

Innovation of Secure Payment Gateway Principles from Cash to Bitcoin

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Abstract— *There was no need in money for the primitive man – all he could do himself could be exchanged with a neighbor. Lately instead of this tradition the payment by noble metals appeared. Afterwards they started to mint coins, and then the banknotes appeared. Nowadays credit cards joined our usual way of paper money payment that gives us an opportunity to pay services via ATM or terminal. Credit cards for payments stay popular for a long time. Actually, the first credit card didn't look like usual rectangles we used to see every day – it wasn't even plastic, metal though. Metal cards were constantly improving. Only in the 1975 electronic payments got available. People got an opportunity to pay everything via ATM without visiting a bank and getting cash. Formed inter-bank card associations – NBI (known as Visa International) and ICA (MasterCard International) are still the major players in the cashless payment market. While one theorized about money incredible future, others – the supporters of info value – proved their correctness in practice. Bitcoin are well-known for 9 years already and they flip all the basis of currency system. This research paper investigates the changes and development of security gateway and preference of usage of period of payments from the cash to bitcoin which is new digital currency.*

Keywords—Blockchain, Cybersecurity, privacy, Internet of things, cyber attacks

1. INTRODUCTION

Money is an instrument of deals and a universal equivalent of the cost of goods and services. It has a quite specific purpose – to make change processes simple and clear, reducing the price of goods or services to a particular value. Long ago one of the ancestors of our civilization decided to possess a thing which belonged to his neighbor without violent methods. The enterprising dealer took one of his own things precious to him and offered to exchange it. Direct barter, during which the transfer of ownership from the parties to each other, is one of the most vivid and simple forms of concluding property transactions. Mostly via the direct exchange came the goods vital for all centuries – cattle, food, weapon, luxuries... [1-3].

Barter deals practically immediately showed its weak sides. They are: difficulties with tax collections, great probability of thefts, problems of conduction of major operations. However the concept itself is paramount – the goods valuable for the market participants used to be the medium of exchange, so it means – the money.

Eventually, the principle of security for the exchange of real goods led to the emergence of secured money. During the next centuries the search for the most universal measure of value of goods and services occurred, and as a result – the experiments for the selection of the most efficient means of exchange – clay figures has problems as well.

The mankind in various regions used seashells, pearls, stones of special shapes, minerals, metals and other goods as money, for a particular amount of which one could purchase something. Our ancestors appreciated metals most of all. They started to pay by bars or small pieces of a bar in case of the fractional calculation. The coins started to be mint in the VII century BC.

Though noble metals had its several disadvantages stated in the literature. One of them – the problem of transferring big amounts of money for big deals – led to the obvious extension of the thesis. Why one should transfer gold and silver from secure storages when it's possible to replace it by written commitments, which gives the owner an opportunity to get any amount of them without logistic difficulties.

The most secure store and guarantee of returned values were state banks. Quickly they got a monopoly on an approval and issue of banknotes of a specific sample in the regions. They obligated public of their regions to use exact banknotes during any deal. After a successful spread of national currency the banks took the obligation to change the note on values. A citizen of a country couldn't come to a bank and demand silver or gold in exchange of bills.

The fundamental difference of the bitcoin from other currency systems is that the bitcoin is not cash substitute. It is not valued. Its issuer is not a concrete person but the participants of the system. However nobody is committed to change it on anything at a fixed rate during its emission [4-6].

Bitcoin system operates on the basis of the software with open source. This eliminates the hidden "loopholes" and undocumented features in the system, and thus partly guarantees its security. Bitcoin forms a peer-to-peer network. In other words it doesn't have any governing body. The system works as an interaction between equal users [7-8].

Bitcoin doesn't depend on any special center specialized on emissions. Any user of the system can issue currency. Data on the movement of funds stored in a distributed database located on users computers. Database synchronization between users is performed automatically with the help of the technology based on peer-to-peer network Protocol. The security of the system is guaranteed by the usage of cryptographic protection [9-10].

2. TYPES OF MONEY

The main types of money are commodity money and token money. Various goods had the role of money in different countries: salt, cattle, tea, leather etc.

There were different monetary systems in counties:

- Monometallism (one metal – silver or gold – was used as money)
- Bimetallism (both metals were used as money)

Paper and metal money are token money. Its peculiarity is that the value as goods was much less than as money. In order to make paper and metal money become a legal tender, it must be fiat money. In other words - legitimized by the state and approved as a universal means of payment.

Under modern conditions fiat money is supplemented by credit money, so called «IOY- money» (I owe you-money). Money represents debt. This can be a debt obligation of the central bank (cash) or debt obligation of a private economic agent. So the paper money is credit money.

There are three forms of credit money:

- 1) promissory note
- 2) bill
- 3) check

A promissory note is a debt obligation of one economic agent (private person) to pay another economic agent with a certain amount borrowed, at a certain time and with a certain fee (percentage). The promissory note, as a rule, is given under the commercial loan, when one person buys goods from another, promising to pay after a certain period of time.

Banknote is a promissory note (debt obligation) of the bank. In modern conditions, as only a central bank of the country has the right to issue banknotes, cash are debt obligations of the central bank.

Check - the order of the owner of the bank deposit to give a certain amount of this contribution to himself or to another person.

Plastic cards are divided into credit and debit, but neither credit nor debits are money. First of all, they do not fulfill all the functions of money and are not the means of circulation. Secondly, credit cards are not money; it's just a form of short-term bank loan. Debit cards are not money because suppose the possibility to withdraw money from the bank account within the amount previously put on it, and therefore already included as a component of the money supply in the total amount of funds in bank accounts.

3. TRENDS IN PAYMENTS

History of the international market of plastic bank cards counts more than half a century. However, due to the simplicity and formation of this segment of the financial sector, nowadays it is on the threshold of global transformation. The source of transformations is a large scale of reasons, starting with the actions of individual players of the "plastic" market ending with global economic processes such as the liquidity crisis in the United States and the shift of the poles of economic influence [11].

4. IS BITCOIN EVIL? OR A BETTER MECHANISM FOR TRUSTED PAYMENTS?

With the development of the Internet people have to pay "at a distance" which sometimes is not small - financial relations often connect people from different hemispheres of the planet. Directly transfer funds do not work: to transfer money tete-a-tete is impossible. Thus it's important to turn to intermediaries - electronic payment systems, couriers or banks [12].

Any intermediary charges a fee for any operation. Nobody wants to work for free. In principle, the greater the volume of transfers of capital leads the higher the level of commission losses. With the development of the information business people are thinking about how to avoid costs and do business in conditions of absolute efficiency.

Great number of the ways of problem solutions was offered, but all of them were rejected. Even if a platform of commission-free payments would be invented how could we protect ourselves from frauds trying to prove that you have transferred a certain amount to the specified address or got it?

The solution was found in 2009 when Satoshi Nakamoto published the description of a new payment system based on mathematical calculations [12-13].

While creating Bitcoin he/they made the following [14-16]:

1. In order Bitcoin not to be subject to strong inflation they decided to limit the amount of virtual money (there is a tentative schedule of appearance of new units for many years to come). A virtual equivalent of gold was invented, because bitcoin is like gold, you can either buy it or mine it. The process of getting new units of the cryptocurrency is called mining.
2. In order Bitcoin is more alike gold it should be as difficult to mine as gold. All the miners with the help of their PCs carry out time-consuming calculations for this – they sort numbers, where the hash will match a specified pattern.
3. This pattern is chosen so that at any number of miners a new unit of bitcoin appeared not more often than once every ten minutes. Once in two weeks the system adjusts the difficulty of producing another unit of cryptocurrency (mining) to reduce or increase the probability of hitting at the right target.
4. The one who adds a new unit if cryptocurrency gets a commission to cover the costs. This sum decreases every fourth year, still the growth rate of the cryptocurrency is fully compensates.
5. Those that provide PS for mining both help the system to conduct transactions and add this data and synchronize it between databases of all the participants of the system. All new transactions are confirmed only by mining a new unit, it means once in ten minutes.

As the course of bitcoin is very high at the moment, the calculations are made in fractions of bitcoins, most of all Satoshi are involved in these operations, one unit of which is 0.00000001 Bitcoin [17].

Nevertheless, bitcoin has it's benefits and drawbacks [17-18]:

- **Independence** – the system is absolutely autonomous and does not need anyone's control. Moreover, it doesn't accept any influences from outside. You cannot see the processes of any transactions and you cannot reject, cancel and block any processes as well.
- **Limitations** - the supply of bitcoin is limited, it's production is complex and time-consuming, and we cannot just pick and print in the right quantity, as common money. According to the algorithm that ensures the viability of the cryptocurrency, you can get a maximum of 21 000 000 bitcoins, then their production will cease. It is difficult to predict what consequences will be, but unless there is a financial collapse, the cryptocurrency will simply remain in circulation and will periodically change course.
- **Complete anonymity.** By the numbers Bitcoin-wallets it is impossible to determine who is or is not the owner, therefore, opens the possibility to illegally launder money or cheat. But there is the other side of the coin: you cannot restore the access to your money as there is nowhere to come with your passport.
- **The absence of intermediaries** - the bitcoin transfer takes place without the involvement of a third party. This simplifies, accelerates and reduces the cost of the transaction, which is the advantage. Though makes them less safe, because it's impossible to withdraw the payment.
- **The lack of security.** The cryptocurrency unlike real money, is not backed by gold reserves or GDP, so the current high exchange rate of bitcoin can easily fall down to a full zero. The reason for it – absence of fundamental economic factors which can support it.
- **It's not legal.** Bitcoins can have a negative impact on the economy, therefore, the attitude towards bitcoin by governments of different countries is incredulous. Probably, bitcoins will never be legal because if it will be legalized real currency can be displaced.
- **Lack of popularity.** Not all economic institutions, online stores or services that accept payments trust bitcoins and sell goods in exchange for it.
- **Scalability.** It turned out that lack of popularity may be a great advantage. Initially distributed model of the blockchain carries some limitations, including the number of transactions and volume of stored database.
- **Unstable exchange rate.** Most probably it's the consequence of insecurity, but, nevertheless, the high volatility prevents this cryptocurrency conquering the real sector of the economy. It's low transfer fees would be appreciated by online-business. Though, one jump in the exchange rate for bitcoin may undo all obtained from the business revenues.

5. OTHER ETHICAL QUESTIONS ARISING FROM PAYMENT SYSTEMS: WORKER EXPLOITATION

Nowadays you can hear a common phrase “the salary was detained again”. Often they get it in parts or even don't get it at all because of different reasons.

Moreover, lots of workers are not satisfied with the high level of income tax, contributions to the pension fund etc. In some countries from the salary of a common worker is no more than 25-30% [19-20].

According to the law the employer must transfer salary to a bank card of the employee. Service bank is also paid by the worker. Moreover, if we think more profoundly we'll find other ways of spending money.

As for the bitcoin and the blockchain system, there are no third parties as I described already. Everything is clear and logged. If we understand the principle of the work of this technology we will be able to realize that it is unique in its security.

6. THE CASE OF PAYROLL CARDS

Debit card - is a payment card through which the disposal of funds in the deposit account, with which it is associated. The share of credit cards relative to debit continued to fall sharply. In Russia, the reason was the program held by various Russian banks and other credit institutions in relation to legal persons. This program is called "Salary project". The point is that salary is transferred to payment card of the organizations which take part in this program. Lots of organizations take part in it as it has a number of significant advantages: reduction of the functions of accounting, simplification of salary payment to staff, reducing time loss during the day of payment, the confidentiality of information about employees and their wages, the possibility of obtaining cash at any time [21].

The disadvantages of the calculations on the cards include a fee for the issuance of a card for annual service fees for cashing etc.

Another disadvantage is the lack of anonymity. Additionally, if payment for the goods or services is in cash the buyer has the opportunity to preserve their anonymity, while the electronic calculations the identity of the payer is identified with the help of technical devices. So buyers who do not want their transactions became known to the general public, prefer to use cash.

Using all the advantages the store has additional costs connected with the cost of purchasing or renting the necessary equipment. It is also stated in the literature that, when transferring funds to the account of the store, the bank charges a commission usually 2-3 % of the transferred amount [22-24].

Nevertheless, when making payment for the goods through plastic cards, unlike cash money, the speed of payment processing is slowed down: it is necessary to request a confirmation of payment from a third party. Moreover it has a negative impact on the turnover of retail trade enterprises.

The initiators of the introduction of credit and other types of cards were the banks, expecting to receive the following benefits [25-28]:

- the increase in consumer loans
- the increase of attracted resources
- the expansion of the Bank's activities in remote areas
- cross-selling additional products and services to cardholders
- organization of faster and more convenient calculations for customers
- reduction of volume used in the calculation of cash and hence reducing the cost of operations
- testing new, more advanced paperless technology
- unloading of the central office of the bank from the influx of customers
- fees that the bank takes over all operations with cards

Moreover, the customer pays for a card and for annual maintenance:

- it will increase the competitive capacity of the Bank taking into account the global trend of displacement from payment transactions not only cash, but also checks
- it increases the credibility of the bank as a participant in the innovation processes;
- prestige and advertising of the bank on plastic cards that customers used not only as a means of payment, but also as a sign of a certain social status, etc.

In order the card projects are effective, banks are forced to go to great expense: the charge for accession and membership in payment systems or the costs of organizing its own processing center, the cost of creating infrastructure to service the cards.

A serious disadvantage of domestic plastic business is the fact that the ATM is running mostly in one direction - on the receipt of funds. Unfortunately, the card projects are still dominated by salaries, the share of purchases is small. One of the reasons is in retail and the service sector has not yet developed the necessary infrastructure to service cardholders.

7. THE ADVANTAGES AND DISADVANTAGES

Undoubtedly, a thin bank card is more comfortable to carry than a fat wallet. Most likely, its all about advantages. . Then disadvantages come [29-30]:

1. To save money on plastic is not as safe as it seems. Some people believe that the money on the card are safer than cash in your pocket. Where did they get this? Probably, officials have convinced. However, keep cashless in the form of numbers on the servers of the banks is not as reliable as it might seem. Firstly (and this is the main disadvantage of plastic), the money in your account does not belong to you, but to the bank – never forget about it. This means that they can easily confiscate it (as in Cyprus) or arrest without any reason. The more money will rotate in non-cash sector, the higher the probability that one day we will be able to see round the zeros on the bills. Secondly, electronic money can be stolen either by hackers or phony credit card as well as pickpockets steal cash. Third, the bank will speculate your money, and if you go bankrupt, you will go over the years for insurance and prove that you are a sheep, and conscientious investor, but the bankers will have a different opinion.

2. The banking commission. It is now you'll be able to buy a pie without a bank fee, then gone. Then every citizen will be forced to pay the Bank for any purchase: for buying, for selling, banking cards, etc. are First 1% of large transactions (for example, when buying an apartment you will give the Bank 100 thousand dollars for the fact that it moved money from one line of the computer to another). Now for acquiring services (payments on cash cards) banks charge 2% on average. And then, if they wish, they will be able to take all fifty. Or even 99. Maybe I'm exaggerating, but the trend is exactly that: the growth of payments for each banking operation, because the banking system is a monopoly headed by a single center, which is free from competition and is fed by money. And monetary appetites, as we know, infinity. And you won't be able to do anything with it (the growth of Bank payments), as you will have no alternatives. In the end you'll have only barter.

3. The loss of freedom. The establishment of a total of cashless payments is an attack on personal sovereignty of every person, and this is the strategy of the global banking system. The whole modern banking system refers to the world, and it seems that there is no independent banks at all. (even the famous Swiss banks do not have the right to secrecy of deposits). Its task is to manage all funds of the planet's population from a single center. It is not important where is the center. What is more important - soon there will be the time when the account will simply be cancelled by pressing the button on a computer somewhere in London. At any time you can block the accounts of all the discontented, and thus to deprive them of the means to resist.

8. CREDIT CARD FEES

Nowadays the operation with plastic cards is still not widespread. And if almost all outlets of the developed countries unconditionally accept modern plastic cards, countries that stand on the step below in its development of the economy, restrict the use of cards only for the large supermarkets. Such disadvantage of plastic cards is quite noticeable.

The difficulty for certain segments of the population. Issuing banks are constantly working to simplify the interface of existing ATMs, but the majority of people, the older generation, experience noticeable difficulties in using them in practice.

High commissions also have a negative impact on trading organizations. It occurs because of possibilities of reception of payments for the charges, when the cost of acquiring initially built into the final cost of products.

Security vulnerability. Even with the current perfection of the security systems of modern plastic cards there is a high variety of frauds. This applies to the ATMs (if applicable cash), and to the process of payment the goods or services required in doubtful points. System of fraud in the Internet payments is especially developed. That's why it is necessary to be extremely vigilant. In this case problems with credit cards won't touch upon you [31].

Limits of cash. For some part of card holders specified limits of possible cash (daily or one-time, and so on) are quite unpleasant thing in the use of modern plastic cards [32].

Bank card has other not-so-significant shortcomings. It is transparency of personal incomes and expenses, that sometimes is a completely unacceptable fact and some of the problems with "tip" and so on.

People who let card balances climb increasingly are paying them down with home equity loans because they can deduct some of that interest from their taxes. But that doesn't explain why more people are adopting the habit of clearing credit card bills each month, before the debt has a chance to build. Some believe customers, already more sensitive to interest rates than they once were, also are using credit differently.

"The huge Baby Boom bulge clearly has retirement on their minds and is finally putting some money away," said Fritz Elmendorf, executive vice president with the Consumer Bankers Association in Arlington, Va. "Normally, as people get past home building, child rearing and the college period, they start to focus on putting money aside."

And the fact that credit cards are now accepted at places like the grocery store means people who ordinarily wouldn't use credit are charging purchases, using the cards as they do checks, and then paying off their bills every month.

The credit card business is still very profitable. Banks that specialize in the credit card business have higher returns on assets and equity - key measures of banks' profitability - than banks as a whole, according to FDIC figures.

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