Hyperledger: Contemporary Technique to Resolve the Issue of Cross Border Payment

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ABSTRACT

Hyperledger is founded by LINUX Foundation in December 2015 and implemented in 2016. This framework is very specific and technically advance to implement blockchain technology. With the help of this wonderful framework, it is very much possible to fix these current challenges and issues of blockchain. This paper presents introduction of existing Blockchain, Hyperledger Framework (HF), Cross Border Payment (or Transaction), Distributed Ledger, Proof of Work (PoW) and Consensus. The objective of the paper is to address for existing blockchain challenges and issues, with reference to Cross Border Payment (CBP). CBP challenges are categories into six parts as: slow payment (transaction) processing; inefficient operational activity; inappropriate frameworks and automation; lack of sufficient information about payment (transaction); regularization about data privacy and sharing of information; and laundering of money. The design of cross border transaction model is to overcome these challenges from existing blockchain (BC) with the help of Hyperledger technology. At the end, the utility of Hyperledger transaction model has been highlighted against generic (general) Cross Border Payment (CBP) system.

Key words: Blockchain (BC), Cross Border Payment (CBP), Consensus, Hyperledger Framework (HF), Transaction Model.

1. INTRODUCTION

On the planet, whatever the work done in the past, or work is doing currently or work is going to be done in future, everything happens only for data. This whole process only for the safety and security of data. Previously data is a single file on single hand, after that it is sharable with others. When shifting from a traditional offline and time-consuming data warehousing system to a real-time system, two important considerations are speeding up the ETL and the OLAP process. [19] Now the term 'trust' is arise. Then starts with so many techniques to apply on data for safety and security of data. Blockchain is a very nice technology for shared or distributed decentralized database with lot of trust points on trustless peers group.

Blockchain is very supportive technology for increasing business perspective to the current market. As per the last research, blockchain is used to record transactions on decentralized, distributed and public ledger digitally.

An internet is used for maintaining the communication either between two peers or among multiple peers. Blockchain is a platform which runs on the internet for exchanging of business values among partners, banks, suppliers, traders, customers/clients and others. On this BC platform, each and every exchange value is known as 'transaction'. Business is successful only, if transactions are successful. Successful transactions are always be fast in processing, secure, precise, accurate, and easily agreed on terms and conditions by the parties whose are participating on particular transaction.

The transaction is for exchanging of values internationally, this kind of transaction is known as Cross Border Payment (CBP) transaction. CBP refers to the transaction/s involves individuals, organizations, companies, suppliers, traders, banks or settlement institutions, are operating with at least between two different countries.

In recent days due to maximization in using blockchain technology and increasing number of users, some challenges and issues arise. Challenges of these overburden have been categorizing in to six parts as:
A. Slow payment (transaction) processing;
B. Inefficient operational activity;
C. Inappropriate frameworks and automation;
D. Lack of sufficient information about payment (transaction);
E. Regularization about data privacy and sharing of information;
F. Laundering of money.

This paper introduces the idea to fix these challenges and rectify the issues, which are facing by the user due to above challenges. Then the term Hyperledger comes in to the light. Hyperledger is a newly growing framework and speedily famous to the market.

2. LITERATURE REVIEW

2.1 Blockchain (BC): Blockchain is invented by Satoshi Nakamoto in 2008, but implemented in 2009. BC is an innovative idea for sharing of things and exchanging of values digitally. BC is the digital solution of commercial problems. If anyone or any peer wants to share/transfer payments/money without involving bank, it is possible with this BC platform. BC is also very helpful to record all the transactions. [1]

BC facilitates the parties/peers for transaction without involvement of central authority or third party. This third or central authority purpose is to maintain trust between them to particular digital ledger, transactions are stored into blocks and grouped together. These blocks are connected with each other in the form of a chain by using hashing algorithm concept, public-private key encryption, Markle tree and peer-to-peer networks.
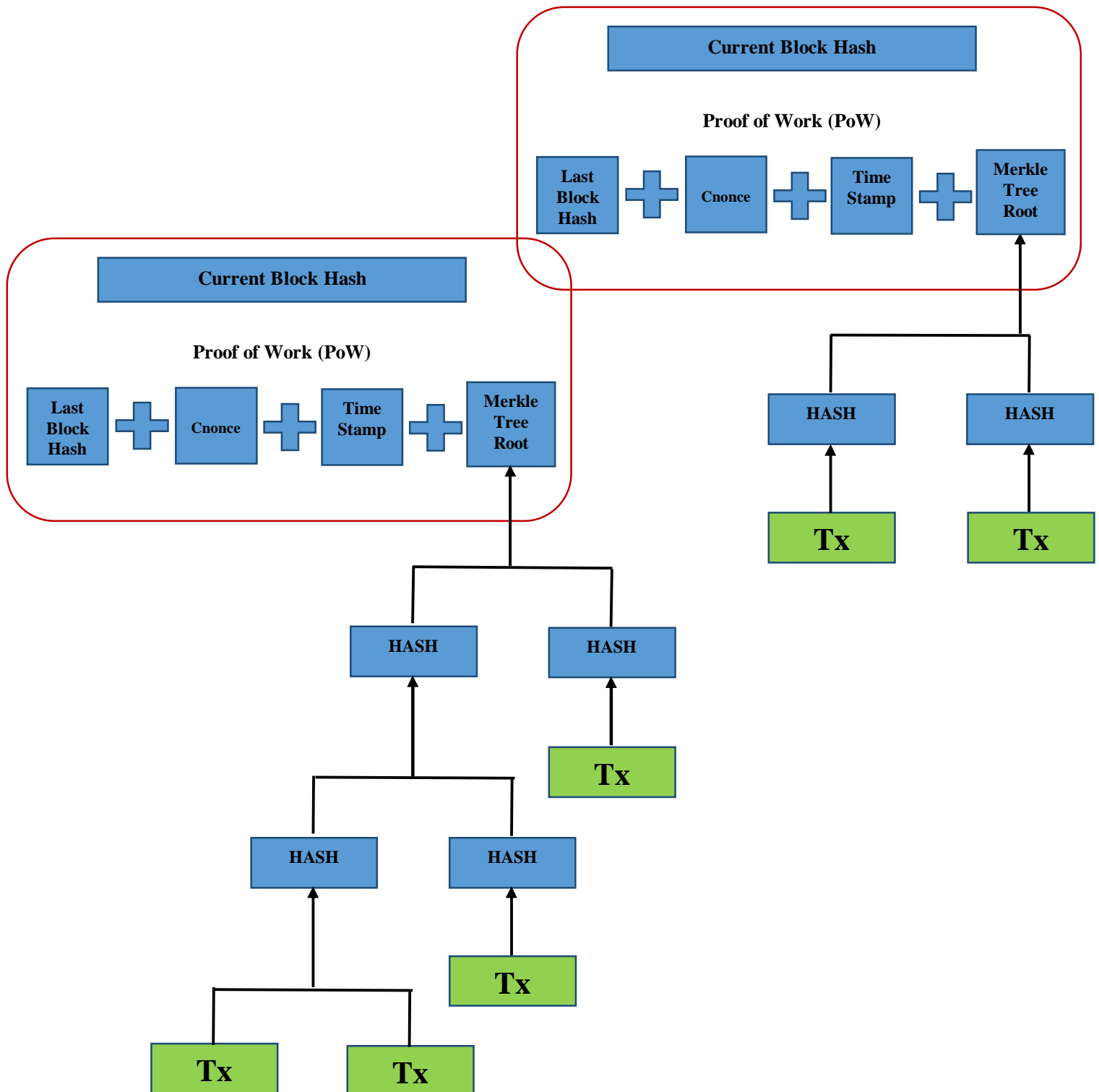

Figure-1: Blockchain (BC) Architecture

Symmetric-key schemes are simpler and faster, but their main disadvantage is that the two parties need somehow exchange the key securely. Which is avoided in the public-key scheme. [20]

BC is also helpful to do business between two parties, who are not trusting each other, to agree on sharing assets. The party/peer has assets, basically interested to conduct new business.

With BC, transactions are recorded on ledger and maintain identification of those parties, who involve with transactions for further verification by other users. An agreement is generated between the parties/peers with details of transactions in ledger like identities of parties, as well as trade things with exchange of values.

BC is not a hypothetical technology. The BC records maintain as any transaction happens. On BC, previous data never be modified and once the data add-on in manner to validate the trade resources. It is beneficial to rectify issues between parties by further verification. By this user achieves some more benefits are portability of data, private contract, security of key, and increase in business legally and technically.

Now-a-days, many organizations or industries are trying to adopt this BC technology for enhancing their business, but they find that it is not perfect to replace existing systems. [2]

Blockchain has been the new concept of changing the various scenarios in every industry proposing its use. Blockchain seems to hold answers for many of the problems from the financial industry to the public sector, industries face. This eagerness to promote blockchain as an elixir for all multi-party transactions is the same thing that could destroy its long term prospects. When the interests of the parties involved are not well aligned for different industry. Blockchain is the viable option for situation's that required shared right access. [3][4]

2.1.1 Need of Blockchain

Distributed ledgers which consists of digital data shared across countries, institutions multiple sites with no or centralized data storage. There are some requirements of blockchain to be technology platform, such as: **(1)** Transactional dependencies; **(2)** Negotiators; **(3)** Low on trust; **(4)** Multiple writers; and **(5)** Shared repositories.

2.1.2 Blockchain in Heterogeneous Domains

Cooperation among multiple parties is especially on the upstream site and having investments are two major characteristics of the oil and gas industry. However often thinks takes place across multiple companies like changing of ownerships, transaction and information change. This happens because of intrinsic trading nature and bulk movement of commodities which comprises of refined products, gas, crude oil and petrochemicals.
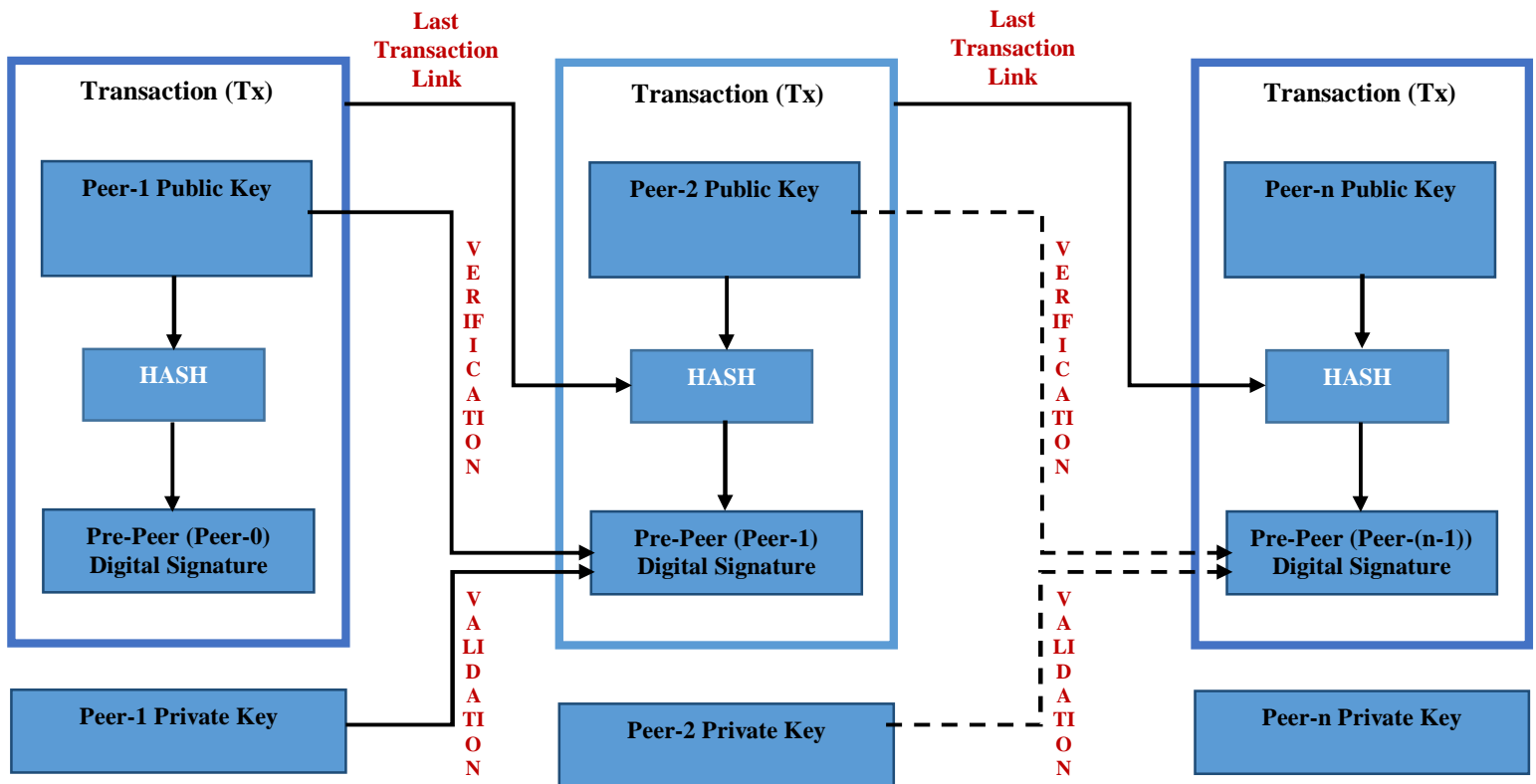

Figure-2: Verification and Validation for Peer-to-Peer Transaction (Tx)

Because of these characteristics the industry becomes a good candidate for blockchain in the areas where the ownership is changing, expenses are shared and multi-party collaboration. The industries' rigid requirements and the necessity to share information with governmental authorities makes blockchain relevant.

Blockchain can be used in many scenarios but we are going to focus where information from previous transaction can be used for next transaction; global entities are involved; financial considerations involved; large quantity and high frequencies of transactions.

Ideas like blockchain can't happen in isolation, there are always infrastructure and business maneuver that must be considered. Homogenous infrastructure is not provided by blockchain. It is important for blockchain to run on different platform and able to interact with each other. A good opportunity for the gas and oil industry to experiment to access the value and business case for its use can be presented by private blockchain. By reducing cost, risk and increase in the work flow efficiency blockchain brings optimizations, transparency, and business value. **[7][8]**

2.2 Hyperledger

It is an open source. It is a combine effort of organizations which are creating to advance cross-industry blockchain technologies, and global associations. Hyperledger product is a global association, includes the organizations in the field of banking, finance, supply chain, manufacturing, technology and IoT (Internet of Things).

Hyperledger BC is a peer-to-peer distributed ledger under consensus. This concept is useful for building a new generation of transactional applications. It is helpful to establish accountability, transparency and trust at inner-core architecture, as well as streamline business processes and legal constraints.

It as an operating system for decentralized digital communities, data-sharing networks, micro-currencies and business market.

Vastly reducing the cost and problems of getting things done in the real world are important characteristics of blockchain. The transparency, longevity, interoperability can be protected by Open source, collective software development approach and it will support the blockchain technologies to mainstream commercial adoption. So, Hyperledger is summarized as communities of software developers, who building blockchain frameworks and platforms. **[13]**

2.2.1 Hyperledger Objectives

A. Single point of access to stakeholders, buyers and sellers.
B. To build an advanced ecosystem with adoption to crypto economy.
C. To be the most cost-effective and easy to use platform to facilitate end users and potential investors.
D. To eliminate the risks involved in cross border payments by introducing blockchain based payment system.
E. To accelerate mass adoption and increase trustworthiness of Cryptocurrency market. **[14]**

2.3 Cross Border Payment (CBP)

Cross border payment is a transaction that involves individuals, corporations, settlement institutions, central banks or a combinations of thereof, in at least two different countries. Cross border payments are complicated in nature as it includes different parties, different currencies, different regulations, different technologies and many sub transactions involved to complete a cross border transaction. Numerous technologies have been adopted to facilitate cross border payments for which there exists various formal, semi-formal and informal channels. These transactions have become important due to technological up gradations and globalizations. Therefore, the increase to comprehend the innovation in technology which facilitates international payments as it is changing and reorganizing the financial service providers' business and facilities.

This paper under see the literature to study the concept of cross border payments, to review the very popular and much talked about technology these days i.e. blockchain technology in context with cross border payments. **[9]**

2.3.1 Decentralized Payment System

To predict a high growth for cross border payments requirement in these times of globalization and competent world. Thus to satisfy customer expectations and sustain in the market the financial sector has to be ready with various technical advancements.

Cross border fund transfers are increasingly adopting digital systems and are becoming paperless. Therefore, many countries, being an emerging economy and competitive in the world has to adopt to innovative techniques/ electronic means. In some countries transactions are more focused on quantities rather than quality, therefore to address micro and macro payments there has to be cost effective mechanism.

All the banks cannot have their own payment gateway and so they confide with different with different financial institutions and payment providers to use their services to provide the better services in terms of time, cost, easiness of the transactions etc. to its customers. Keeping all this in mind we can say that electronic payment or perhaps decentralized payment gateway are very significant in facilitating cross border payments. **[10][11][12]**

2.3.2 Blockchain Vs. Cross Border Payment

Financial institutions and banks are adopting blockchain technology to offer cross-border payments cheaply, high security and more reliability to overcome the current structural weaknesses. Therefore the costs which are associated with investigation and litigation are trimmed because of blockchain by which payments are tamper-proof and accurate.

The blockchain technology make it all a reality, i.e., A cost-efficient, faster and secure cross-border payments system will enhance international business and ensure that migrants aren't charged extravagant rates for sending money home and more people are included into the present financial system.

Over the time period the crypto currency landscape, its underlying technology blockchain always deals with trust issues, focusing on compliance, security and data protection. Other benefits of blockchain are:

A.Blockchain money is cheaper.
B.Blockchain money is safer.
C.Blockchain money is faster.

Looking at these benefits to conclude that decentralized payments system helps in cross border payments.

2.4 Other Recommendations

In comparison to Nostro-Vostro accounts, to increase visibility and speed of cross border payment transactions with IBM blockchain through Hyperledger. In banking terms, a Nostro account is an account of domestic bank, refers in foreign bank for foreign currency. Nostro means ours. A Vostro account is simply head the foreign bank, refers to the account in domestic bank. Vostro means yours.

This type of accounts often used to facilitate and simply used for trade and foreign exchange transactions. Through the process of reconciliation, banks interact to cash received or receivable and amount paid or payable. Now-a-days, Nostro-Vostro accounts are manual and inefficient. Due to this, data is fragmented and many systems are incompatible. So it is hard to trap. In the next phase, NV accounts could become stored account transaction on the blockchain. It provides transparency and efficiency. **[18]**

For global or cross border payments, there are involving multiple banks and multiple currencies with ever changing foreign exchange rates. A blockchain can provide information about liquidity position in limited time, increased transparency on payment instruction and better reporting.

By using the Hyperledger fabric, IBM blockchain is able to do level security based on balance of open information access.

3. PROBLEM STATEMENT

The To Improve the Customer Experience for Sharing Information through Cross Border Payment System, it is necessary to analyze the challenges to make trust of parties to use these services. So there are some challenges and issues in the current existing system, such as:

A.Slow Payment (Transaction) Processing: Due to more central or third parties involved during transaction commit between two parties, it processing time is much greater.
B.Inefficient Operational Activity: Due to non-automatic or manual messaging system and manual processing done by third parties on both sides of transaction for
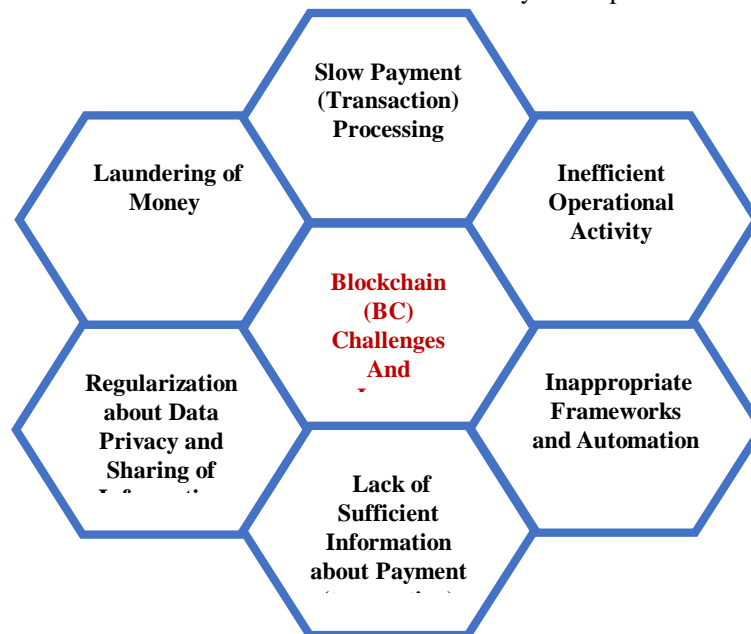

Figure-3: Key Challenges and Issues of Blockchain (BC)

verification and validation. So it achieves inefficient operational activity regarding banks, less of profit, time consuming, and unnecessary employee effort.

C. Inappropriate Frameworks and Automation: No proper framework to implement Blockchain (BC). Blockchain is a platform (or Operating System) for implementing Cross Border Payment. So there is no perfect framework and automation to Cross Border Payment (CBP) system.

D. Lack of Sufficient Information about Payment (Transaction): Due to insufficient information, transaction is declined. If sending bank has no proper information about receiver, because no existence of interoperability feature between them. So transaction is not completing.

E. Regularization about Data Privacy and Sharing of Information: Due to multiple third parties in between the parties (peers) to commit transaction, data reflects too many. So loss in data security and safety; and information is shared with non-trustable entities.

F. Laundering of Money: Due to multiple third parties to commit a transaction, and lack of interoperability between the banks systems. So laundering of money is easier for corrupt central agents. **[5] [6]**

4. PROPOSED WORK

4.1 Algorithm

As per studied about Hyperledger Technology, it is a very good platform to develop Blockchain with specific features like permissioned or permission-less BC. With the help of this LINUX Foundation contribution of developing Hyperledger Framework, this paper propose an algorithm to rectify the challenges and issues of BC regarding CBP. This algorithm accomplish in to six steps as:

1. **Peer Request or Transaction Proposal:** For n-Peers on the same or different network, if any party or peer needs to transfer money to another party or peer. Then firstly one transaction proposal sends to Peer-1 to Peer-n.

2. **Simulation of Transaction:** In this step, it is deciding for that which peer is requested for which peer to complete the transaction. It is a virtual process. Here it finds the address of second peer for which the client requested. So it simulates the transaction.

3. **Validation by Digital Signature (Endorsement Signature):** In this step, it validates for the membership services of both parties (peers). It means that both parties (peers) should be registered first, then only transaction committing. Otherwise, transaction not to be proceeding for further step.

4. **Hyperledger Broadcast Endorsement:** In this step, the Hyperledger network verify the parties' memberships. Then connects both the parties (peers) directly. By this

connection, parties (peers) affiliate the deal with privacy, security and safety

5. **Verification and Validation (V&V) Policy:** In this step, both the parties (peers) generate results. These results send to the cloud and verification should be done as per consensus (agreement) about transaction of payment transfer. It validates the requested transaction.

6. **Finalization of Transaction (or Transaction Committed):** In this final step, once the transaction validates at the last step-5, second or another peer receives the payment directly without central body or third party. And then transactions are committed to the distributed ledger.

4.2 Pseudo-code

Anyone Party (Peer) submit proposal to transfer payment (or transaction commit) to Another Party (Peer), such as:

1. *Transaction_Peer(TransferPayment, Peer-1_to_Peer-n)*
2. *Search(ReceivePeer, REQ, ACK)*
   SearchPtr → ReceivePeer
   ReceivePeer sends ACK to RequestPeer
3. *Membership_Verify_Platform(RequestPeer, ReceivePeer)*
   {
   If   (RequestPeer==Member   &&
   ReceivePeer==Member)
   Then
   Validate_Peers_further_transaction
   Otherwise
   NoTransaction_Proceeds
   }
4. *If (Membership_Peers== Verified)*
   Then
   Hyperledger_BC(Connects_BothPeers)
   Then
   Affiliate for further transaction
   Otherwise
   No transaction happen for Peers
5. *If (Peers_Connect && Transaction_Affiliates)*
   Then
   Request_Validate,Transaction_Commits
   Then
   Both Peers generate Results
   Otherwise
   No Results generate
6. *Once Results generate*
   Then

Transaction_Details Commit to Distributed Ledger and Copies Share to Both Peers as per Consensus (Agreement)
END.

4.3 Results

The output of the proposed pseudo-code with CBP model, the role of third party will be minimized to perform transaction between two peers (parties). The resultant of proposed model contains as:

A. **Transaction should be Fast:** No third party involved for completing the transaction. Due to this, it takes less time to perform CBP transaction or transfer payment from one peer to another peer.

B. **Operational Activity should be Efficient:** Due to fully automatic transaction system, it must be fast. No third party involved for verification and validation process. So, it is less in time consuming, maximizing profit value, less employee effort and minimizing operational cost.
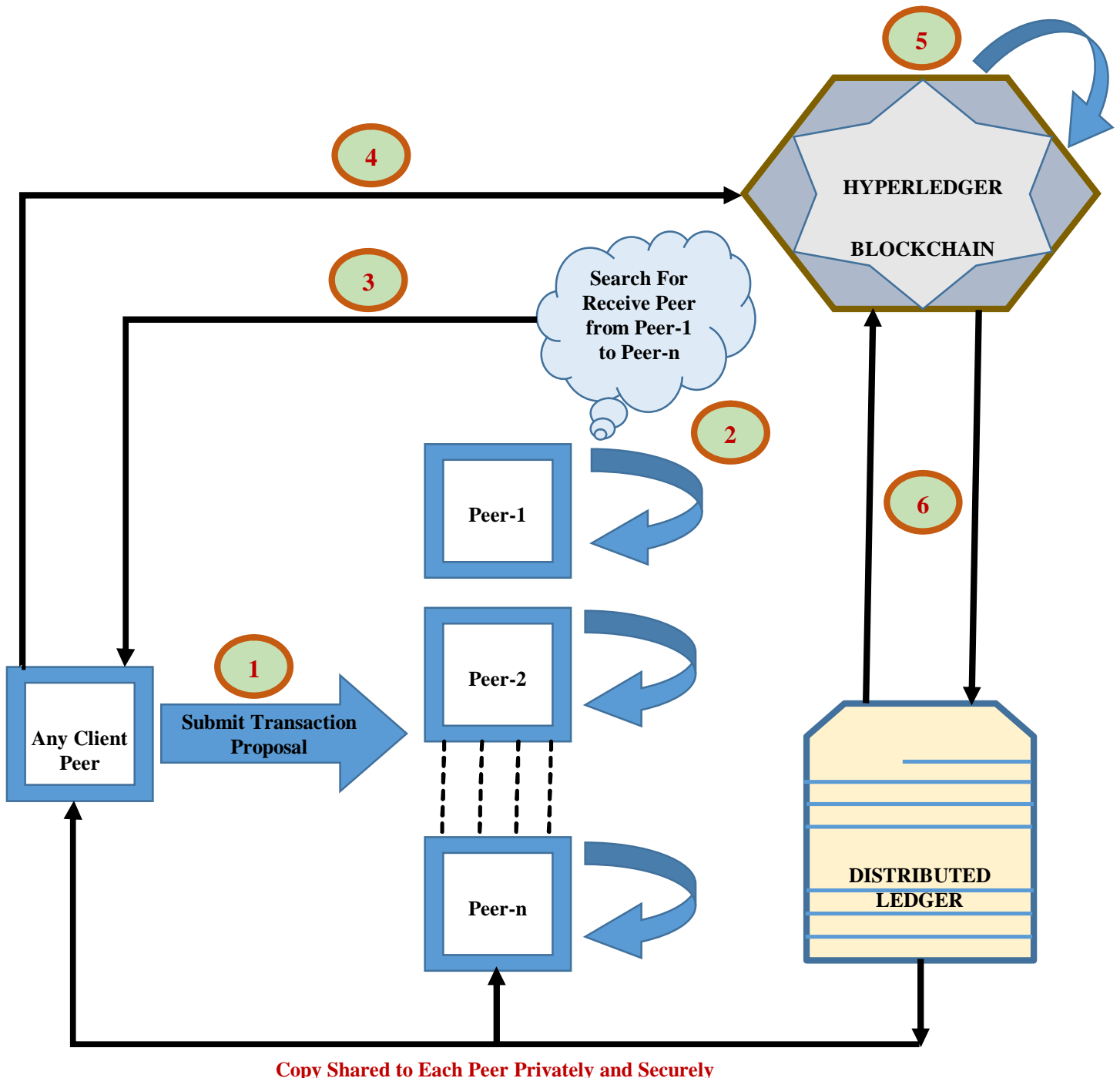
Figure-4: Hyperledger Blockchain (BC) Based Cross Border Transaction (Payment) Model

C. Appropriate Framework and Automation: Hyperledger is an advanced framework to develop a Blockchain (BC) platform. This is used to implement permissioned and permission-less BCs. So it is an appropriate framework and fully automated technology.

D. Sufficient Information about Transaction: After implementing this work, both the peers are connected directly together. So they knows very well to each other for making payment transfer or completing transaction.

E. Data Privacy and Sharing of Information: On the BC, both peers are connecting together under some consensus (agreement) conditions to maintain data privacy and sharing of information. Peers maintain data privacy, because of no third party for committing transaction in between. Before committing the transacting, both peers follow the consensus terms and conditions regarding information share in between.

F. No Money Laundering: With permissioned Hyperledger BC, peers are connecting directly without involving of central body or third party. So money laundering is not possible with this fully automated system and all the transaction details or information should be maintaining on distributed ledger time to time. On each and every step of transaction, distributed ledger is maintained by default. On the finalization of transaction, distributed ledger final copy of particular transaction share to each peer (which are involved with transaction) automatically.

5. CONCLUSION

Due to the rapid development in the field of Information Technology and transactions through new technology has gain the priority. This paper covers the secure transaction among the peers. It will generate the trust among the parties like organizations, traders, suppliers, banks and financial agencies. With the help of this new transaction model, organizations can remove the security flaws of the existing transaction model. This model also issues the fast transactional acknowledgement between the peers. Gradually it can be attached with existing IoT infrastructure.

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