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QM wallet Chain: Blockchain Traceability using Working Vacation Queueing Model in Mobile Wallet

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Abstract

Smart and cashless payments through mobile wallets are the recent implementation of digital payment alternatives in developing countries to achieve competitive advantage. Blockchain is an egressing digitally managed technology (BT) which allows ubiquitous monetary transactions with the untrusted entities. In blockchain it is impossible to change records without notifying all participants and validating signatures. Hence it overcomes the security challenges that exist in the mobile wallet. In this paper, we develop a single server bulk service queueing model with working vacation which evaluates in detail the characteristics of a mobile wallet system and measures the various performances of the blockchain based mobile wallet system.

Keywords: blockchain, mobile wallet, bulk service, smart contract, working vacation, performance measure

1. Introduction

Mobile payment is popularly known as digital payment transaction executed by the customer using mobile devices for purchasing products or services anytime and anywhere. It is an alternative method to the existing traditional method of Cash, Debit Cards , Credit cards, NEFT, RTGS and net-banking mechanisms which is used to carry out payment transactions for day-to-day services. The popular mobile payment solution is the mobile wallet where user uses mobile wallet application for making payments instantly.

Mobile payments are playing key role by increasing the sales across in-stores and also online purchases where the acceptability depends on the willingness to accept the new technologies, eagerness to use mobile devices with many advanced features, easy availability of internet, saving the cost and overall increasing the margin and profitability of any merchants.

Also, Perceived earlier experiences of mobile payment, external influences, and social compulsions play a major factor that influences the consumer willingness to use mobile payments. Many studies and literatures revealed that the factors affecting the m-payment mainly include: trust, perceived risk, perception, acceptance and willingness and these factors are taken into consideration for further exploration in the current study. Mobile wallets enhanced user experiences and offers make a competitive differentiation in the market among many providers having multiple models of smart phone, different technologies, multiple mobile wallets applications indirectly creates negative influences on the consume user experience. In addition it seamlessly connections between traditional banks and new mobile payment adoptions and limitations on transactions impacts in ensuring trust in the mobile wallets.

Easy availability and installation of two many apps in the single mobile device leads into Cyber security issues, perceived threats and malware penetration in the mobile device, that considered to be the major factor for the lower adoption rate.

Mobile wallets can play major role in reducing the financial losses to the consumers, providers and merchants as it is safer than plastic cards which is prone for hacking and stealing the money. Despite the many benefits and advantages, early adoption of mobile wallets considered to be risky and non-trustable among the consumers in using digital technologies due to the concerns such as privacy, perceived security and payment transactions. Mobile wallets is the new technology where perception factor significantly plays key role in usage and adoption that the consumer are not trusting the mobile payment companies invariably as there is no transparency on how and where money is maintained in the wallets and the uncertainty involved in refunding money in-case of failed transaction. The self-efficacy is key factor influencing the resolution to use mobile wallets during purchases in the store. Hence, when more retailers offers mobile payment options to consumers that will improve the perceptions and self-efficacy. Once if trust will be build towards the mobile wallet system then the consumers continue to use this method according to their understanding of the level of security. Trust in mobile payment providers is a significant factor affecting willingness to use mobile wallet. Conversely, the availability of additional mobile services has little effect on use, as consumers may stop using mobile payment even if providers offered additional services. This paper models a system which is based on blockchain technology using smart contract involves entire stakeholders of a smart and automated mobile wallet system, though there may not be direct link among the parties.

The rest of the paper is organized as follows. Section II gives the related work section.

Section III gives the various mobile wallets used in India, section IV shows the role of blockchain in the mobile wallets and mobile payments, section V the proposed model of blockchain in mobile wallet, section VI mobile payments stakeholders, section VII model description and queueing model, section VIII system performance measures, section IX the numerical results of the model and finally section X concludes the paper.

2. Related Work

Government and companies are emphasizing more on mobile payment methods and trying to make cashless transactions more popular. The study has collected information from 400 e-wallet customers

and by the application of decision trees algorithm. Because of six different types of risks people's intention in using mobile wallet is not increasing so rapidly and they can be listed as privacy, psychological, security, performance, time and financial. The mobile payment users can all be categorized into low, medium, and high. There are various competitive models have been used to examine the intention of users by the ML tools such as kNN, Naïve Bayes, decision trees, SVM and logistic regression. It has been found that the privacy with performance issues are the crucial to many users. Many low intention users need are safe, secured, reliable, and fast mobile payment environment and they are less concerns about financial risk. The medium intention users needs are avoidance of financial loss, safe, secured, reliable, and fast mobile payment environment and they are less concerned about time. Monetary loss, safe, reliable, and fast mobile payment environment are extremely important to high intention users with less concerns about security risk and psychological risk. The survey results can help the companies to apply appropriate strategies to improve the customer base. The purpose of this paper is to identify the stakeholders and to build a secured model using blockchain technology and also to analyze the performance of the proposed system so that the customer base of mobile wallet will increase. Although mobile technology has become part of our everyday life, certain actions and services, such as mobile payments, are still used relatively infrequently.

Bitcoin has attracted attention of researchers and studied extensively by research communities, e.g., the impact of Bitcoin on economics in economic community [Huberman G et al., 2017], the technological aspects of encryption and P2P networking in computer science [Decker C et al., 2016], and the incentive mechanism of Bitcoin ecosystem in the community of social science [Lewenberg Y et al, 2014; Möser, M et al., 2015]. Comprehensive reviews in terms of technology principles, history, risks and regulatory issues are well provided in [Böhme R et al.,2015 ; Bonneau J et al.,2015;Tschorsch F. et al.,2016;].

The block-construction mechanism plays an important role for the Bitcoin blockchain. From the transaction point of view, a newly issued transaction waits in the memory pool of a miner node, is included into a new block, and is finally confirmed when the new block is added to the blockchain just after the corresponding mining process ends. Since a block includes several transactions, the block-construction process can be modeled as a queueing system with batch service, in which a group of customers leave the system simultaneously at service completion.

Blockchain systems can be modeled as queuing systems with bulk service (Goswami V,et al, 2012), which had studied in (Kabak I, 1970). The Markovian bulk arrival $M^x/M/1$ as well as bulk service $M/M^x/1$, are provided in (Shortle J F et al., 2018). Many use cases with bulk-arrival along with bulk service were examined thoroughly in (Kaur K et al.,2016, Mahammad S et al.,2017) and had applied to various applications (Flynn B. B et al.,2016;Gu X et al.,2016), but it is not modeled to blockchain systems. (Vuran M. C et al.,2018) applied the blockchain mechanism in the asynchronous system and verified the consistency of the applied mechanism.

3. Different Mobile Wallet Apps in India

Digital India is a new transformation to make India more digitally sounds and economically strong. With this vision, The government of India has started the Digital India programme. The major role of

this programme is to make Paperless, Cashless, and Faceless transactions. Promotion of this programme has been given a higher priority task to include all the segments of our country under one-fold. The major aim is to facilitate all Indian's digital payment services in a convenient, easy, secure, and quick manner.

Hon'ble Finance Minister announced several activities in promotions of the digital payment from FY 2017-18, through Unified Payments Interface (UPI), Immediate Payment Service (IMPS), Aadhar Pay, Unstructured Supplementary Service Data (USSD), and Debit Cards. Ministry of Electronics & Information Technology (MeitY) has been allotted the responsibility to the initiative in the promotion of the Digital India Programme. To make this a grand success Meity has been working with various stakeholders such as Banks, Central Ministries/Departments and States to set the ecosystem to enable digital payment services across every corner of the country. Meity is working on strengthening these services by creating an awareness program through promotions of digital payment the system, such as cashback options for merchants, Aadhar merchant incentive schemes, referral bonus schemes to individuals. A dedicated "Digidhan Mission" has been set up in Meity in collaborations with many stakeholders to find out various strategies and schemes for promotions of digital payment systems to empowered Digital India.

To facility these services to India, to move to a cashless society, mobile wallets have played a major role in reducing the weight of bulky wallets. From invoice cards to mobile wallets, the major focus is to comfort our life while purchasing any goods. This is a blessing in the pandemic situation to give a contactless transaction from our home. This also reduces the waiting time in a long queue for ATM cash withdrawal. Payment wallets in India have made the online transactions in a smooth way, in one-tap application, speedy processing, all at one go.

A mobile wallet is a digital wallet that uses a bank account or credit/ debit card to make hassle-free payment methods while securing user data. These are designed to provide secured transactions with less fraud. This is one of the best methods in online payment methods that is more economical as compared to other physical wallets. These mobile wallets are easily accessible in the play store or app store. These are the proven solution to harsh problems like demonetization in the Indian Economy. For this, the Government of India has promoted e-wallet users to strengthen the user base for this digital economy. Nowadays many choices are available in mobile wallet systems. The top ten among these mobile wallets are described below.

1. Google Pay:

This is considered the best mobile app in the mobile wallet industry. It has a strong base as it is developed by Google. It is quite popular and gained a quick user base in spite of being a late entrant in the wallet industry. It is very popular among its users due to its user-friendly features, instant cashback policy during online transactions. It is connected to the user's bank account securely and has no monthly charge for its account activation. The user can easily send/ receive money to/ from friends, recharge phone, pay bills, buy online – all via UPI from the bank account. It completes all these transactions without reloading the wallets or any additional KYC. Periodically cashback and reward through scratch cards enhance the user interest to go for online transactions for monthly

recharging or payment of utility bills. With the help of UPI, account to account transfer through UPI is more preferred among the users, which is addon services provided by Google Pay mobile wallet. For this reason, it reaches 100 million users who downloaded this app from the Android Play store to avail its benefits.

2. PayTM

PayTM is one of the largest online commerce platforms in India offering its services since 2010. The money can be stored in a customer's digital wallet from a bank account and make online payments. It is based on a semi-closed model. The customer can store money in his digital wallet and make payment to those merchants which have tie-ups with PayTM. Before UPI comes to the digital payment market, PayTM is considered to be the number 1 mobile wallet in the digital wallet market. Along with e-commerce transactions, the app gives additional services such as money transfer, bill payment, avail services from merchants like travel, retail, and entertainment industry. With the growing demand for UPI, PayTM has also added UPI-enabled services now. Currently, its number of users reaches 10 crores.

3. PhonePe:

This is the next on the list of top mobile wallets in India. Launched in the year 2015, it has gained a lot of popularity which crossed the number of users to 100 million in just 4 years. It has a very good user interface, which makes its user to experience all sorts of UPI payments, online transactions, recharge bills, online money transfer all in one app. Its rich features enable the user to avail safest and fastest online transactions in India.

4. Dhani:

Dhani app is a part of the Indiabulls group. This app is not only an e-wallet app but also can be combined with the Dhani Supersaver card to provide many rewards and loyalty to its customers. It gives additional facilities to customers as to play games. The customer can win cash prizes for mobile recharge, EMI, and Insurance payments and for online shopping with Dhani products. It can also be combined with Rupay to give 5% cashback for all the payments through this card and completely free for the first month. Due to all these functionalities, its number of users increases to 2 crores.

5. BHIM Axis Pay

BHIM is very popular among mobile wallets in India. It stands for Bharat Interface for Money. It is developed by NPCI (National Payments Corporation of India). It was launched in December 2016. This facilitates e-payment directly through a bank account. The user has to register his bank account with BHIM and set a UPI pin for this account. The user of any bank can avail of this service. It is not required to be an Axis bank user. The mobile number is the permanent address. With the help of this, the user can do any type of online transaction by tapping a button. The number of its users reaches 1 million.

6. Mobikwik

MobiKwik is an independent digital wallet network. It was launched in 2009. Being an independent mobile payment network, it attracts 32 billion users in its pocket. The user can add money through debit cards, credit cards, net banking, etc. The expense tracker is the unique service provided by MobiKwik. It helps to set the expense budget through SMS data to monitor and analyze user expenditure. With the growing market trend in India, MobiKwik is added with some grocery stores, restaurants, and offline merchants.

7. Yono by SBI

Launched by the State Bank of India, Yono is a semi-closed digital wallet. It is available in 13 languages and non-SBI customers. The customers can transfer money to another bank account, book tickets, pay bills, recharge the mobile and make online shopping, etc. This app has an extra feature to set for the reminders for dues, money transfers and view mini-statements for the already done transactions. To date, the number of Yono installers reaches 1 crore.

8. ICICI Pockets

Pockets are one of the best mobile wallets in India. It is provided by ICICI. It facilitates the Indian user to fund the mobile wallet and make payments for transactions. The user can transfer money, recharge, book flight and train tickets, send gifts to friends, etc. It gives a virtual VISA card to its user. Through this VISA card, the user can transact on any website. It provides many attractive offers and packages from its associated brands. Currently, it reaches 5 million installs in the Android play store.

9. HDFC Payzapp

Payzapp is the mobile wallet by HDFC bank is giving power to pay solution in just one click. It is used for recharging mobile, DTH and data card, book flights, book bus and hotels, movie tickets, send money anyone who is in your phone book.

10. Amazon Pay

Amazon pay is owned by Amazon is a online payment processing service. It is a top online payment platform used in India as well as globally. In India it was launched in 2017 though it was launched in 2007 in other countries . Through Amazon account the customers can pay and some other app also allows to pay their bills through Amazon Pay. Amazon pay also tied up with fintech companies ZestMoney which helps the customer to buy products from Amazon and pay through affordable monthly installements.

Besides the above 10 well known mobile wallets in India the other wallets which are also popular are:

- JioMoney

- AirtelMoney
- Oxigen
- Ola Money
- FreeCharge

etc

The smartphone wallet purchases in India can be categorized as 60% mobile recharges, 52% travel services, 58% utility payments, 58% online shopping. These numbers shows that there will be a growing need for secure, faster and efficient payment methods for the online marketplace, efforts to make payments to an individual or brick & mortar stores are also increasing. Start-ups and many corporate are constantly working on it and developing customer-friendly technology including various mobile wallets giving more secured power to do financial transactions into the customer's hand.

4. Role of Blockchain in the mobile wallets and mobile payments

Mobile wallets can leverage key benefits from blockchain as it is becoming an important and very essential tool of any mobile users. Blockchain drives peer-to-peer lending. P2P lending which is one of the upcoming trends in the payments industry. Using the blockchain, borrowers can simply use their mobile devices for securing a loan from the lender on a direct basis. This reduces the hassle of dealing with the regulations and traditional paperwork of banks or financial institutions. Faster payments are another benefit. Mobile payments expected to be nearly instant, but still, it takes several minutes or hours for a transaction to go through. Using blockchain technology, transactions can be processed faster and across borders. Also, mobile payments are expanding beyond smartphones and tablets. With the use of wearable devices such as bracelets, watches, and rings, payment companies are embracing IoT. There are multiple ways of using the blockchain in different purposes and banks are experimenting with how they can make use of the Ethereum , Bitcoin , a popular blockchain tools to prepare powerful smart contracts. Smart contracts verify and enforce the terms of a contract automatically, which is regarded as a major boon for banks and fintechs. Also, the financial institutions can use blockchains to settle loans on a quicker basis and identity management when compared to older processes.

5. Proposed Model of Block chain in Mobile wallet

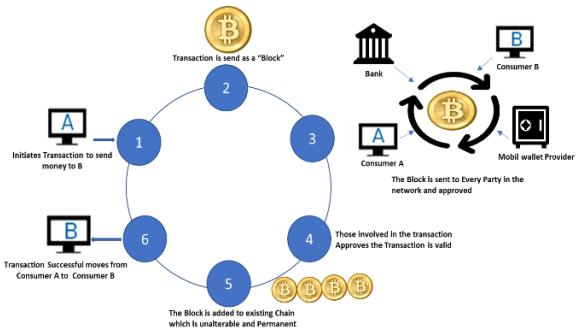

Figure 1. Proposed blockchain based mobile wallet system

The proposed model figure 1 shows the use of mobile wallet using Distributed Ledger Technology (DLT) of blockchain technology where each transaction in mobile wallet is stored in public ledger. The distributed feature of Block chain allows consumers in network to collectively record verified data in a shared ledger without relying on a trusted central party there by you avoid misuse of information by anyone. Once transaction is completed it is added in the block chain so that no one can be modified. There are two types of Ledgers are proposed. One is Permissionless and other one Permissioned.

Blockchain, an emerging technology, also known as distributed ledger technology (DLT), has the potential in helping security with scalability challenges. In the P2P network, each node have a full and up-to-date copy of the entire ledger. Any addition to the ledger by a network participant is communicated to every node in the network. Using an algorithmic consensus mechanism all the participated nodes collectively validate the change. Once the validation is accepted, the new addition is being added to all respective ledgers to ensure data consistency across the entire network. There is no central owner and identical copies of the ledger are distributed to all network participants.

Figure 2 below depicts an example of a blockchain data structure: The last block (block 4) was added to an existing blockchain (blocks 1-3, block 1 being the 'genesis block'). The blocks are connected using a linked list. 3. Block 4 represents the newest addition to this blockchain which updates the ledger. The blockchain transactions are shown in figure 3.

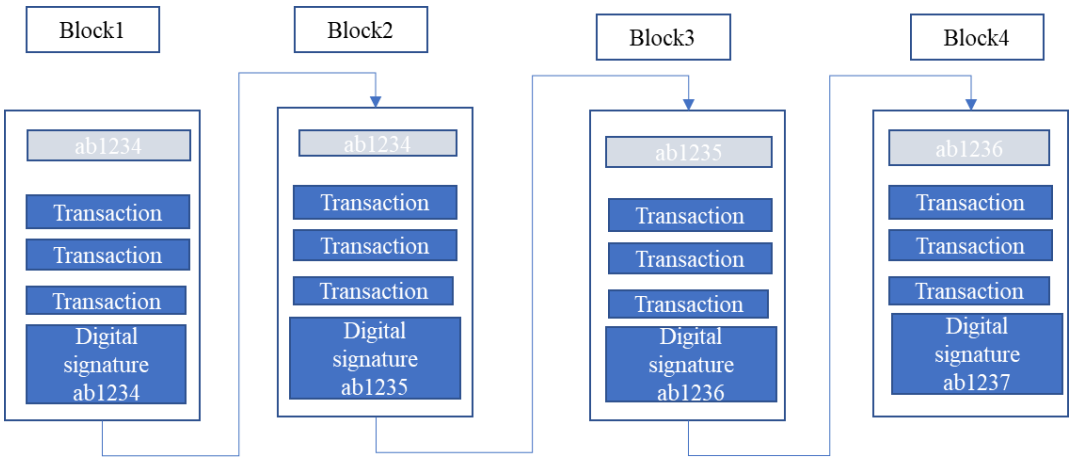

Figure 2. Blockchain structure

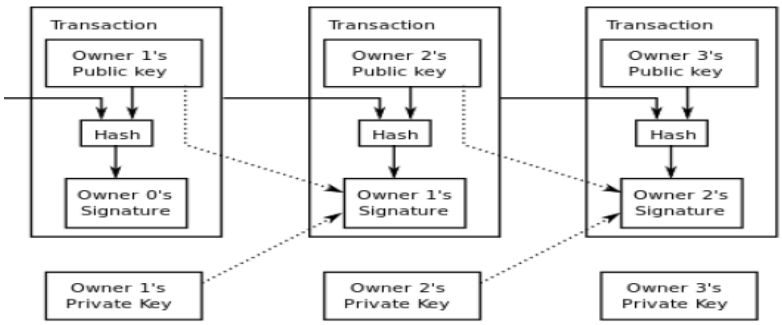

Figure 3 . Blockchain transactions

6. Mobile Payments Stakeholders

There are varieties of stakeholders in a mobile payment system. Some are involved only in the manufacturing process and others are in the transaction process. In this paper we are considering the stakeholders who are involved during the mobile payment process. Along with the implementation scenario, the stakeholders change and many are involved to the system.

1. **Consumers** are the main stakeholders who are the users of the mobile wallets and initiate the mobile payment transaction.
2. **Issuers** are those whose provides the mobile payment capabilities and provides easy management.
3. **Merchants** who accepts the mobile payments either contactless or contacted.
4. **Acquirers** trusted third parties those who support the mobile payments.
5. **Mobile Operators** who support NFC (Near Field Communication technology is a contactless-communication technology based on a RF (radio frequency) filed).
6. **Payment Networks** are those who set standards.
7. **Chip and Handset Manufactures** are those who support the financial applications.
8. **Payment App developer** are the App developer for the mobile wallet applications.

Besides the above stakeholders the few other stakeholders involved in the system shown in the figure 4.

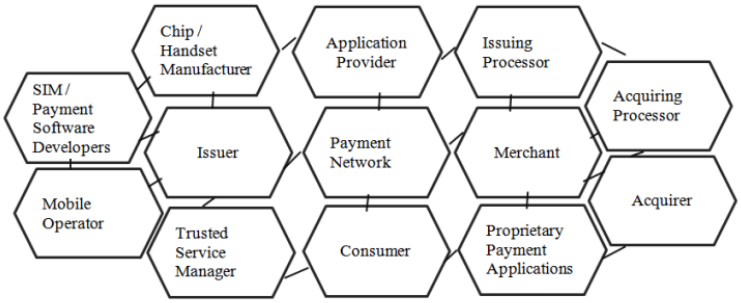

Figure 4. Various stakeholders of Mobile Payment

The mobile wallet payment process is shown in figure 5. The main steps involved in this process are registration, transaction and settlement.

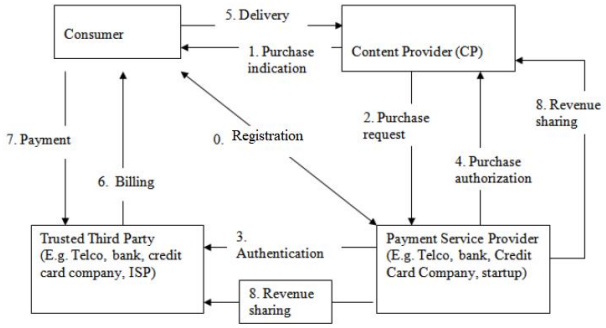

Figure 5. The Mobile Payment system

7. Model Description and Queueing Model

The blockchain based mobile wallet system can be 2885ehavio as a working vacation queueing system. The system can be considered as a blockchain queue, where the block generation and processing of the blocks are considered as the two stages of the system where the batch service works. A block consists of many transactions but a maximum of b transactions can contain inside a block. The transaction arrival rate to the system is λ which follows Poisson process and the transaction are served in bulk. The server gives two different types of services and they are normal and lower. Both the service time follows exponential distribution with service rates μ1 and μ2 respectively. The vacation time also follows exponential distribution with a parameter α. The service begins only a minimum of 'a' transactions in the buffer and a maximum of 'b' transactions in the system. At time t=0 let there are 'a' transactions in the system. The general considerations made in the analysis are:

- The server goes into a working vacation if after the competition of a normal service there are less than 'a' transactions in the system and goes to idle state and again the server starts but this time with lower service rate as the number of transactions reaches 'a'. If the number of transactions in the waiting buffer lies in between 'a' and 'b' then all the transactions in the waiting buffer will be served and the waiting buffer becomes empty and server starts normal service. If there are more than 'b' transactions are waiting in the buffer then the first 'b' transactions are taken for service and the remaining transactions will have to wait.
- During the working vacation period, if the server finds the number of transactions in the buffer is between 'a' and 'b' then all the transactions in the buffer will be served but with lower service rate and the waiting buffer will become empty. If the server finds the number of transactions in the buffer is more than 'b' then the first 'b' transactions will be served from the buffer with lower service rate and the rest transactions will be in the buffer.
- After the vacation period completes the server comes back to the system and the normal service starts if there are a minimum of 'a' transactions in the buffer, if it finds there are less than 'a' transactions in the buffer then the server will be waiting in the system for normal service. If the server finds the number of transactions in the buffer is in between 'a' and 'b' then all the transactions in the buffer will be taken for normal service and buffer becomes empty and server starts normal service. If it finds more than 'b' transactions are waiting in the buffer then the first 'b' transactions are taken for normal service and the remaining transcations will have to wait for normal service.

Figure 6 shows the working vacation Queueing model for the Blockchain based Mobile wallet system

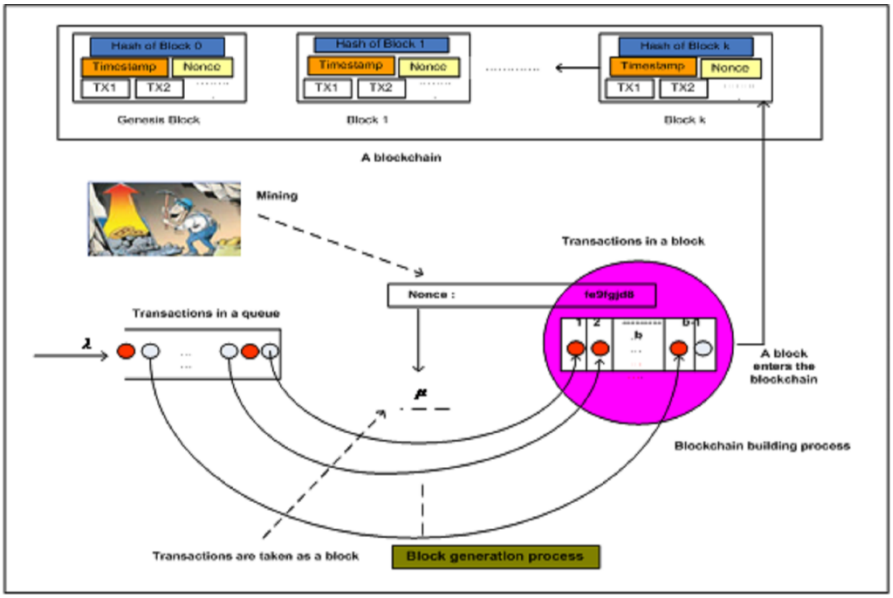

Figure 6 : Working vacation Queueing model for the Blockchain based Mobile wallet System (Patra, S. S et al.,2021; Mukherjee, P et al, 2021)

8. System Performance Measures

The following are the various system measures which are used to bring out the 2886ehavior of bulk service working vacation queueing model.

a. Probability of having n transactions in the waiting buffer during the server is idle at time t $=P_{n0}(t)$

b. Probability of having n transactions in the waiting buffer during the server is busy at time t = $P_{n1}(t)$

c. Probability of having n transactions in the waiting buffer during the server is idle in working vacation period at time t = $P_{n2}(t)$

d. Probability of n transactions in the waiting buffer during the server is busy in working vacation period at time t= $P_{n3}(t)$

e. Probability of server being idle at time t= $P_{idle}(t) = \sum_{n=0}^{a-1} P_{n0}(t)$

f. Probability of server being busy at time t= $P_{busy}(t) = \sum_{n=0}^{\infty} P_{n1}(t)$

g. Probability of server being idle in working vacation period at time t =

$$P_{idle\,in\,working\,vacation}(t) = \sum_{n=0}^{a-1} P_{n2}(t)$$

h. Probability of server being busy in working vacation period at time t =

$$P_{busy\,in\,working\,vacation}(t) = \sum_{n=0}^{\infty} P_{n3}(t)$$

i. Average transactions in the waiting buffer =

$$L_q(t) = \sum_{n=0}^{a-1} P_{n0}(t) + \sum_{n=0}^{\infty} P_{n1}(t) + \sum_{n=0}^{a-1} P_{n2}(t) + \sum_{n=0}^{\infty} P_{n3}(t)$$

9. Numerical Results

To demonstrate the applicability of the above blockchain based mobile wallet system, several numerical results have been carried out and some are presented here. Table 1 shows the probability measure of number of transactions in the buffer when the server is idle, table 2 shows the probability measure of number of transactions in the buffer when the server is busy, table 3 shows the probability measures of number of transactions in the buffer during the server is idle and in working vacation, table 4 probability measures of number of transactions in the buffer during the server is busy and in working vacation and table 5 the system performance measures.

Table 1. Probability Measures of number of transactions in the buffer during the server is idle

t	$P_{00}(t)$	$P_{10}(t)$	$P_{20}(t)$
1.0	0.1227	0.2173	0.2739
1.4	0.1232	0.2168	0.2716
1.8	0.1232	0.2168	0.2716
2.2	0.1232	0.2168	0.2716
2.6	0.1232	0.2168	0.2716
3.0	0.1232	0.2168	0.2716

Table 2. Probability Measures of number of transactions in the buffer during the server is busy

t	$P_{01}(t)$	$P_{11}(t)$	$P_{21}(t)$	$P_{31}(t)$	$P_{41}(t)$
1.0	0.0733	0.0194	0.0051	0.0014	0.0002
1.4	0.0729	0.0193	0.0051	0.0014	0.0002
1.8	0.0726	0.0192	0.0051	0.0014	0.0002
2.2	0.0726	0.0192	0.0051	0.0014	0.0002
2.6	0.0726	0.0192	0.0051	0.0014	0.0002
3.0	0.0726	0.0192	0.0051	0.0014	0.0002

In table 1 and 2 $\lambda = 5.2$, $\mu1 = 16$, $\mu2 = 12$, $\alpha = 6$, b=5 and a = 3 .

Table 3. Probability Measures of number of transactions in the buffer during the server is idle and in working vacation

t	$P_{02}(t)$	$P_{12}(t)$	$P_{22}(t)$
1.0	0.1232	0.0930	0.0537
1.4	0.1231	0.0936	0.0549
1.8	0.1231	0.0937	0.0552

2.2	0.1231	0.0937	0.0552
2.6	0.1231	0.0937	0.0552
3.0	0.1231	0.0937	0.0552

Table 4. **Probability Measures of number of transactions in the buffer during the server is busy and in working vacation**

t	**$P_{03}(t)$**	**$P_{13}(t)$**	**$P_{23}(t)$**	**$P_{33}(t)$**	**$P_{43}(t)$**
1.0	0.0134	0.0034	0.0007	0.0003	0.0000
1.4	0.0139	0.0036	0.0008	0.0003	0.0001
1.8	0.0141	0.0036	0.0008	0.0003	0.0001
2.2	0.0141	0.0036	0.0008	0.0003	0.0001
2.6	0.0141	0.0036	0.0008	0.0003	0.0001
3.0	0.0141	0.0036	0.0008	0.0003	0.0001

Table 5. **System performance measures**

t	**$P_{idle}(t)$**	**$P_{busy}(t)$**	**$P_{w\_idle}(t)$**	**$P_{w\_busy}(t)$**	**$L_q(t)$**
1.0	0.6139	0.0992	0.2713	0.0177	0.9994
1.4	0.6116	0.0987	0.2717	0.0184	0.9987
1.8	0.6113	0.0986	0.2719	0.0186	0.9988
2.2	0.6113	0.0986	0.2719	0.0187	0.9989
2.6	0.6113	0.0986	0.2719	0.0187	0.9989
3.0	0.6113	0.0986	0.2719	0.0187	0.9989

In table 3,4,5 $\lambda = 5.2$, $\mu1 = 15.5$, $\mu2 = 10.2$, $\alpha = 5$, $b = 5$ and $a = 3$ is taken.

10. Conclusion

Blockchain, distributed ledger and smart contract being used in crypto currencies at first and later , in many use cases researches and industries have started using the technology. To verify the authenticity of various use cases and the applications of smart contract mathematical models have been used in many literatures. One of the fundamental question is whether the applications and technologies are going to give the required performance measures. To facilitate this, we have

applied queueing model with working vacation, the M/M(a,b)/1, which evaluates the various performance measures of the mobile wallet system.

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