

# Near Field Peer-to-Peer Payment System (NF3PS): Digitalization Adopt of Currency in Bangladesh

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**Abstract:** At present, paper currency is the major medium of exchange. Alongside there are different transaction carrier systems such as online or card-based payment. But questions come, how much money can you carry with you? Isn't the paper currency going to be old-fashioned? In this paper, we will show the history of money evolution, criteria for the long circulation of money (e.g., durability, divisibility, transportability, and non-counterfeit ability), existing transaction systems in the world, and some proposed payment systems instead of physical money. Finally, we motivate an approach of the Cryptocurrency model for *Near Field Peer-to-Peer Payment System (NF3PS)* from the perspective of Bangladesh Bank's rules & regulations which will show the possibility of the next revolution from paper currency to virtual currency.

**Keywords:** Near Field Communication (NFC), money evolution, P2P payment, counterfeiting, electronic transaction, monetary system.

## I. Introduction

There has been a need of exchanging services and goods from the beginning of civilization. At first, transactions were made by resources; later coins came up and then were followed by paper money. Nowadays by the grace of technology, we see several digital payment methods. The actual methods as those with card-based money have many disadvantages (e.g., account-based, no anonymity, no offline transfer, fees for every transaction) and are accordingly not a satisfying and acceptable replacement for coins and bills in e-commerce. Different kind of systems gives us different kinds of advantages in a different area. In this paper we will consecutively show money transaction carrier technology, the evolution of money and transaction medium, why money still retains the reliance, some existing online and mobile-based transaction system and their comparison, an electronic transaction in Bangladesh bank's perspective, the weakness and challenging issue in an existing digital system and proposed system and our motivation to NF3PS in Bangladesh by overcoming the previous challenging issue. Our main target is to show a tentative model of Near Field or short-range communication as a transaction carrier in peer-to-peer payment.

### A. Peer-to-Peer (P2P) Communications

Peer-to-peer (P2P) has become one of the most widely discussed terms in information technology. The term peer-to-peer refers to the concept that in a network of equals (peers) using appropriate information and communication systems, two or more individuals can spontaneously collaborate without necessarily needing central coordination.<sup>[1]</sup> This is a type of decentralized and distributed network architecture.

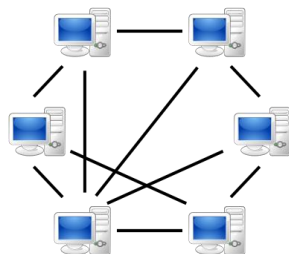


Fig. 1. A peer-to-peer network model

It has 3 level model characteristics; they are: Sharing of distributed resources and services, Decentralization, and Autonomy. This is a model for communication, now we will see what type of communication medium we will use for P2P.

## B. Near Field Communications (NFC)

NFC is a short-range high-frequency wireless communication technology that enables the exchange of data between devices over about a 10 cm distance or a few inches. The significant advantage of NFC over Bluetooth is the shorter set-up time. Instead of performing manual configurations to identify Bluetooth devices, the connection between two NFC devices is established at once (under a 1/10 second). Due to its shorter range, NFC provides a higher degree of security than Bluetooth and makes NFC suitable for crowded areas where correlating a signal with its transmitting physical device (and by extension, its user) might otherwise prove impossible. NFC can also work when one of the devices is not powered by a battery (e.g., on a phone that may be turned off, a contactless smart credit card\*, etc.).<sup>[2]</sup> The three modes it can operate <sup>[3]</sup>: are **R/W mode**, **Peer to Peer mode**, and **Card emulation mode**. Some of the NFC usages features showing below in the figure:



Fig. 2. NFC system

At now we can consider Bluetooth or infrared or any single-hop Wi-Fi signal as short-range communication. By providing data-integrated techniques during transactions this sort of technology can go forth. These are only transaction carriers for money. To convert physical money into a virtual entity we need to know how this paper currency arrives in our day-to-day life of exchange.

## II. Evolution of Money & Transaction

Money is a good that acts as a medium of exchange in transactions. Classically it is said that money acts as a unit of account, a store of value, and a medium of exchange.<sup>[4]</sup> So money is not only a well-designed paper sheet or metal block. Humans have invented different types of exchange mediums from different ages for their economic benefaction and till now paper money achieves the most powerful trust among us. So, there is a strong possibility of the digital concept of money will someday become a breakthrough focus for our finance.

### A. Money Evolution

Have a little journey about money. In the beginning, *Barter* is the exchange of resources or services for mutual advantage, and the practice likely dates back tens of thousands of years, perhaps even to the dawn of modern humans. After thousands of years, domestic animals like cattle, sheep, and other livestock took the place of the oldest money system. After that, a *cowrie* shell of the mollusk is used as a money transaction. Even as recently as the middle of this century, cowries have been used in some parts of Africa. The cowrie is the most widely and longest-used currency in history. The First Metal money and coin of Bronze and Copper cowrie imitations were manufactured by China at the end of the Stone Age and could be considered some of the earliest forms of a metal coin. Leather money was used in China in the form of one-foot-square pieces of white deerskin with colorful borders. This could be considered the first documented type of banknote. In all, China experienced over 500 years of early paper money, spanning from the ninth through the fifteenth century. The wampum is the earliest transaction medium used by North American Indians in 1535. Gold was officially made the standard of value in England in 1816. At this time, guidelines were made to allow for a non-inflationary production of standard banknotes that represented a certain amount of gold. Today, the currency continues to change and develop, as evidenced by the new \$100 U.S. Ben Franklin bill. Now it's time to realize that in the future, Digital cash in the form of bits and bytes will most likely continue to be the currency of the future.<sup>[5]</sup> The following figure clearly defines the evolution of the monetary system from 3000 BC to 2000 and beyond. The noted point is that the amount of money is dependent on the reserved gold of any state. Now a day's money is also reserved in bank-volt and online or card systems taking the temporary place of money.

## B. Security Issues of Paper & Metal money:

There are so many security issues in industrial money-making. In 2011, the U.S. Treasury issued a newly designed \$100 bill that incorporates the latest high-tech anti-counterfeiting features. Why the real money cannot be counterfeited? A big question is in here. An article <sup>[6]</sup> shows the extraordinary feature of money-making security issues. There are 10 key anti-counterfeiting features. They are:

- 1) Intaglio Printing
- 2) The Portrait
- 3) Color Shifting Ink
- 4) Microprinting
- 5) Fine Line Engraved
- 6) Serial number and treasury seal
- 7) Currency Paper
- 8) Multi-colored Fibers
- 9) Security threads
- 10) Watermark

Different countries maintain their security according to their regulations but the above 10 features remain almost the same. Remember that money is only the physical value of the exchange medium but there are several ways to transact it (e.g., hand-to-hand, online, mobile or ATM card based, etc.). From hand to hand today we are using wired and wireless technology to transfer money by service provider. Our focus will be using the following criteria we will propose a secured Cryptocurrency model.

## III. Our Motivation for NF3ps In Digital Bangladesh

As per our government's aim for Vision 2041 Smart Bangladesh in this globalization era, almost everything turns out digital and online based. A third-world country like us 47 years after independence we have already achieved a great revolution in the industrial, economic, and digital areas. Past 5-8 years we become familiar with mobile, computers, and advanced technology also the online-based system in day-to-day life. Especially our financial zone has already used e-transaction systems at small and broad levels. People are putting their reliance on mobile banking, online marketing, all other ATM card transaction, and e-commerce activities. But still, paper money and metal coin never recede their place. All the monetary system and object value, the final transaction is happening over the physical money. But this money gets older, decayed, and shabby so new money has to produce instead of the older money; So again, the money-making production starts with raw materials like rag paper, color-shifting ink, drawing a portrait, making watermarks and many more authentic steps which is a costly effort for physical money and coins.

### A. Money Virtualization

Our motivation is saying that why are we not completely giving the digital system (virtual money) in place of physical money? Nowadays we are just using the online or digital system as a carrier but not as a leading value. Where some places in the world are using semi-modified digital coins (e-Wallet) or NFC-based transactions.<sup>[7]</sup> So according to our proposed view by reviewing all the previously proposed models and developed systems there should be a total replacement of paper money with digital token money. A near field p2p payment system (NF3PS) that model contains only 2 users and advanced authentic software for an atomic transaction by cryptographic token value instead of paper money. As we see previously in the history of money evolution, money as an exchange medium takes place in our mind because of its mobility and set unit value measuring. Though counterfeit money moves all over the country sometimes it harasses us and corrupts our economy, but we people still have strong faith in the paper monetary system and its extension. Because paper money has overcome all the security and interchange weaknesses over the entire exchangeable medium such as barter, wampum, cattle, cowries, and gold.

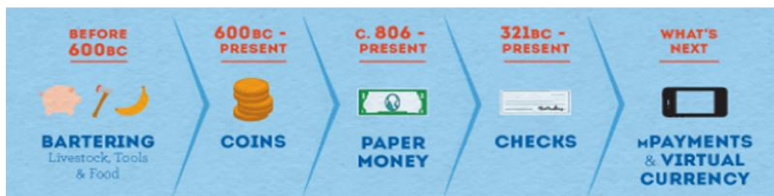


Fig. 3. Future of currency

In our country in the primary stage of mobile technology, it was unknown and unpopular but now everyone; even illiterate, non-technical people can easily handle a mobile phone without knowing its full feature functionality. That is because worldwide convention and forthcomingness impose people to keep pace with the modern period. Now we must take proper steps to develop this NF3PS and make this popular too.

### B. NFC in the P2P Payment System

We suggest NFC (*Near Field Communication*) as a medium in **Peer-to-Peer Payment Systems (3PS)** because the ATM or online user already has faced the common problem during money transactions such as network traffic or unavailability. The NFC has superiority over the online system since the online system has a possibility of an attack by a hacker. Moreover, the online data error rate is high, and transmission speed is not so always fast enough; it has multi-hop communication that redundant the data routing method. Also, during the error period, it must reprocess the data transmission which consumes time and queuing delay for transaction failing where NFC has extra facilities in these cases. Almost every mobile phone already has at least one NFC medium and does not need much experience to use it.

### C. Proposed infrastructure for NF3PS

Our proposed Near Field Peer to Peer Payment System (NF3PS) has a simple structure model with a complex integrated application scheme. A brief discussion about the requirements, components, and process of this system are:

- 1) Two endpoints; users mobile (Buyer and Seller or two traders)
- 2) The mobile must have at least some NFC feature such as Bluetooth or infrared and software installable platform with internet accessibility.
- 3) An easy shortcut accessible interface and understandable, flexible command module for all levels (literate, illiterate, non-experienced, etc.) of people.
- 4) NF3PS must support standalone features like a wallet. It should not depend on any mobile operator generally.
- 5) Strong encrypted authorized application software.
- 6) Small storage to store digital cash (token coin), transaction information log history, and user information.
- 7) If required establish a server connection to update the reserved balance status and to validate digital currency token whether the token is original or duplicate.
- 8) For remote device detection and during suspicious transactions it will use main server validation.
- 9) Also, the digital cash transfer has an option for a re-spend feature and money-back issue according to the user's compliance.

There are many more steps, security, and process concern in this system we are just giving only simple transaction possibilities within our limited resources. Only infrastructure is not enough to hold this system, so we must also emphasize security issues.

### D. Encryption procedure to prevent counterfeiting

To replace physical entity money with a virtual entity called digital token coin we must ensure some extra facilities, features, and security. Observing the ethics of secret service agencies, money manufacturer authorities, and Bangladesh bank's money distribution can be applied to this system to maintain the reserved capital. We must consider the permission of Bangladesh Bank according to their electronic fund transfer rules & regulations regarding our new proposed system. In the security issue our concern for unique and unclonable digital money *each e-coin or virtual token money will contain a unique-strong-encrypted token value*. We will replace every feature of anti-counterfeiting in the encryption process. In our proposed model, each step of the anti-counterfeiting process shown in section 3.3 will hold individual departments of money-making industries. 10 of the department

will never know each other's process of strong encryption rather than they will only get the output cipher value of a token. Every department will encrypt the raw token by using its secret **key** and after encryption, the intermediate cipher token will be passed to the next department. After encrypting using keys  $k_1, k_2, \dots, k_{10}$  final e-token we will get the final token value which we will use as a unique digital coin. To counterfeit, the e-token one must gather all 10 individual keys. As we can see each key is only known to the self-department and no others hence there is almost no chance of hacking the e-token/coin.

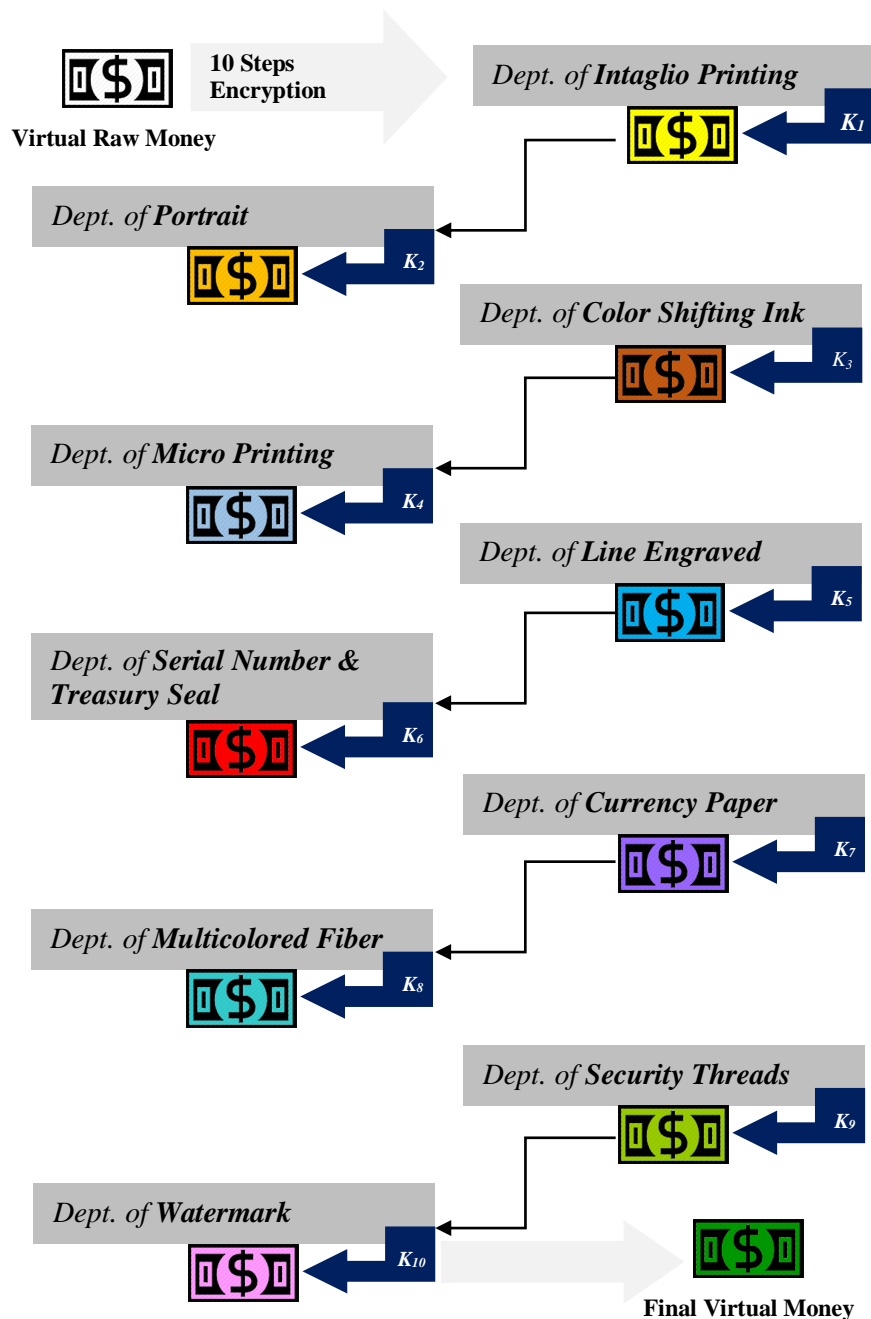


Fig. 4. Concept of NF3PS Virtual Money-Making Process

#### IV. Conclusion

Paper currency seems on its way out. We cannot surrender it completely until there are secure and accessible processes in place that are accepted by businesses, consumers, and all levels of people; so, it's going to be a long, slow, circuitous route. But it is a path that we are certainly headed down. In summary, this new model will change the exchange medium from physical paper

money or metal coin to virtual digital token coins and speed up the transaction system among users. Also, it will act similarly to money in small trade and big financial scenarios. In the future, we plan to develop this system with a strong protocol. There may be some preliminary difficulties like popularity, ease of usage, making available, maintaining the authorized rules and regulations, etc. also technical issues like interface design, developing under existing technology, free of cost, reliability, and security aspects.

## References

1. Ramesh & Brian. "Peer-to-peer computing: The Evolution of a Disruptive Technology". Idea Group Publishing. February 2005.
2. "NFC (Near Field Communication)", gsmarena.com. Web. 16 March 2014.
3. "About NFC." Toppan forums. Nfc-world.com. 20 March 2014.
4. Rev. Samuel Bakare, "World Validators", Xlibris Corporation UK. 31 October 2011.
5. NOVA. "The History of Money." Pbs.org. Public Broadcasting Service. 26 October 1996. Web. 16 March 2014.
6. NOVA. "Anatomy of a \$100 Bill" Pbs.org. Public Broadcasting Service. 08 January 2002. Web. 16 March 2014
7. Curiosity. "Big Question: How much longer will we use paper currency?" discovery.com. Web. 25 March 2014