

NEO Classic

White Paper

V. 1.0

Table of Contents

Executive summary	2
1. Technical background information	3
1.1. Understanding NEO	3
1.2. NEO – advantages over Ethereum	4
1.3. NEO issues	5
1.4. Understanding forks	6
1.5. Snapshots	8
1.6. Forkability of NEO	8
2. Introducing NEO Classic	10
2.1. Connection to NEO	10
2.2. Snapshot and distribution	11
2.3. Mining in the Ethereum network	11
2.4. Multiplatform web client	12
2.5. Digital and digitized assets	13
2.6. Asset marketplace	14
2.7. Second-layer protocol support	15
2.8. Summing up	18

Executive summary

As the first wave of the post-industrial revolution comes to an end, we are getting closer to a real smart economy. This economy will be characterized by increased independence of people from centralized authorities, higher transaction rates, disintermediation, lower costs and improved cross-border communication. The age-old issue of trust in business relations will be resolved through the use of blockchain technology and smart contracts that provide zero cost, instant cross-border payments and simplify contract compliance verification.

At the same time, the blockchain technology itself is undergoing profound transformations. Its scalability will soon improve significantly with the advent of Layer 2 protocols, and the launch of decentralized applications will become much more affordable. Cryptocurrencies and dApps will cease to be an exotic novelty for the most technologically savvy and will become an everyday reality.

NEO Classic intends to become an integral part of this transformation, helping to facilitate the transition to a smart economy. The project offers a convenient environment for launching new digital assets and digitizing real assets in accordance with the principles underlying the existing chain of NEO blocks. On the other hand, NEO Classic presents the many benefits of the Ethereum network, such as scaling protocols, mining capabilities and an easy-to-use API to launch new dApp applications.

This document outlines the technical basics needed to understand the goals of NEO Classic, including forks, scaling protocols, and various mining algorithms. In addition, the White Paper discusses the specific technical features of NEO Classic and its advantages for NEO coin holders. The reasons for using the NEO network snapshot as a basis for distributing NEO Classic coins (NEOC) are also explained, as opposed to conducting an ICO.

NEO Classic implements a number of concepts inherent in NEO (asset digitization, digital identification, etc.), and provides a number of advantages for token holders, miners and digital entrepreneurs. This makes the new proposed cryptocurrency a successful combination of the advantages of two systems: NEO and Ethereum. At the same time, NEO Classic eliminates a number of drawbacks present in these networks, such as the excessive centralization of NEO and the slow speeds common to Ethereum.

1. Technical background information

NEO Classic is an ERC20 compliant project that combines some of the most successful principles that NEO is based on with the benefits provided by the Ethereum network: from mining capabilities to support for the Lightning Network. To understand what NEO Classic offers to do and why it will benefit the cryptocurrency community as a whole, it is important to have a clear idea of some of the basics of the blockchain. In this section, we provide a detailed analysis of NEO's strengths, its potential weaknesses, and its differences from Ethereum. We also explain the difference between different types of cryptocurrency forks and explore the possibility of forks in the NEO network. It explains the basics of the Byzantine failure protection mechanism, as well as the algorithms “performance testing versus impact testing” and the importance of snapshots for the branching process.

1.1. Understanding NEO

NEO is the first major cryptocurrency project in China with a total market capitalization of more than \$ 1 billion as of October 2018. It has the advantage of being supported by the Chinese government and a number of leading Chinese companies, including Alibaba. Like Ethereum, NEO is designed as a platform that can contain ICOs, dApps (decentralized applications) and smart contracts. The main declared goal of the system is to simplify the transition to a “smart economy” based on the digitization of real assets. The ownership of such assets is confirmed by digital identification (which may belong to an individual, organization, company, etc.). To authenticate a digital ID, the NEO network uses a complex procedure, which includes face recognition, fingerprints, SMS messages, emails, etc.

NEO uses two types of crypto assets on the network. The first - NEO coins themselves - act as shares, that is, give the owner the right to own part of the network. The total supply of NEO is limited to 100 million, and the negotiable supply is 65,000,000. All NEO coins were mined when creating the genesis block at the time of launch. NEO is not divided - therefore, the smallest amount of NEO that everyone can hold is 1.

The second asset, somewhat confusingly known as GAS, is being generated according to a special algorithm and will reach its maximum supply in about 22 years. GAS is used to power transactions on the NEO network, such as deployment of smart contracts. GAS is provided to NEO holders as dividends. So for instance, a holder of 100 NEO will receive a GAS reward of about 10 GAS per year (circa \$50 with the current GAS price), resulting in a ROI of about 3%.

On the other hand, GAS works just like gas on the Ethereum network, paying for various operations on the blockchain. Since the amount of GAS rewards generated may not be enough to pay for all the transactions required by a user, additional purchases of GAS may be required.

1.2. NEO – advantages over Ethereum

Despite the fact that NEO allows you to create and deploy smart contracts and ICOs, like Ethereum, it has a number of attractive advantages over the Ethereum network:

1) Smart contracts can be written using C # and Java (Python should be added in the near future), which means that developers do not need to learn a new programming language to write smart contracts for the NEO blockchain. In contrast, developing a smart contract on Ethereum requires knowledge of Solidity.

2) Improved negotiation protocol - NEO uses a stake proof approval protocol, while Ethereum uses acknowledgment of work (although the hybrid PoS / PoW protocol is being tested). This means that in NEO, the node for checking the transaction is selected by the number of NEO coins they hold in the form of a blocked deposit (stake), and partly by how long they held them. This algorithm requires much less computing power, allowing ordinary users to participate without buying mining equipment. It is also more sustainable and cheaper, as well as much more environmentally friendly. Since neither NEO nor GAS coins can be mined, nodes that complete blocks on the network should be called falsifiers, not miners, and what they get is transaction fee, not block reward. On the other hand, Ethereum is still fully proving its work: miners compete in solving mathematical puzzles to decide who will get to complete the block and get a reward. Work requires much more computing power and electrical energy, which makes it expensive and environmentally unstable.

3) Delegated Byzantine Fault Tolerance protocol – this consensus algorithm allows the keep the system live and running smoothly even when some of its nodes (up to 1/3) experience failure or act maliciously – that is, intentionally transmit incorrect information. Byzantine fault tolerance mechanism allows to reduce energy consumption, since the system does not require a round of confirmations from all the miners before finalizing a block. Ethereum has implemented the protocol in a hard fork in October 2017, but NEO has featured it from the start.

4) Network capacity – the NEO network can in theory handle thousands of transactions per second, while the Ethereum network's current capacity is only about 25 transactions per second, which often results in delays processing payments.

5) Chinese government support – many believe that the potential of NEO is larger than that of Ethereum due to its inherent compliance with the state regulations in China. What’s more, the founder of NEO Da Hongfei was asked to advise the Chinese authorities on the best course of action regarding cryptocurrency exchanges and ICOs – and he famously recommended temporarily banning them in order to reduce the number of scams and failures and better utilize the potential of blockchain. In the world where official regulation of cryptocurrencies is becoming ever stronger, the support of China can prove crucial to the future of NEO.

6) Protection against quantum computers. Even though no commercial quantum computer is available on the market yet, they will appear in the next couple of years; many believe that quantum computers will represent a deadly threat to cryptocurrencies, being able to hack into blockchain networks and private keys. Ethereum has no valid protection against quantum computers so far, while the developers of NEO have apparently already developed a mechanism called NeoQS.

1.3. NEO issues

With all the advantages that NEO has over Ethereum, it also suffers from a number of issues that prevent the network from achieving its full growth potential.

1) System speed – in spite of the advertised capacity of thousands of transactions per second, the actual speeds on the network are usually much slower, and in periods when an ICO is running, one block can take minutes to complete. On some occasions, the network experienced outages lasting up to two hours.

2) No mining – since all NEO coins were pre-mined during the creation of the very first block, no new NEO can be created. GAS cannot be mined, either, since it is automatically generated by the system. Thus, the network cannot profit from the attention of the mining community. Pre-mining all the coins concentrates vast amounts of a new cryptocurrency in the hands of the developers and early supporters, creating a level of centralization that – as many believe – goes against the very ideology of cryptocurrencies.

3) Centralization and regulation – while the support of the Chinese government can be good for the future of NEO in China, it requires a high level of control of both the team and the regulator over the network. The rules of the game can be changed at any moment to comply with new laws and rules.

4) High fees – among all leading blockchain platforms that allow for deployment of new cryptoassets (Ethereum, EOS, etc.), NEO is currently the most expensive. Launching an asset will cost between 100 and 1000 GAS, depending on the type and complexity, which with the current (as of October 2018) GAS price of \$5.78 means an investment between \$578 and \$5780. Launching an ICO carries a fixed fee of 5000 GAS - \$28900! This is prohibitively expensive for most ICO teams. For comparison: deploying even a complex ICO smart contract on Ethereum generally doesn't cost more than \$100.

5) Smart contract vulnerabilities. To date, two important vulnerabilities have been discovered in the way NEO handles smart contracts. The first is the so-called storage injection vulnerability (NEP-5) – the potential possibility to increase a token's total supply by sending more tokens to the contract's Total Supply string used as an address. While new tokens cannot be created this way, the contract's owner's address can in theory be changed, and consequences for advanced dApps can be disastrous.

The second vulnerability recently discovered (August 2018) is the DoS attack vulnerability, which can allow a hacker to recreate a classic DoS (denial of service) attack. In this case, a malicious smart contract can cause all network nodes to crash as it propagates across the NEO blockchain. Of course, launching such a smart contract would require the hacker to pay the required high fee. The vulnerability was patched a few hours after discovery, but there may be others. NEO is a very promising but still very new platform, so the extent of its security issues remains unclear.

1.4. Understanding forks

The term “fork” can take various meanings in the cryptocurrency realm, resulting in a lot of confusion. In its simplest form, a fork is a situation when two blocks are creating pointing to the same previous block. In most cases, this is accidental (and happens often in Ethereum and other networks) and is quickly resolved: whichever of the two split chains gets a new block faster becomes the truthful chain, while the transactions in the other are reversed, after which it is abandoned. Such forks are unplanned and usually mean only a delay, not a change to the system.

By contrast, forks that permanently split a chain are more serious and can be both planned or unplanned. Since most cryptocurrencies are open-source, any developer can write and present to the community a potential improvement or enhancement of the existing code. Users who accept a proposed change need to upgrade their software.

In a soft fork, those users who do not perform the required upgrade can still use the network, view new transactions and participate in consensus, but they will lose part of the functionality – for example, they will not be able to complete new blocks and get rewards. In a hard fork, users are not able to use the network without upgrading their software (though they are still able to use the old, unforked version of the network). This is similar to the release of a new version of Windows: users can choose to continue using Windows 7 or 8.1, for example, but newer versions of many applications (such as Photoshop, Office, etc.) will not work on their machine until they upgrade to the latest Windows version.

In some cases, the original developer team includes a hard fork in their project roadmap and presents the necessary upgrade with all the necessary explanations. In such cases, all network users readily accept the fork. Sometimes the need for a hard fork arises suddenly as a result of a hacker attack or a dangerous vulnerability being discovered. Finally, the growth and scaling of a network can require a fork – just like it happened with Ethereum, which introduced its new version (Constantinople) in October 2017. It includes the dBFT (delegated Byzantine Fault Tolerance) protocol, which will allow the network to process many more transactions per second.

Sometimes part of the community doesn't accept the fork (for ideological reasons, for example) and remains behind. In this scenario, the majority that chooses to go ahead with the fork retains the original name of the coin, while the minority that rejects the upgrade essentially keeps using the old coin, but under a new name. The most famous example is probably Ethereum, which split to correct a vulnerability that had led to the collapse of the DAO project (Decentralized Autonomous Organization) after an attack. Those users who could not accept the centralization of control required by the fork still use the "old" Ethereum, but under the name of Ethereum Classic (ETC). Their ideological choice has cost them quite a lot: the price of ETH just before the fork was circa \$13 but has since grown manifold (circa \$200 at the time of writing, but its all-time high was over \$1400 in January 2018). ETC's price, on the other hand, hovers around \$10.

In other cases, hard forks are proposed by users themselves, when the consensus on the network splits. Some developers in the community may find that a serious change is necessary to reduce network fees or increase processing speed. This is exactly what happened with Bitcoin Cash, Litecoin, and Dogecoin, which are all modifications of Bitcoin. In such situations, the community is permanently split, and a new coin is created. To attract users and miners to the new coin, it is usually distributed for free to holders of the old coin in the form of an airdrop. For example, in the recent Bitcoin forks, each BTC holder could receive 1 BCH (Bitcoin Cash), 1 BTG (Bitcoin Gold), 10 BCD (Bitcoin Diamond), and 0.5 BTX (Bitcoin Core). It is important to

note that new coins are awarded for free, so that holders of the old coin do not need to give it up – the very fact of holding BTC, for example, gives the owner the right to claim and collect free new coin. This ensures a wider adoption and circulation on the new coin on the market.

1.5. Snapshots

Shortly before a fork happens, a so-called snapshot of the network is taken – essentially, it is a copy of the whole blockchain that lets fork developers know how many of the old coins each user holds. A snapshot is crucial, since free new coins are distributed in accordance with its data. Sometimes an exact date and time is announced for a snapshot and sometimes the block height (that is, the block number which will be used for the snapshot). A combination of the two methods is possible, when the date is provided long before the fork and an exact blockheight is given shortly before the snapshot. This is useful when the computing power in the network and the resulting hash rate can change very quickly (for instance, with the entrance of a new mining rig), as it happens often with Bitcoin or Ethereum.

It is important to point out that the number of free coins that each holder receives depends on the number of old coins he or she holds at the moment of the snapshot, not at the moment of the fork itself (which can happen hours later, once the first block of the new chain is completed). After the snapshot, users are free to do what they like with their old coins, including selling them. This makes forks an attractive investment instrument, since one may choose to buy some of the “old” coins in order to get new cryptocurrency for free, then sell the old coins and wait for the new currency to get listed at an exchange to sell it, too.

1.6. Forkability of NEO

A lot of misunderstanding and incorrect representations surround the question of NEO forks. To put it simply, NEO cannot be forked in the same way as Bitcoin or Ethereum – that is, there is no way to split the chain and create a new coin based on NEO. The reason for this is the implementation of the delegated Byzantine Fault Tolerance protocol, which requires at least 50% for a consensus on any change. This means that a change to the network can only be accepted or rejected by the network as a whole. If it is accepted, the old chain will be abandoned and the new chain will automatically become the “true” one, to be used by everybody. It is impossible for some of the users to remain with the “old” NEO.

That said, it is possible for the whole NEO network to be upgraded upon the initiative of the developer team and subject to a general vote. As recently pointed out by the founder and CEO

Da Hongfei¹, NEO might need a major upgrade in the future, but it will take at least a year. Such an upgrade would create NEO 3.0 – a more efficient and secure network. It will require such a serious change to the code that a new genesis block may need to be created. In this case, users will not need to do anything – their NEO and GAS coins will be exchanged automatically, and the transfer for developers should be seamless. Old transactions will remain on the NEO 2.0 chain but will be readily available for review.

One instance that has generated significant confusion around NEO’s ability to fork was an accidental fork that happened in September 2018.² The dBFT (delegated Byzantine Fault Tolerance) that NEO uses is not the same as the original scheme (known as Practical Byzantine Fault Tolerance) proposed in the research paper by Castro and Liskov in 1999.³ The original protocol includes three stages to reaching a consensus: pre-prepare, prepare and commit. In NEO and other networks that use dBFT, the last stage – commit – is omitted to make the process faster and less resource-intensive. However, this can lead (in rare cases) to a situation where nodes create two valid blocks with different hashes but the same block heights, which results in an accidental fork. This is exactly what happened to NEO, stalling the consensus. The situation was eventually resolved and one of the chains was selected as the true one. The fork was unexpected and required a vulnerability patch, but it is crucial to note that it was not a planned or specially prepared hard fork. Once again: a “true” hard fork, in which a new NEO-based coin is created, is impossible on the NEO network.

1

<https://www.chepicap.com/en/news/3831/neo-s-da-hongfei-probably-need-a-hard-fork-or-new-genesis-block-for-neo-3-0-.html>

2——— https://www.reddit.com/r/NEO/comments/97qm27/how_did_neo_fork/

3——— <http://pmg.csail.mit.edu/papers/osdi99.pdf>

2. Introducing NEO Classic

NEO Classic leverages the strong methodological foundation behind NEO (smart economy, crypto assets, digital identity verification) with important practical benefits of Ethereum (mining, Lightning Network, low fees, etc.). In this section, we will look at the main functions and tools of the NEO Classic project, including its ERC20 mining token, an early distribution scheme among NEO owners, and various types of digital and digital assets that can be created using NEO Classic. Considerable attention is paid to the verification of user identity and second level scaling protocols.

2.1. Connection to NEO

As stated in the previous section, real hard forks like Bitcoin / Bitcoin Cash are not possible in NEO. Therefore, NEO Classic should not be seen as a genuine fork of NEO. Rather, it uses some of the most successful principles that NEO is based on to create a more efficient and secure Ethereum-based blockchain environment while focusing on the NEO community. The launch moment of NEO Classic is called simplicity for reasons of simplicity, but in fact an ERC20 token is created that takes the best of both worlds.

We have decided to mainly address the NEO holders community for several reasons:

- 1) It is altogether smaller, more tightly-knit and forward-looking than the Ethereum community, which is overloaded by newbie users who cannot contribute quality new assets to the network;
- 2) NEO has issues that have already become very clear to users and developers participating in the network and that NEO Classic can effectively address;
- 3) NEO network hasn't yet become a fertile ground for scams and undercooked, low-quality projects – the entrepreneurs interested in launching their projects on NEO exhibit a more serious approach to planning and development;
- 4) The concept of smart economy and digitization of real-life assets together with a sophisticated authentication system appeals to the founding team of NEO Classic.

It is necessary to point out that the development team of NEO Classic is not affiliated with the original NEO team. The prefix NEO in the name of the project is used in accordance with the tradition of naming new forked coins after original cryptocurrencies they fork from (as in Bitcoin Cash and Bitcoin Gold), even though NEO Classic is not a real fork of NEO.

2.2. Snapshot and distribution

The initial distribution of free NEO Classic coins (NEOC) will be preceded by a snapshot of the NEO blockchain. The picture is scheduled for August 24, 2019 (20:00 GMT). The exact block height will be announced later.

All users who have received NEO coins at the time of the snapshot will be able to get free NEOC coins in a ratio of 2: 1. For example, a user with 100 NEO will be entitled to 200 free NEOCs. Only NEO coins held in NEO's private wallets (such as Ledger Nano S, NEON, NEO-GUI, etc.) will be eligible for a free NEOC reward. Users who store their NEOs in exchange wallets will not be able to claim free coins. A possible exception would be sharing, which adds NEOC support before the snapshot.

After the picture is taken, NEO holders will be free to sell or transfer their NEO tokens at their discretion - they will still be able to claim a reward.

The total NEOC supply is limited to 225 000 000 coins, out of which 20 million are reserved for further improvement and development of the system and 5 million for the bounty campaign.

2.3. Mining in the Ethereum network

For a long time, there were no mineable ERC20 tokens in the Ethereum blockchain – moreover, many users still believe that such tokens cannot be mined. Instead of being created by miners, such tokens are traditionally pre-minted by the smart contract owner and distributed to backers during an ICO or for free in the form of an airdrop. The problem with this scheme is that ICO tokens are considered securities by regulators in more and more countries, since they represent a transfer of value that allows the token holder to sell the token later and earn a profit; the resulting income (that is, an eventual increase in the price of the token) does not result from any effort made by the token holder. Such a token sale model – making a contribution to a common enterprise with the goal of earning profit that stems from other people's efforts – is what constitutes a security according to the famous Howey test (named after a court case presided by the US judge Howey and used by the US Securities Commission, or SEC, to determine if a certain asset is a security).

On the other hand, mined tokens or coins cannot be considered a security from this point of view, since they require a considerable effort on the part of a miner to create (by solving

mathematical puzzles in the Proof-of-Work consensus protocol). For this reason, altcoins that are mined usually do not attract regulators' attention.

Apart from the regulatory issues, ICOs are subject to a number of other problems, including numerous frauds (known as scams) and frequent failure due to the fact that such projects raise funds without a viable product.

Moving away from the ICO model and pre-minted tokens to mined ERC20 tokens represents a good solution to the ongoing ICO crisis. Creating mineable ERC20 tokens is not only possible but completely feasible, as long as the target difficulty level increases with time along with the increase in hash rate. NEO Classic will be just such a token. Its additional advantage lies in the fact that it will allow small independent miners (even beginners) to enter the field, since they will not have to compete with large mining farms. The reward will be set to 5 NEO Classic per block. The system will provide a wide range of tools for both individual miners and those who seek to form a pool. We believe that the future of the Ethereum network lies in mined tokens and not in dubious ICOs where founders have full control over token supply.

Not only will NEO Classic be mineable – new assets created on the NEO Classic blockchain can be designed to be mined, too. While the block reward model is the most convenient basis for the mining process at present, the introduction of major Ethereum updates (starting from Constantinople) that introduce the Proof of Bet consensus mechanism will make PoS an available option in the near future.

2.4. Multiplatform web client

A convenient, multi-functional client application is necessary for any cryptocurrency project. Unfortunately, most of the existing solutions - be it wallets, exchanges or trading floors - are overloaded with unnecessary features and have a steep learning curve that scares off many newcomers. The NEO Classic team has developed an easy-to-use yet modern web client optimized for various devices, browsers and platforms. It will provide access to the NEO Classic wallet (used to store NEO Classic and any assets created on the basis of its blockchain), the client for mining and the asset market.

The client will feature tools for identity verification, community-building, project promotion, etc. NEO Classic wallet can also be used for storing ether and other ERC20 tokens, including those that are not created on the NEO Classic network. NEOC (NEO Classic tokens) will also be supported by many other popular wallets, such as Trezor.

The development of the web client and other features will be financed out of the proceeds from pre-mining and forked coins allocated for the project's reserve fund.

2.5. Digital and digitized assets

NEO Classic will be a complex but user-friendly environment for launching digital assets of all types: platform tokens with support for blockchains, cryptocurrencies, property rights, shares in startups and so on. NEO Classic will provide a complete set of tools to create a new asset and ensure its adoption in the community. Digital assets that can be developed and sold with NEO Classic include functional and non-functional ERC tokens for use in ICOs, blockchain games, investment projects, etc. E. However, existing assets (virtual and physical) can also be digitized and used on the NEO Classic network.

The concept of digitized assets that underlies the present NEO blockchain will be further developed in NEO Classic to leverage the advantages provided by the Ethereum network and new second-layer scaling protocols (see below). Not only on-chain assets can be transferred and traded – any asset, including a physical object, can potentially be digitized. Put simply, digitization of an asset means creation of a digital proof of ownership that can be transferred with or without physically transferring the asset. A similar scheme already works in our everyday life: for example, selling a car requires making a record of the new owner in the car's identification document. Similarly, buying company stock does not mean physically transferring part of the company's production facilities to the new owner: rather, the change of ownership is recorded. To digitize such assets as a car or a gold bar, a special code (usually a QR code) needs to be physically added to the asset – for instance, stamped somewhere on the surface. For some assets, such as real estate, an address would be enough. Data from the code is then recorded on a blockchain. In case of a sale of such a digitized asset (where an on-chain transfer is not possible), the funds would be stored in a multisig escrow wallet provided by NEO Classic until the buyer receives the asset (or a proof that the ownership has really been transferred – as in the case of gold bars stored in a safe vault, for example).

Naturally, the more valuable an asset, the more important it is to verify the identity of its owner or buyer. NEO uses a sophisticated authentication system known as digital identity, and this concept will be enhanced in NEO Classic. A whole variety of tools can be used to create a digital identity of a user, and the complexity of authentication will depend on the type of asset that a specific user owns or transfers. For example, ownership or sale of digitized gold bars or shares in the ownership of a company worth thousands of dollars requires a more stringent identity check than a simple exchange of cryptocurrency. Among the tools used to create a digital identity are

facial recognition, fingerprints, digital signature, single-use codes sent by email or sms, and so on. Those NEO Classic users who make the effort to go through all the checks will have preferential access to the services of the platform.

2.6. Asset marketplace

All digital and digital assets created by members of the NEO Classic ecosystem will be available on the platform market. A decentralized voting and selection process will be conducted to evaluate assets and assess their value, as well as to prevent the appearance of risky or fraudulent assets on the market.

As we have pointed out before, all kinds of assets (first digital and, in the near future, digitized real-world assets) can be launched on NEO Classic and traded in the marketplace. This means the following, among others:

- utility tokens issued for crowdfunding purposes and to give access to new platforms;
- new cryptocurrencies;
- equity shares in a new company;
- collectible in a blockchain game;
- proof of ownership rights, license, or copyright;
- right to access a real-world, physical service (like the right to use a mining facility, for example);
- tokens giving assets to digital content, such as video, ebooks, educational courses, interviews, etc.;
- storage capacity;
- databases and collections of big data.

Digital identities of asset creators and holders will be verified with varying degrees of rigour depending on the category of an asset. This will resolve the issue of conducting a KYC; in particular, which presently plagues many blockchain projects. Whenever an asset cannot be sold or transferred to a citizen or resident of a particular country for reasons of legal restrictions, a startup is forced to conduct an identity check for each potential customer, asking users to supply their IDs, selfies taken with these IDs, and sometimes even bank statements. However, since a KYC is a time-consuming process, many teams choose to rely on costly outside service providers. Those who decide to process KYC applications themselves often find that the workload is simply too great: it takes weeks to process all requests, resulting in delays in distribution of tokens and significant annoyance among token buyers.

Another problem is that every project conducts its own KYC: those users who back numerous platform have to perform virtually the same identity check over and over again, sending the same files and waiting for approval, sometimes for many days. By contrast, thanks to the system of digital identities established by NEO Classic, every user will be securely identified from the start and able to participate in all the projects on the marketplace without having to pass a new check every time. At the same time, each digital identity can be enhanced with new data (similar to systems of certificates assigned to users in some payment systems). Thus, identities will come in several types, or levels, from beginner (almost anonymous) to fully certified (a user who has submitted an extensive range of documents and passed all the checks). Each project or asset in the marketplace will be accompanied by a required level of digital identity verification, to be selected by the team of that project. Those users who wish to participate but do not have the necessary identity level yet will be able to submit additional documents and obtain the required identity rank.

Only a minimum fee will be charged for launching an asset, which will distinguish NEO Classic from the original NEO blockchain, where, as noted earlier, it costs thousands of dollars to hold a token sale. The use of a second-layer protocol – be it via payment channels or child chains – will allow NEO Classic to avoid unnecessary miner fees. Thanks to the same second-layer solutions, exchange of assets on the network will be instantaneous. Affordability, security and speed will be the defining qualities of NEO Classic.

2.7. Second-layer protocol support

From the very inception of major blockchains like Bitcoin and Ethereum, it was clear that scaling would eventually become an issue. While the Bitcoin network can currently process up to 25 transactions per second (and the Bitcoin Cash around 60), Ethereum can manage only 15. For comparison: Visa can process over 40 000 transactions per second in peak times, and it is this “Visa barrier” that blockchains ultimately aspire to cross.

The reason for current low speeds is the necessity to obtain confirmations to each transaction from all nodes on the network – which is exactly what makes blockchains so safe and tamper-free. As long as the number of users – and, therefore, transactions – on the network is low, delays are not an issue; however, as the number of transactions grows, users are forced to wait for many seconds – sometimes minutes – for their transaction to go through. Fees factor in, too: all miners on the network have to receive their reward, so transaction fees can become uncomfortably high, especially in case of micropayments, where the sums themselves are small.

It is clear that in a true “smart economy” based on trustless, smart contract-driven payments and digitization of assets, users should not have to wait for their transactions to go through – payments must be instant. Until the system is able to scale properly, such everyday uses of cryptocurrency as paying for a cup of coffee or petrol for one’s car are not feasible. (True, many businesses already accept payments in Bitcoins as a marketing move, but in reality they simply use third-party services to convert receive Bitcoins into fiat currency that is deposited in the company’s account – it is not a sign of real adoption.)

NEO Classic, as a project based on the concept of smart economy and free creation of new assets, will necessarily require a scaling mechanism. It has long been understood that the best way to scale a major blockchain is to transfer most of the smaller transactions off the main chain, relieving the load on nodes. While blockchain is extremely secure exactly because records of transactions are validated by all the nodes and stored on-chain, most operations clearly do not need to be stored on the main blockchain. Moreover, they do not require the agreement of all the network members, as long as users performing a transaction between themselves agree to it. Thus, there is a need for a protocol that would allow users to transact with each other without waiting for the general network consensus and paying the fees charged by miners.

Such protocols are already being tested and are known under the general name of second-layer protocols, the first of which to be formulated is the Lightning Network, developed for Bitcoin, Litecoin and other altcoins.⁴ Similar solutions are being tested for the Ethereum blockchain, the main among them being Raiden and Plasma. It is crucial to note that each of these titles is not a specific branded product, but rather a concept that is being worked on by many developers around the world simultaneously.

Second-layer protocols developed for Ethereum take two main forms. In the first, used by Raiden, users establish payment channels with each other and place a deposit into a special shared wallet. Two users who wish to transact with each other both have private keys to such a wallet, and the information about the wallet and the amount of funds in it is recorded on the main Ethereum blockchain. Once the channel is established, the two users essentially transfer some of the funds in the wallet to each other, but the maximum amount that can be sent is limited to the size of the deposit. If users decide to conclude their payment process and transact no more, the channel can be closed and the information about the final ownership structure of funds in it is recorded on the main blockchain again.

In this system, one user can establish many payment channels with other users and send payments via those channels, even if the final recipient doesn’t share a direct channel with the

4 — <http://lightning.network/lightning-network-paper.pdf>

sender. It is enough to enter the address of the recipient, and the system will find the best route. Since transactions do not need to be recorded on the Ethereum blockchain (essentially all payments are processed off-chain), the fees will be minimal or even equal to zero, and processing will be executed instantaneously.

At the time of writing (2018), only one solution was working on the Ethereum network - Micro Raiden. This protocol allows one user or platform to receive payments for many other users (many-to-one setting) and may be useful for companies selling goods or services, but not for several users exchanging assets among themselves. The release of another, more universal solution - Raiden Network - is scheduled for the next few months.

In a different type of second-layer protocols (the main being Plasma), multiple child chains are created, all stemming from the “root chain” - that is, the main Ethereum network. Each child chain is independent from the others and represents the network of a particular dApp. Users can freely transfer resources from the main chain onto a child chain, which has its own smart contract, nodes and consensus algorithm (which can be different from that of the root chain). When entering a child chain, a user has to attach a collateral to guarantee correct behaviour. All payments are made inside the child chain with minimal fees. A user can choose to leave the child chain at any time, withdrawing their assets to the main chain, which is recorded on the Ethereum blockchain. At the moment of exit, other users are encouraged to challenge the user and point out any malicious behaviour – if the user is caught as having done something wrong while on the child chain, they will lose their collateral. Plasma is not operational yet, but the development process is going quickly.

Both Raiden and Plasma can potentially increase the capacity of the Ethereum network to up to 1 million transactions per second, eliminating bottlenecks and dramatically reducing transaction costs. Some express concerns about security (especially if a lot of micropayments start going through the same nodes, called hubs, which will create some centralization), but it can be expected that large and more important transactions will still go through the main Ethereum blockchain, with smaller dApps using second-layer protocol solutions.

In the context of NEO Classic, this means that users who create and trade their own tokenized assets will be able to sell them instantly and without any transaction fees (or almost). Whether it's tokens of a new project, digitized real assets, a share in the digital business, any asset can be safely transferred using a solution similar to the Lightning Network. All such solutions work through the API, so NEO Classic users do not need any special technical skills. Without such an instrument, a viable asset exchange system is simply not possible.

It is necessary to underline once again that none of the major second-layer solutions and upgrades have been released on the Ethereum mainnet yet, but they will be in the very near future. A drawback of Raiden is the limit that it sets on the total amount of funds that can be transmitted within one payment channel (it cannot exceed the deposit in the shared wallet); however, the fees can be reduced down to zero. With Plasma, all transactions still operate on-chain and involve nodes that are rewarded with a small fee, but security is generally higher. Thus, the NEO Classic team has not yet committed to implementing Raiden or Plasma; the choice will be made once at least one of these protocols goes live and can be tested.

2.8. Summing up

NEO Classic seeks to help create a true smart economy based on reliable, instant transactions with zero commission. To achieve this, the project will implement a hybrid model that uses the NEO blockchain concept with Ethereum network stability with the addition of mining functionality. Thanks to its asset market, support for second-level scaling protocols and digital identifiers, NEO Classic is a good solution to many problems that currently hinder the wider adoption of cryptocurrencies, such as scaling, entry barriers for beginner miners and users, high tariffs and transaction delays .

The initial distribution of NEO Classic will be held among current owners of NEO after the picture taken on August 24, 2019, after which each user with NEO will be able to receive free NEO Classic coins (NEOC). Immediately after that, everyone will be able to start developing NEOC and developing their own digital assets based on NEO Classic. In the coming months, NEOC will be included in a list of several leading exchanges (negotiations are ongoing), and support for scalable protocols such as Plasma or Raiden will be added.

The combination of proven digital assets, means of authentication by user identifiers, a convenient environment for launching new assets will make NEO Classic a real gateway to the intelligent economy of the future - transparent, reliable and free from centralized authorities.