

# Third-Party Cryptocurrency Payment Based on Smart Contract for Influencer E-commerce

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**Abstract** [ **Background** ] The main features of influencer economic, such as global Internet, real time and peer-to-peer, are similar to cryptocurrency. The influencer e-commerce includes donates and transactions relies a fast and safe cash flow technology to execute on the Internet. Cryptocurrency payment is a novel choice for influencer e-commerce transaction. The traditional third-party payment support a trust mechanism to protect seller and customer. However, third-party agency still causes a safety and trust issues because the cryptocurrency trading center may be constructed through untrusted agency on the Internet. How to design a fast, safe and trusty cryptocurrency payment with decentralization becomes an important issue. [ **Objective** ] This project aims to design a fast, safe and trusty cryptocurrency payment for influencer e-commerce. An enhanced third-party payment process is designed with electronic wallet so that the temporary payment during appreciation period, the efficiency of settlement mechanism, the transaction fee and human operation avoidance are enhanced. [ **Methods** ] The cryptocurrency third-party payment is designed by using smart contract, which is also protect by blockchain. The smart contract program coordinates ordering blockchain, cryptocurrency blockchain and third-party payment cross-blockchain to achieve the goal of this project. The execution metrics trust level, settlement time and transaction fee are adopted to evaluate the design mechanisms for influencer e-commerce. [ **Results** ] The main contributions of this work includes: ① address the trust and safety problems of cryptocurrency third-party payment for influencer e-commerce; ② design a cross-blockchain smart contract to improve the problem and evaluate the design to achieve high efficiency payment; ③ the decentralization of the designed smart contract supports autonomous system to reduce human operation and enhance trust.

**Keywords** Blockchain; Cryptocurrency; Influencer E-commerce; Smart Contract; Third-Party Payment

## 1 Introduction

Traditional e-commerce starts from the Web technique to let consumers view

product category<sup>[1]</sup>. The consumers select the items they required. Web advertisement increases the exposure opportunity to

promote the Web site or products. E-market aggregates many Web sites into a platform to form such an online department store that the consumers can connect to one site and buy anything they want<sup>[2]</sup>. Famous platform is a short cut for consumers to search the required products. They even give a discount to promote their service and products. Then, consumers can utilize their mobile phone to access the platform through designed app<sup>[3]</sup>. Recently, influencer e-commerce becomes population that the digital influencers affect consumer satisfaction and ultimately boost their intention to conduct social commerce activities<sup>[4]</sup>.

Third-party payment with fiat money has a long history<sup>[5]</sup>. The main role of this type of payment is notarized third party, which might be handled by a big company, to guarantee the payment between buyer and seller. Third-party companies build up their own platform to hold the money for safety and trust guarantee. Some companies have provided a serial banking similar services, but they did not associate with banking system<sup>[6]</sup>. How does the private company guarantee the money safety and trust of consumers? On the Internet, the third-party agency is highly complex so that the operation situations of the agency are almost unknown. How to enhance the safety and trust becomes an important problem. Thus, this project aims to propose a new payment solution to improve this problem.

The economics of Internet influencer are

operated online to affect people around the world. The traditional payment (e.g., bank transfer and credit card) has to exchange the money through banking system<sup>[7]</sup>. The exchange rate and transfer fee are high and the transactions need a little long time to complete. Oppositely, the essence of cryptocurrency is Internet so that it runs on global without exchanging money. The money is directly transferred to the target account in a short settlement time<sup>[3-8]</sup>. Thus, several cryptocurrencies, such as NFT Crypto Art Craze, are popular in sports, art and media areas, and are used for influencer e-commerce.

Fiat money defined as the traditional money is issued by a country (e.g., CNY in China) or local area (EUR in Europe). Even though few types of fiat money can be used around the world, such as USD, the payment is based on the local issued money. Therefore, fiat money limits the usage area. If a consumer intends to pay foreign products or services, he/she has to exchange money and then transfers the money to foreign account. Although we can use credit card to pay transnational transactions, the exchange money process is required to handle through banking system. Exchange rate and transfer fee are included<sup>[3-9]</sup>. Oppositely, the original features of cryptocurrency are global, peer-to-peer (P2P), autonomous system, etc<sup>[10]</sup>. The advantages of blockchain embedded in banking system were summarized in this passage<sup>[11]</sup>. The P2P payment directly

transfers the money to another account through Internet. Consumer might require to pay a little fee for system process fee, which is received by miners to process the ledger blockchain<sup>[12]</sup>. This trend triggers this project aiming to design a third-party cryptocurrency payment mechanism based on smart contract with blockchain technologies for influencer e-commerce<sup>[13]</sup>.

Several features shown as follows are similar for the cryptocurrency and influencer e-commerce<sup>[14]</sup>.

#### (1) Global Internet.

Both cryptocurrency and influencer e-commerce run on Internet so that their service ranges cover the whole world. The P2P influence and payment result in the service pass through the country boundary and government regulation especially for the online digital services.

#### (2) Process in real time.

The live streaming delivers the digital contents online to their fans around the world in real time. Meanwhile, the social e-commerce service is provided in real time and the cryptocurrency payment supports this type of service especially for the short time settlement.

(3) Large amount of fans with small piece of money.

The famous influencer owns larger amount of fans. One of main features of Internet influencer economy is to build up sand into a tower. Small piece of money payment relies on the low cost, low fee,

even low tax. Cryptocurrency happens to have this feature with low-cost online automatic Ledger, low payment fee, no money exchange and low government tax to process the transactions.

(4) Decentralization with P2P interaction.

Influencer adopts social media to interact with their fans directly. The platform supports the face-to-face interaction between influencers and fans. Simultaneously, the origin of blockchain is P2P to process the cryptocurrencies and applications. This feature makes both applications achieve decentralization.

A blockchain is an emerging technology that has received considerable attention which mainly caused by its guaranteed security, decentralization ability, recall ability and immutability. The first killer application is Bitcoin cryptocurrency running on a blockchain system<sup>[15]</sup>. The main characteristics of the cryptocurrency is to use on Internet with a set of 0—1 bits without any paper money and paper work. It is useful online, because it can send/receive online messages immediately and settle transactions in a short time. The cryptocurrency is not just a currency which is used for payment<sup>[3-16]</sup>. It could be used as a token to correspond the weight of profit sharing, gift, donation, etc. The latest version is NFT, which is non-fungible tokens to set the various price for any digital item<sup>[17]</sup>. These features change the network service models.

Smart contract, which is included in blockchain 2.0 or 3.0, is an extension from Bitcoin blockchain system. This technology supports users accounting for history records with automatical mechanisms. The contract can be made by any two or more parties with a set of rules and then configured the rules as a set of constraints in application program<sup>[3-19]</sup>. Both the program and data are validated by a set of miners. The data records and payment accompany user behaviors so that the untrusted seller and buyer can entrust with the proposed blockchain-based third-party payment.

Several types of consensus mechanisms, such as proof-of-power (PoW)<sup>[15]</sup>, proof-of-stake (PoS)<sup>[20]</sup>, and proof-of-authorize (PoA)<sup>[21]</sup>, have been designed for various applications. Most of PoW applications are public blockchain (e.g., Bitcoin and Ethereum cryptocurrency). PoS mechanism improves the large resource required and even resource waste problem for alliance companies, such as Hyperledger Fabric. PoA is similar to PoS and is set as consortium blockchain<sup>[3-10]</sup>. No matter which type of blockchains, they can be used for cryptocurrency and token to represent various assets, such as orders, deeds and digital arts. The operation includes network transmission, settlement process and immediately data update with many miners around the world.

We will take a currency exchange and an e-commerce transaction as a serial

of examples to compare the traditional payment and the cryptocurrency technology. The traditional underground currency exchange for fiat money is not allowed by law. TransferWise and cherrypay platforms convert multinational fiat money payments into online electronic payments. Under matching, consumers can make remittance payments without going through the banking system<sup>[9]</sup>. Compared with the use of credit cards, this service can efficiently confirm and obtain payment both for buyers and sellers. Figure 1(b) shows that the benefits of sellers, consumers and platforms outweigh the costs with lower exchange fees and network transmission efficiency. However, the analysis process of the transaction belonging to underground remittance is the same as which shown in Figure 1(b). In China, it seems the payment with CNY is directly paid to the seller, but the mediator receives CNY in China and paid USD to the target in foreign country. This model does not require bank exchange and remittance to pay foreign currency to the seller. Oppositely, foreigner might pay USD in their country and the mediator pays CNY in China so that the two type of fiat money is balanced. Cherrypay directly maps to fiat money of local country in both sides (i.e., buyer and seller) to achieve online transactions through the Internet, but there are shadows of underground remittances, which causes disputes in transactions.

Converting this model into a collection

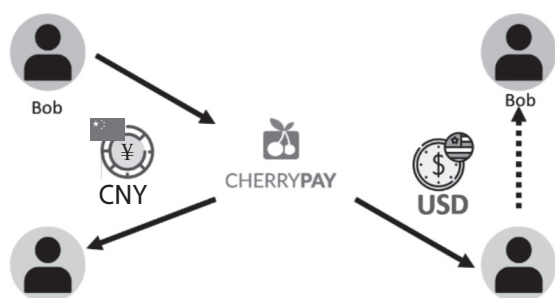
and payment transaction method, a non-banking institution provides consumers with legal currency held by buyer, and then provides plastic currencies, such as credit cards and financial cards, for payment abroad. Through this card issued by the institution consuming in different countries around the world, the consumption payment is made in the currency corresponding to the card, as shown in Figure 1(c). This type of services can also be supported by cherrypay platform. The onsumption is only paid in the local currency of the system platform. You can find the foreign currency that corresponds to the payment on the Internet. Only after the platform keeps the currencies of many countries, you can achieve automatic exchange and payment under a few procedures. The cherrypay platform process is equivalent to a credit card transaction, as shown in Figure 1(d). However, through the analysis of the financial flow, we find this type of financial transaction service brings together the currencies of diverse countries in the FinTech companies, which violate the banking law. In addition, this company allows consumers to pay for cross-border transactions without going through the banking system. Next, the currency pool concept is used to pay for local consumption in local currency. This process is the same as the underground exchange or cherrypay.

Converting the above model to global cryptocurrencies, such as Bitcoin and

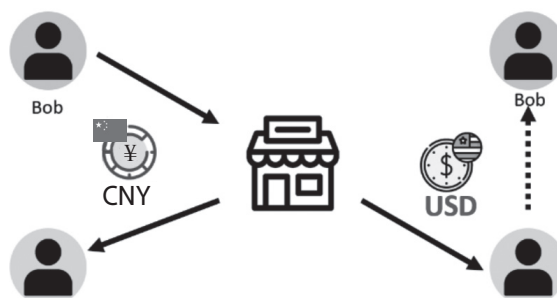
Tether, may accept limited stores. Several countries restrict its usage or treat it as a tradable commodity. After the fiat money is exchanged into cryptocurrency, foreign transactions can use this cryptocurrency for trading. Take Tether cryptocurrency as an example. Tether currency tightly sets the USD exchange rate. Holding this type of cryptocurrency is equivalent to holding USD. This currency is similar to one type of global universal currency in cherrypay. For stores that accept Tether, buyers do not need an additional third party to make bilateral transfers with the legal currencies of the two countries, but directly pay Tether to the other party. In this case, it is similar to the global USD. Universal cryptocurrency changes the original underground exchange transaction problem<sup>[22]</sup>, as shown in Figure 1(e). Is it still illegal? Many even provide tourism innovation services, through the concept of community or social network allowing travelers to provide experience in exchange for cryptocurrency as token rewards. The platform cryptocurrency is exchanged for legal tender to achieve the issuance of currency (ICO), as shown in Figure 1(f). From the above analysis process, we find that the original criminal behavior of underground exchange has been transformed into a legal mode and skipped banks to conduct cross-border transactions under the development of science and technology. The extended criminal behavior is even more difficult to regulate.

In summary, the cryptocurrency possesses the features of real time, low fee, P2P interactive, global usage and convenient to replace the fiat currency. Different from the existing monetary system, cryptocurrency executes on the

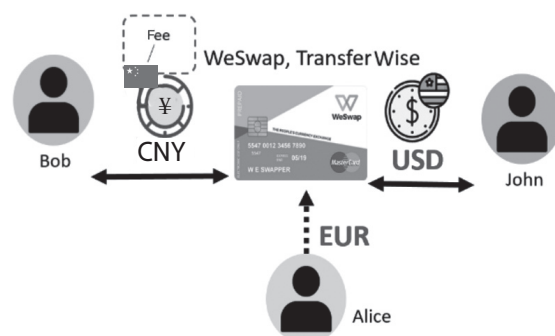
Internet channel in decentralization and provides a choice payment. The blockchain technology supports P2P payment running on an untrusted environment, so third-party payment still has an open issue to be addressed.



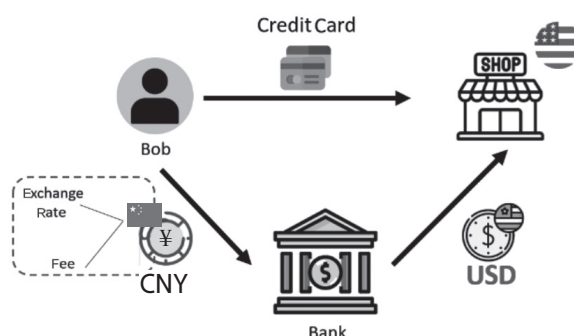
(a) Transnational E-commerce Online Payment



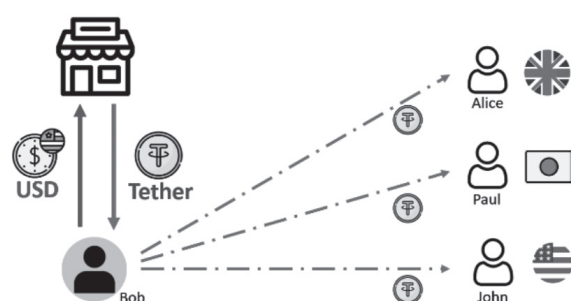
(b) Similar Traditional Underground Exchange



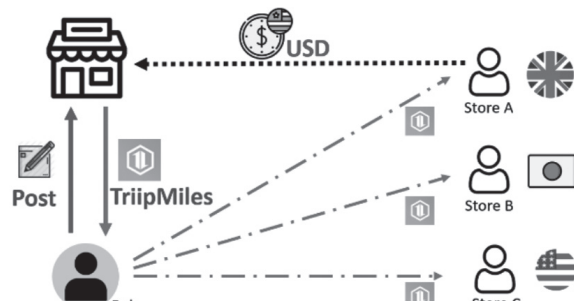
(c) Transnational Online Money Exchange through Credit Card.



(d) Transnational E-commerce Credit Card Payment



(e) Global Transaction Payment through Cryptocurrency



(f) Cryptocurrency ICO through Social Network Platform

Figure 1 Payment Modes Comparison in Cross-Border Exchange Transactions

Digital services, such as music, video, e-ticket, e-book and software, are delivered as the products and services online. This type of services does not limit in one country or local area. A critical feature is that the online services do not require to pass through import inspection. How to guarantee the digital services after payment or how to obtain money once the services are delivered become an important issue. Blockchain system supports a decentralized solution for security, decentralization ability, recall ability and immutability<sup>[23]</sup>. Thus, this work aims to propose a third-party cryptocurrency payment based on smart contract for influencer e-commerce.

## 2 Related Work

Some researchers considered initial coin offering (ICO) of the third-party blockchain with their own cryptocurrency. They released their own cryptocurrency for consumers to exchange money<sup>[3]</sup>. Namely, both users have to exchange their own money into the ICO. The exchange rates with the different cryptocurrencies are listed by the third-party. Each consumer with cryptocurrency in the third-party blockchain is pledged with the corresponding cryptocurrency in the corresponding blockchain and kept by the smart contract.

Borkowski, et al. proposed a protocol for various type of cryptocurrencies and set each virtual coin as an electronic wallet. They set the amount of assets map in their

defined cryptocurrency for each wallet. Then, the related amount of PBT synchronize the amount of money in diverse wallet<sup>[24]</sup>. PBT is used to calculate the balance for each electronic wallet. Accordingly, PBT executes the cross-blockchain transactions proof. The transferring process did not lock the asset when a consensus of the balance has done. The problem is that the blockchains did not negotiate with each other. This project considers that the cross-blockchains rely on the electronic wallet app and smart contract to associate and evaluate with each other.

They set the block generation time of the blockchain for 13 seconds when the different blockchains were used to test cross-chain transactions. They found that the transaction validity period was too short to broadcast to all blockchains so that the balance cannot achieve consistency among the blockchains. The experiments found the transaction validity period is at least 4 block generation times (52 seconds)<sup>[24]</sup>. However, the block generation time of diverse blockchains is not the same. If the block generation time of a certain blockchain is long, the transaction validity period is extended and even one of the blockchains can only perform one transaction at a time. Transactions cannot be recorded and updated in time so that this results in inconsistent balances that might cause other blockchains misjudgement. Then, consensus miners consider the responding blockchain as an untrusted blockchain and abort the



transaction. Even worse, blockchain prevents itself from participating in the Detxx cross-chain protocol. Thus, how to address the authorization and validation processing time differential is one of issues addressed in this project.

The features of influencer e-commerce with cryptocurrency payment among several blockchains through third-party blockchain is proposed in this study. The corresponding cryptocurrency has to be mortgaged before the corresponding cryptocurrency appears on the third-party blockchain. The third-party blockchain adopts account model to verify whether the account balance is sufficient for the transaction. Furthermore, all transactions are carried out on the third-party blockchain.

The low amount of transactions per second processed by Bitcoin system is a critical issue. Poon and Dryja proposed lightning network method that both parties deposit part of their assets when the transaction submits to the blockchain system. To launch a transaction among cross-blockchains is designed through the smart contract. Once the digital signatures of both parties are received with each other, the transaction is established and stored in both sides<sup>[25]</sup>. The transaction is not yet submitted to the blockchain system immediately. Only when both parties agreed that transactions do not occur and turn-off the off-chain channel do both parties get back the deposit. The system adopts the digital signatures of both

parties for the latest transaction record. The system allocates Bitcoin and chain records based on the transaction record because it aggregates several transactions into one transaction to increase the second in disguise transaction volume.

The Hashed Timelock Contract (HTLC) is a smart contract for time-limited transactions. This contract program allows the buyer generate a hash value with a random number. It supports the transferor in locking the traded asset with its own hash value. When the buyer or seller verifies with a random number, the hash value can be calculated to unlock and obtain the token to ensure that the transfer buyer is authorized for this transaction.

The off-chain transactions can effectively improve the low amount of transactions per second. However, the existing design only runs on a single blockchain so that they did not support to be used as a cross-blockchain agreement. It encourages us to propose a new mechanism based on the concept of off-chain transactions and HTLC to mortgage assets through the smart contract in the corresponding blockchain. The existing method is to generate the corresponding cryptocurrency in the third-party blockchain after verification is completed. However, this work aims to design a smart contract to mortgage in buyer account and then determines whether to pay the money to the seller who ignores the transaction. User ignores the confirmation time differential



among several blockchains when trading on the same blockchain and ensures that transactions in the third-party blockchain are all packaged and traded by miners.

Because the consensus mechanism, architecture and transaction records among the blockchains are different<sup>[10]</sup>. The blockchains are independent with each other. Neither of them can verify the transaction status of other blockchain<sup>[24]</sup>. User has to communicate with the other transactions by using the cross-blockchain. It requires a third-party notary or side chain to verify the transaction status of the blockchain or even the relay chain as a bridge of communication.

Compared with notaries, other cross-blockchain technologies are not yet mature and can be widely used. The exchange or even transfer of certain types of cryptocurrencies is often limited<sup>[10]</sup>. For example, Bitcoin and Ethereum can be used to verify Bitcoin transactions through Bitcoin relay by using Ethereum smart contracts. This work aims to design the cryptocurrency third-party payment smart contracts for the digital products or services of influencer e-commerce.

Why does a user intend to exchange cryptocurrency on an online exchange center? One of the reasons is that the exchange center provides many type of cryptocurrencies. The relationship exchange of the centralized database can easily help users to automatically match, integrate

pending orders and limit trading when they grab orders. The exchange center acts as a third-party notary to allow users deposit their assets in the exchange center for pending orders or directly trade to achieve the objective of cross-chain transactions. However, cryptocurrencies are not legally recognized by countries all around the world. Although most exchange agencies are subject to regulatory supervision, when an exchange agency is hacked and their customers' assets are stolen. The sudden closure of the exchange agency or theft by guards caused the assets of customers are often not protected. Exchange agencies are often the target of hacker attacks because the agencies keep a large number of cryptocurrencies.

For example, Mt. Gox was a largest Bitcoin exchange center. It was responsible for more than 70% of global Bitcoin transactions. However, the CEO announced his withdrawal from the Bitcoin foundation in 2014. On February 25th, 2014, the official Website suddenly announced the closure of all transactions. The price of Bitcoin fell to a minimum of USD448 from USD573 within a day. The reason is that 850000 Bitcoins were stolen on February 24th. Users take the risks to exchange cryptocurrency through the exchange center.

The transaction confirmation time is different with various cryptocurrency blockchains. This work aims to design a cross-blockchain system for influencer

e-commerce. The time differential among various blockchains should be adopted by the system to operate with each other. Figure 2 shows the exchange center acts as a third-party notary to hold the payment between buyer A and seller B after the ordering status had confirmed. The payment will be held by smart contract in appreciation period. If there is no dispute of the order transaction, the payment is automatically delivered to the seller. The problems of this type of third-party payment are as follows.

①The payment is held in the trading center during appreciation period that still exists risk to be stolen and the trust issue of

the exchange center.

②Two times money transfer from buyer to exchange center and exchange center to seller. If there is a dispute, two transfer fees are required to get back the payment.

③The settlement time is caused by various type of blockchains.

If we want to improve the time of each transaction, one way is to custody the assets in the buyer wallet and call the seller wallet for each transaction to shorten the waiting time. However, exchange centers are often attacked by hackers targeting the places where wallet keys are stored and a large number of user assets are stolen.

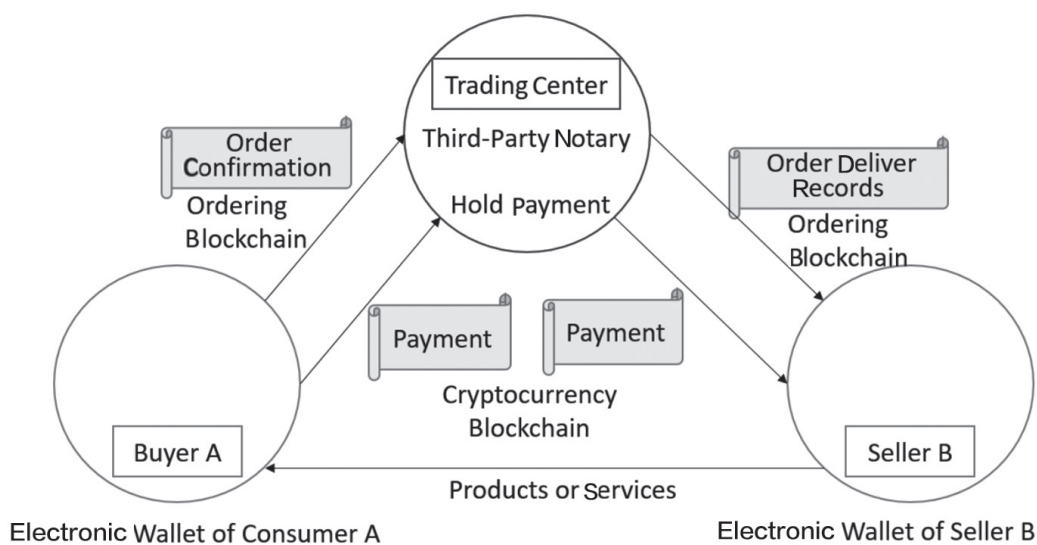


Figure 2 Exchange Center Acts as Notary for Cross-Blockchain Transaction

Three independent blockchains with the same block time are used for the cross-blockchain operation in Dextt. Actually, the block time of each blockchain would not be the same. According to the Dextt

experimental results, it is concluded that the observer can be guaranteed to broadcast to all participating blockchains as long as 4 blocks (52 seconds) are generated<sup>[24]</sup>. The block time of most blockchains is

shorter than Bitcoin blockchain, which possesses 10 minutes as the block cycle time (i.e., settlement time). If the balance of a blockchain is inconsistent, it will be considered to be maliciously modified. They did not check how large the block generation time differential which leads to the considered malicious modification is. As a result, the blockchain can no longer participate in the Detxx cross-blockchain protocol<sup>[24]</sup>. The time differential between blockchain operations is an important issue that will be addressed in this project.

### 3 Problem Description

Cryptocurrency is executed on blockchain system, which possesses decentralization feature, to support P2P payment service<sup>[3-26]</sup>. This service is a type of third-party payment with a large amount of untrusted hosts (i.e., miners) to cooperate with each other<sup>[20]</sup>. Blockchain 2.0 supports smart contract to extend the pure cryptocurrency payment of Blockchain 1.0. Smart contract is a software system executed on the Internet<sup>[3-18]</sup>. When a transaction is issued, the payment request delivers to the smart contract program to satisfy a set of the designed rules before actually submitting it out. The smart contract programs form a decentralized and autonomous system. The online payment submits to the third-party system with smart contract programs to guarantee the transaction for the unknown buyers and sellers. The problem is how to design a smart

contract for third-party payment. This work also aims to enhance the performance.

One of main features is that the transaction cannot not rollback by user once a transaction is submitted to the blockchain system, except the system failure. The settlement can be processed in a short time. Although the settlement might take about one hour in Bitcoin system<sup>[15]</sup>, the payment cannot back out of this deal. The latest version of cryptocurrency payment, such as Hyperledger<sup>[27]</sup>, can even confirm a transaction in several seconds. However, these mechanisms are not suitable for appreciation period. Therefore, we have to design a new mechanism to support third-party payment during appreciation period.

Cryptocurrency trading center can act as third-party payment agency, which is similar to the traditional third-party payment. Initially, a buyer submits the payment to trading center, which is similar to the Alipay. Next, the seller delivers the products or services to the buyer after the sellers ensure that the payment has been received by trading center. The trading center delivers the money to the sellers once the appreciation expires. However, the cryptocurrency trading center might be an untrusted third-party agency. The agency can be established by anyone without supervision. Several cases have shown trading center hacked event occurrences, though the cryptocurrency is temporarily held by the trading center that differs from

the traditional third-party agency.

Diverse blockchains have various processes and settlement periods. For example, the Bitcoin blockchain generate a block in 10 minutes<sup>[15]</sup>. However, the settlement period is about 60 minutes due to fork chain problem. Although Ethereum blockchain generated one block in 12—19 seconds, the transaction validation has to wait for more than 20 blocks generation time. Different blockchains have different transaction confirmation times that causes cross-blockchain operation time differential. For example, online ordering products or services and payment are recorded on independent blockchains, respectively. We have to consider the time effect on diverse blockchains.

The objective of this work is to design a third-party blockchain with smart contract for online transactions under untrusted environment. A cross-blockchain operations are designed to reduce transaction risk. Buyers execute smart contract of the third-

party blockchain and prove the delivering validation message. Only when a buyer and a seller send out the confirmation message, is the transaction validated. Figure 3 shows the relation between buyer, seller and third-party blockchain. Consumer executes the payment smart contract to send the money to the third-party electronic wallet and hold the money. Seller delivers the digital service through ordering smart contract blockchain. The third-party smart contract determines to deliver the payment to the seller or return the money back to the buyer. Thus, the research problems include how to design the smart contracts for payment, ordering and third-party cross-blockchains; how to protect the payment money to be safely held by third-party blockchain or small contract; and how to improve the performance for the third-party payment.

Four requirements are set for smart contract that are buyer launches ordering procedures and payment cross blockchains; the third-party of blockchain ensures

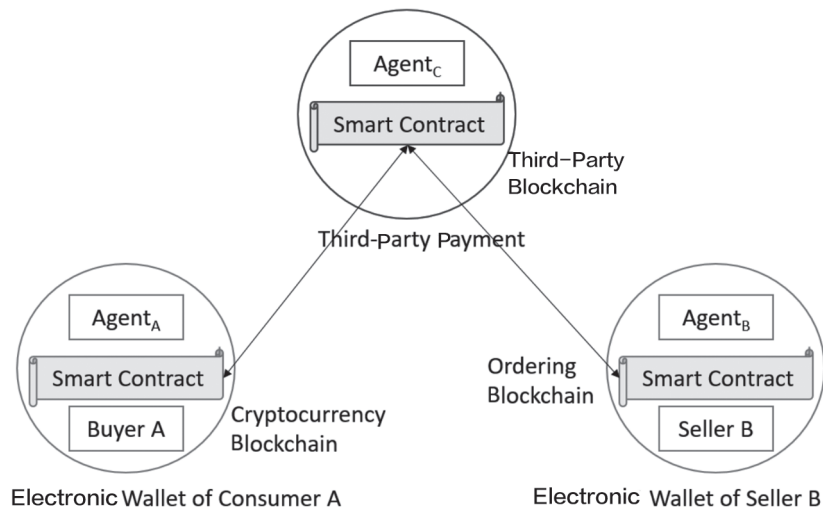


Figure 3 Decentralized Third-Party Blockchain as Public Notary

whether the buyer submits out the payment and the paid money is locked by its agents with public key of third-party smart contract; validate the payment and products delivered; validate the signature of both seller and buyer.

## 4 Summary

This research aims to use the feature of continuous and automatic operation of the blockchain to act as a notary. Third-party blockchain assist users in cross-chain transactions to solve the risk of sudden failure of transaction. The corresponding cryptocurrency can be hosted as a third-party guarantor through a smart contract. The corresponding cryptocurrency appears in the blockchain to allow users to transact with other cryptocurrencies on the cross-blockchain. The proposed transaction process flow and smart contract prevent the buyer and seller from canceling the transaction due to special circumstances or malicious attacks with cross-blockchain.

In the following-up research, we explore the encryption method of the blockchain that sends the message to the third-party notary after the asset is hosted by the smart contract. Besides, we explore whether the smart contract will immediately rollback or continue to be hosted until the message is successfully sent. When the customers intend to pay the cryptocurrency for the corresponding online ordering, the multi-signature is used to verify whether the user

really pay the cryptocurrency or there are other safer verification methods as well as the transaction verification when the cryptocurrency is delivered. Users have to verify whether the input cryptocurrency is matched to the order with smart contracts on diverse blockchains.

## Reference

- [1] YAGER R R, PASI G, Product Category Description for Web-Shopping in E-commerce [J]. International Journal of Intelligent Systems, 2001, 16 (8): 1009—1021.
- [2] LI D H, LI J, LIN Z X, Online Consumer-to-Consumer Market in China—A Comparative Study of Taobao and EBay [J]. Electronic Commerce Research and Applications, 2008, 7(1): 55—67.
- [3] 汪志坚, 王志诚, 熊全迪, 等. 金融科技、人工智能与法律 [M]. 台北: 五南出版社, 2020: 192—196.
- [4] FANG J M, GEORGE B, SHAO Y F, et al. Affective and Cognitive Factors Influencing Repeat Buying in E-commerce [J]. Electronic Commerce Research and Applications, 2016 (19): 44—55.
- [5] ZHANG Z Y, CHEN M X. Advantages and Disadvantages of Third-Party Payment Method and Traditional Payment Method [C]. Proceedings of the 2019 10th International Conference on E-business, Management and Economics. Netherlands: Atlantis Press, 2019: 195—198.

- [ 6 ] YE Y, REN Z, LUO X, et al. Garou: An Efficient and Secure Off-Blockchain Multi-Party Payment Hub [ J ]. IEEE Transactions on Network and Service Management, 2021 ( 3 ) : 101—108.
- [ 7 ] NG D, KAUFFMAN R J, GRIFFIN P, et al. Can We Classify Cashless Payment Solution Implementations at the Country Level? [ J ]. Electronic Commerce Research and Applications, 2021 ( 46 ) : 10—18.
- [ 8 ] WANG Q, LAUR Y K, MAO X. Blockchain-Enabled Smart Contracts for Enhancing Distributor-to-Consumer Transactions [ J ]. IEEE Consumer Electronics Magazine, 2019, 11 ( 8 ) : 22—28.
- [ 9 ] 朱雅新. 金融科技于跨境汇款的应用与发展 [ D ]. 台北: 政治大学, 2020.
- [ 10 ] XIAO Y, ZHANG N, LOU W, et al. A Survey of Distributed Consensus Protocols for Blockchain Networks [ J ]. IEEE Communications Surveys & Tutorials, 2020 ( 22 ) : 1432—1465.
- [ 11 ] OBAID M, AQEL M OBAID M. Blockchain Implementation to Manage Banking Mobile Payments [ J ]. Computer Science and Information Engineering, 2021, 24(4): 687—692.
- [ 12 ] TREIBLMAIER H, SILLABER C. The Impact of Blockchain on E-commerce: A Framework for Salient Research Topics [ J ]. Electronic Commerce Research and Applications, 2021 ( 48 ) : 10—54.
- [ 13 ] JIANG Y, CAI H. The Impact of Impulsive Consumption on Supply Chain in the Live-Streaming Economy [ J ]. IEEE Access, 2021 ( 9 ) : 23—30.
- [ 14 ] ANTE L, FIEDLER I, STREHLE E. The Influence of Stablecoin Issuances on Cryptocurrency Markets [ J ]. Finance Research Letters, 2021 ( 41 ) : 18—67.
- [ 15 ] NAKAMOTO S. Bitcoin: A Peer-to-Peer Electronic Cash System. Bitcoin Whitepaper [ EB/OL ], [ 2008—05—12 ]. <https://Bitcoin.org/Bitcoin.pdf>.
- [ 16 ] XU L, CHEN L, GAO Z, et al. Supporting Blockchain-Based Cryptocurrency Mobile Payment with Smart Devices [ J ]. IEEE Consumer. Electronic. Magazine, 2020 ( 9 ) : 26—33.
- [ 17 ] MANZOOR A, SAMARIN M, MASON D, et al. Scavenger Hunt: Utilization of Blockchain and IoT for a Location-Based Game [ J ]. IEEE Access, 2020 ( 8 ) : 63—79.
- [ 18 ] BUTERIN V. A Next-Generation Smart Contract and Decentralized Application Platform [ EB/OL ]. [ 2013—04—17 ]. <https://github.com/ethereum/wiki/wiki/White-Paper>.
- [ 19 ] AHMADISHEYKHSARMA S, SONMEZ R. A Smart Contract System for Security of Payment of Construction Contracts [ J ]. Automation in Construction, 2020 ( 120 ) : 10—34.
- [ 20 ] NGUYEN C T, HOANG D T, NGUYEN D N, et al. Proof-of-Stake Consensus Mechanisms for Future Blockchain

- Networks: Fundamentals, Applications and Opportunities [J]. IEEE Access, 2019 (7): 27—45.
- [21] OMETOV A, BARDINOVA Y, AFANASYEVA A, et al. An Overview on Blockchain for Smartphones: State-of-the-Art, Consensus, Implementation, Challenges and Future Trends [J]. IEEE Access, 2020 (8): 3994—4015.
- [22] 詹德恩. 两岸地下通汇成因及防制 [J]. 法律与法制, 2008, 7 (6): 97—106.
- [23] WU J, LIU J, ZHAO Y, et al. Analysis of Cryptocurrency Transactions from a Network Perspective: An Overview [J]. Journal of Network and Computer Applications, 2021 (190): 103—139.
- [24] BORKOWSKI M, SIGWART M, FRAUENTHALER P, et al. Dextt: Deterministic Cross-Blockchain Token Transfers [J]. IEEE Access, 2019 (7): 30—42.
- [25] POON J, DRYJA T. The Bitcoin Lightning Network: Scalable Off-Chain Instant Payments [EB/OL]. [2016—01—14]. <https://lightning.network/lightning-network-paper.pdf>.
- [26] ABDELLA J, TARI Z, ANWAR A, et al. An Architecture and Performance Evaluation of Blockchain-Based Peer-to-Peer Energy Trading [J]. IEEE Transactions on Smart Grid, 2021 (12): 64—78.
- [27] Hyperledger. A Blockchain Platform for the Enterprise [EB/OL]. [2020—04—25]. <https://hyperledger-fabric.readthedocs.io/en/release-1.4/index.html>.