of the financial sector.

[1] Androulaki et al., (2022) in his paper gives an overview of an in-depth investigation of the performance characteristics of Hyperledger Fabric version 1.0, Fabric has enabled a paradigm that fundamentally differs from the majority of blockchains in that it provides enhanced performance, flexibility, and privacy features. It uses an execute-order-validate way as opposed to an order-execute way to complete things. Order-execute implies both that the consensus process oversees ordering and broadcasting new transactions, as well as that these transactions are carried out sequentially by all peers. Contrarily, execute-order-validate suggests that Fabric decouples ordering from execution and validation.

[2] Network System Design using Hyperledger Fabric is a permissioned Blockchain Framework by the network system consists of several clients connected with additional auxiliary devices. They can be broadly categorized as client-server or peer-to-peer networks based on their architectural design. Networks like the ones we used today rely on centralized database systems. In this kind of system, data integrity is highly valued. However, due to a lack of redundancy, recovering lost data might be difficult or even impossible. The centralized DB system's shortcomings can be fixed by a network that uses blockchain technologies. A specific kind of distributed database system is the blockchain. Data in this system is distributed among all clients; there is no central server in charge of managing the data flow.

[3] Blockchain network has numerous advantages, but there are questions over whether its performance will be on par and as smooth as that of current IT systems. In this paper, it analyses the possibility that the Practical Byzantine Fault Tolerance (PBFT)-based consensus algorithm could be an overload in networks which has a large quantity of peers. To determine the average time to reach consensus for networks with up to 100 peers, we model the PBFT consensus process using Stochastic Reward Nets (SRN). We then use the data to parameterize and evaluate our models. Sukhwani H, et al., (2019) has discussed how to evaluate the performance of bigger networks and do sensitivity analysis across a range of system factors.

[4] A distributed network of unreliable peers uses a blockchain technology called Performance Modelling & Analysis of Hyperledger Fabric, which maintains an immutable ledger of all transactions. According to Sukhwani et al., (2019), even though blockchain networks offer a number of benefits, some people are concerned that their performance will limit their adoption. The focus of our investigation is Hyperledger Fabric (HLF), a modularly designed distributed open-source framework for running smart contracts. The Hyperledger Fabric community can use our models to take a step closer to achieving Fabric's peak performance in real-world deployments.

[5] Blockchain and distributed ledger technologies are very recent innovations with fast and steady development rate, and in this paper, it is aimed to analyse the potential of these computational technologies that rely on Internet specifically for cross-border payment systems. While the development of blockchain has gained some momentum from the technological perspective, there are no globally accepted standards or rules for governance for this technology. The current use of blockchain technology in the financial sector is for cost minimization and efficiency increase and the use of it is to shorten the time the payments are taking as well as to reduce the charges imposed by the intermediary institutions. There are successful private initiatives already helping businesses on this topic; thus, the current level of advancement in the cross-border payments field for blockchain is that private blockchains are operating on a small scale but obtaining successful results have been stated by (Bayram, O. 2020).

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[6] It is interesting to note that permissioned blockchain platforms have recently gained popularity. Hyperledger Fabric is one such permissioned blockchain technology. Various endorsers, committers, validators, and smart contracts make up this. Because Hyperledger Fabric's performance is a major issue for enterprise applications, we conduct a comprehensive empirical analysis in this work to evaluate the system's performance and identify potential performance bottlenecks. We use a two-phase strategy and would like to know how different configuration options affect transaction performance and delay in the first phase, such as block size, endorsement policy, channels, resource allocation, and state database selection. provide distinct instructions for setting these parameters. Parth Thakkar et al., 2018) are also looking for performance bottlenecks and hotspots.

[7] Blockchain, a decentralized record framework, is the underpinning of both Bitcoin and Ethereum. Since its commencement, interest in blockchain has developed. One of the permissioned blockchain structures is Hyperledger Texture. One element of Hyperledger Texture is that it carries out brilliant agreements utilizing universally useful programming dialects like Go, Node.js, and Java (called chain-code in Hyperledger Texture). Potential designers are as of now mindful of the advantages of utilizing these dialects, and it is conceivable that advancement instruments are now accessible. Yamashita et al., (2019) states the way that these dialects were not made to be utilized for making savvy contracts is, in any case, one of the disadvantages. Along these lines, there can be risks that software engineers who use dialects like Robustness or Ethereum do not have to contemplate.

[8] Viable execution assessment of exchange handling is expected because of the Hyperledger Texture stage's expansive use and the interest for ideal exchanges on the stage. The flow appraisal research on Hyperledger Texture neglected block break and additionally exchange underwriting disappointment (brought about by exchange embracing length break). This study considers these two break limitations and makes a various leveled model for the Hyperledger Texture v1.4 exchange process from the place where exchanges are presented by clients direct at which exchanges have been approved and committed as a block. Stage throughput, exchange dismissal likelihood, and mean exchange reaction postpone computation equations are completely reasoned. As indicated by Jiang.L et al., (2020) the estimated precision of the model and equations is confirmed through broad mathematical investigation and reproductions.

[9] As of now, numerous nations utilize an outdated framework to keep property proprietorship records, which leaves space for extortion, information altering, and additionally deception, with next to zero responsibility for guaranteeing the veracity of the data kept. The untrustworthy agents given the obligation of maintaining the records can exploit the framework's shortcoming and absence of straightforwardness for their potential benefit. The objective of the paper is to increment receptiveness by ensuring that every exchange is endorsed by everybody concerned, especially in the space of land obtaining and possession record keeping. Mukne, H et al., (2019) Says laying out an unchangeable history of records that is for all time connected to the framework and smoothing out documentation and record-keeping, it lessens the chance for extortion.

IV. METHODOLOGY

4.1 Hyperledger Architecture

The blockchain is a decentralized system that consists of several nodes that talk with one another. The blockchain processes transactions, stores state and ledger data, and runs algorithms known as chain-code. As transactions are just chain-code operations, the chain-code itself is the critical part. Only endorsed transactions may be committed and affect the state; all other transactions must be "endorsed." For management functions and data, there may be one or more distinctive chain-codes, also known as system chain-codes.

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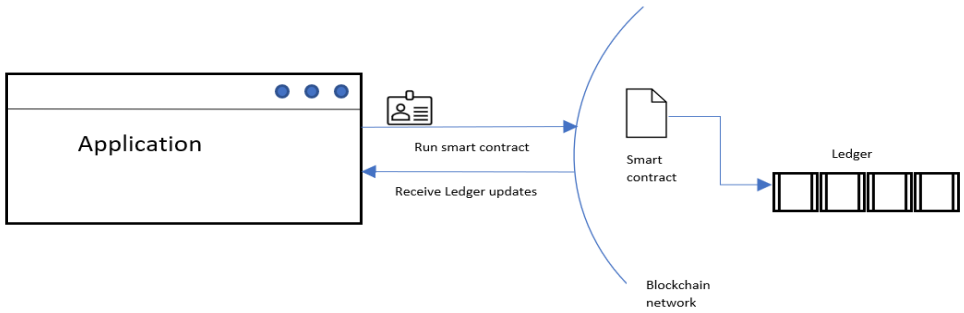

Fig. 1 Architecture of Hyperledger

Developing a work atmosphere. This will download a network that is just comprised of the elements we require for registration/enrolment, queries, and updates because our application needs a network to communicate with finding out the specifications of the sample smart contract that our programme will use. We may interact with the ledger in a variety of ways thanks to the many functionalities that our smart contract contains. To find out more about the features that will be used by our applications, we will examine that smart contract. creating the software that will let users to search for and make changes to assets on the ledger. We will manually change the variables in the app code (our apps were developed in JavaScript) to execute various types of queries and updates.

4.2 CBFT Network Architecture

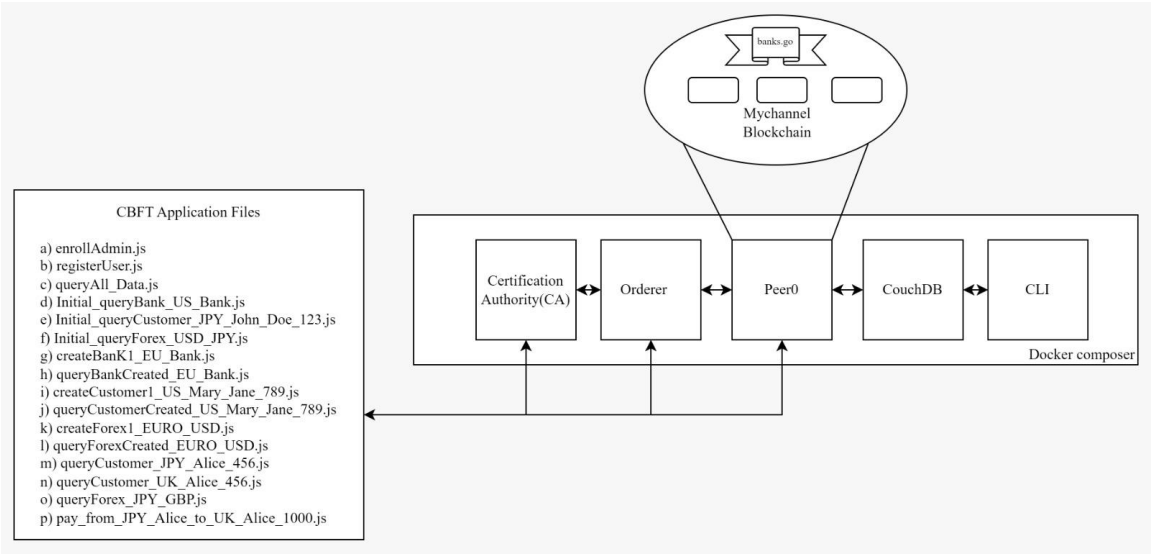

Fig. 2

CBFT Network Architecture

The above diagram depicts how each module interacts with the "Docker Composer." It consists of a certificate authority (CA), which is responsible to create certificate of proof for each transaction. It also consists of an "orderer" that is responsible for overlooking the entire transaction. The "peer" is the system or the transacting system that takes part in the blockchain transaction and helps each bank's system (peer) stay as a part of the entire system. "CouchDB" is the database that is used for storing and retrieving data, it comes as a package for Hyperledger Fabric. CLI is the abbreviation for Command Line Interface through which the Hyperledger-Blockchain and the CBFT application can communicate to each other. Each of the application files work in unison to provide with the requested service to the customer's query.

By offering a safe, effective, and transparent solution for cross-border payments, the implementation of a Hyperledger Fabric-based cross-border fund transfer application has the possibility of revolutionizing the financial sector. The

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platform's advantages include permitting direct transactions between financial firms and completing transactions in close to real-time, which decreases the delay and expense of cross-border payments. The platform also enables accountability as well as transparency by enabling fund tracking and allowing insight into transactions, which can boost confidence and reduce the likelihood of fraudulent conduct. Unfortunately, there are difficulties in implementing a Hyperledger Fabric-based cross-border fund transfer application. Standardization and cooperation between various financial organizations and regulatory agencies are necessary for interoperability between various financial systems and networks. When the volume of transactions rises, the platform's sustainability and scalability must also be taken into consideration. The platform must continue to be developed and optimized for this. Despite these difficulties, financial institutions and their clients stand to gain significantly from the installation of this Hyperledger Fabric-based cross-border fund transfer service. To solve issues and demands, guarantee the platform's scalability, and ensure its sustainability, more study and development is required.

V. CONCLUSION

To conclude, the Hyperledger-Fabric based cross-border fund transfer application provides the end consumer with a safe, effective, and transparent method for transferring money internationally. The platform offers a decentralized network that enables each participating user to maintain, and modify the ledger in real-time with its own digital assets. The adoption of the consensus process makes the solution dependable and secure by ensuring the legitimacy of the transactions and preventing double spending. Because the ledger is transparent, all transactions are accountable, which fosters confidence amongst the participating institutions. A notable advantage over conventional means of cross-border fund transfer, which can take days or even weeks to complete, is the quick and near-real-time execution of transactions.

This is particularly useful in international business and commerce, when time-sensitive payments must be paid. Furthermore, the deployment of smart contracts and other sophisticated features can increase the platform's efficiency and dependability by eliminating the need for middlemen and enabling the automation of certain procedures. Overall, using Hyperledger-Fabric for international fund transfer represents a viable solution for financial firms looking to cut costs, increase efficiency, and improve security in their operation. However, additional study and development are required to meet the special issues and demands of cross-border payments, as well as to secure the platform's scalability and sustainability. This paper has educated us to the design, development, and deployment of a blockchain network powered by a smart contract and built on the Hyperledger-Fabric. Additionally, it has exposed users to the use of JavaScript application files in interactions with the deployed Block-chain Network. Additionally, it has demonstrated how to communicate with a block-chain application utilizing a frontend built on a React App running in a web-browser.

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