

Deep Dive Into NEO









NEO – An Open Network For Smart Economy

August 3, 2018



What is NEO?

- NEO (previously Antshares) is a smart contract development platform that aims to automate the management of digital assets and provide a scalable network of dApps.
- The non-profit project was established in 2014 and has accumulated more than 65 community-built dApps on its platform.

 <p>NEX by The NEX Team</p> <p>NEX combines the NEO blockchain with an off-chain matching engine to enable much faster and more complex trades than existing decentralized exchanges</p> <p>Website GitHub Whitepaper Twitter LinkedIn Medium</p>	 <p>Moonlight by The Moonlight Team</p> <p>Moonlight is a distributed workforce and analytical project management platform featuring a global public ledger of contributor work experience and a new match-making algorithm to effectively fulfill project needs.</p> <p>Website Github Whitepaper Twitter LinkedIn Medium</p>	 <p>Red Pulse by Red Pulse</p> <p>Red Pulse Tokens (RPX) are NEO tokens issued by Red Pulse, an event-driven research firm covering market events impacting Chinese companies, sectors and the overall economy.</p> <p>Website GitHub Reddit Contract</p>	 <p>JARVIS+ by X-Contract Foundation</p> <p>Jarvis+ is A decentralized service of conversation in any IM, webpage, or App. A personal token assistant. And A powerful AI conversation infrastructure that could be embedded into any use scenario of Blockchain.</p> <p>Website GitHub White Paper Telegram Discord</p>
 <p>SEA by SEA团队</p> <p>SEA智能资产管理平台，基于NEO底层，为用户提供点对点数字资产管理服务，降低数字资产管理过程中的信用成本，目前主要产品是智能钱包、NEO区块浏览器，后续将在智能钱包中集成智能置换、智能锁仓、等其他智能合约应用</p> <p>Website GitHub</p>	 <p>AdEx by adex.network</p> <p>AdEx is a decentralized ad exchange built on the blockchain and smart contracts. The core feature of AdEx will be the so-called AdEx User Profile - a personalized page that allows every end user to understand and control the ads delivered to them.</p> <p>Website GitHub Medium Facebook Telegram Twitter Reddit</p>	 <p>NeoAuth by @NeoAuth</p> <p>NeoAuth enables authentication over the NEO blockchain, allowing you to log in with a NEO address instead of an email and password.</p> <p>Website Demo GitHub Whitepaper</p>	 <p>ZEEPIN by Zeepin</p> <p>The Distributed Creative New Economy. Zeepin, a decentralized innovation community, is dedicated to promoting highly efficient circulation of innovation assets. Smart work, Creative life!</p> <p>Website Telegram Twitter Facebook Reddit Medium GitHub Contract</p>

NEO vs. Ethereum

- NEO is often compared with Ethereum and is referred by some as the “Chinese Ethereum” due to their similarities. Smart contracts, ICOs and dApps can be hosted on both blockchains.
- However, there are key differences – for example, NEO supports multiple code bases such as Java / Kotlin, .NET C # / VB, JavaScript / Typescript, Python, and Go, while Ethereum is based on Solidity, its proprietary language.
- There are also technical differences in the type of consensus mechanism used, transaction speed, inflation schedule, etc.

Key features

- **Consensus algorithm:** NEO uses the delegated Byzantine Fault Tolerance (dBFT) mechanism, an improved form of the traditional proof-of-stake mechanism. The system keeps its finality/availability as long as Byzantine fault occurs on less than one-third of the nodes. Once confirmations are final, the transaction cannot be revoked or rolled back.
- **Virtual machine:** The Neo Virtual Machine (NeoVM) is a lightweight stack-based contract execution environment with good start up times and versatility. NeoVM can be ported to other blockchains as well as non-blockchain systems, which increases the utility of smart contracts.

ARCHITECTURE OF NEOVM



Key features (continued)

- **Smart contracts:** NeoContract, the platform's mechanism for creating smart contracts, supports multiple programming languages so developers can develop smart contracts without having to learn a new language.
- **Digital assets:** NEO enables the P2P exchange of digital assets and currencies without the need for third party exchanges. Digital certificates provide legal protection for digital assets on the NEO platform.
- **Distributed file storage:** The NeoFS is a decentralized file sharing and storage service based on Distributed Hash Table (DHT) technology where data is indexed by file content rather than file path. Files can be divided into smaller data blocks that are distributed and stored in multiple nodes. This enables smart contracts the ability to store and access large files on the NEO blockchain.

Key features (continued)

- **Cross-chain interoperability:** The NeoX protocol has two parts: (1) it enables multiple participants to exchange assets across different chains (i.e. atomic swaps) and (2) smart contracts can perform various steps of a transaction across different chains (i.e. distributed transactions).
- **Quantum-proof:** The NeoQ is a lattice-based cryptographic mechanism that works to create problems that cannot be solved by quantum computers. This is important as the rise of quantum computing has made cryptographic protocols susceptible to attacks.

Historical milestones

2014-2016

Feb 2014: The NEO project is established.

Nov 2015: Testnet launch.

Sep 2016: NEO ICO.

Oct 2016: NEO mainnet launched.



2017

Aug: Completed rebranding to NEO; released NEO 2.0 including full smart contract compatibility.

Sep: Preparation for decentralization of consensus nodes.

Oct: Red Pulse conducted the first token sale on the NEO blockchain.



2018

Jan: Voting algorithm optimized; node hosted by City of Zion begins to run on the NEO testnet.

Apr: Nodes hosted by KPN & Fenbushi Capital begins to run on the testnet.

May: NEO and Ontology publicly announced MoU.

July: Election of new consensus nodes initiated.

Future development

- Development of NEO 3.0 began in Q2 2018. This new version is designed for large-scale enterprise use cases with higher transaction speed and stability, expanded APIs for smart contracts, optimized economic and pricing models, etc.
- By the end of 2018, NEO plans to vote KPN and other partners as mainnet consensus nodes. In 2019, NEO plans to open public campaign for election of all consensus nodes.
- For more information on what's next for NEO, check the article published on July 10, 2018 by the team: <https://neo.org/blog/details/4091>.

What's Next for NEO

Posted on 7/10/2018



In the past year, together with the NEO community, we accomplished the development of NEO 2.x. NEO 2.x provided essential infrastructure mechanics of the NEO Smart Economy. Now, it's time to look ahead. What's next? The short answer is **NEO 3.0**, of which development started in the last quarter (Q2 2018).

What is NEO 3.0? What are the key features of NEO 3.0? Today, NEO co-founder and core developer Erik Zhang shares with us the latest features and improvements of NEO 3.0.

Erik Zhang:

NEO 3.0 will be an entirely new version of the NEO platform, built for large scale enterprise use cases. It will provide higher TPS and stability, expanded APIs for smart contracts, optimized economic and pricing models, and much more. Most importantly, we will entirely redesign NEO's core modules.

1. Various Improvements

1.1. Increasing TPS

Increasing the TPS is important if we want to run large-scale distributed applications on NEO. In NEO 3.0, we will increase the TPS in the following ways:

- Refactor the code and core modules
- Optimize the network protocol
- Implement the feature manifest and permission system for NeoContract
- Prepare for dynamic sharding
- Detach state persistence and block persistence

NEO vs. GAS tokens

- NEO has a dual-token system comprised of a management token, NEO (symbol NEO), and the utility token, NeoGas (symbol GAS).
- NEO tokens are non-divisible and give token holders management rights including voting for bookkeeping, network parameter changes, etc. The total supply is 100 million NEO, which were all generated in the genesis block of the NEO network.
- GAS tokens are used to fuel the smart contracts and tokens on the NEO blockchain. The total supply is 100 million GAS but the maximum supply will not be reached until an estimated 20+ years.

THE TEAM

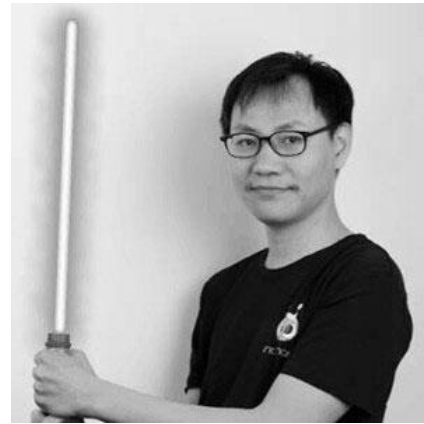
Team and advisors



Da Hongfei

Co-Chair, NEO Foundation

The Founder of NEO and also the Founder & CEO of Onchain, one of China's leading blockchain companies. Prior to that, he was the CEO of IntPass Consulting for 9 years. He obtained his Bachelor of Arts in Technology and English from the South China University of Technology in 2001.



Erik Zhang

Co-Chair, NEO Foundation

The Founder and core developer of NEO and also the Founder & CTO of Onchain. He was the developer behind the dBFT consensus mechanism. He graduated from Shanghai University in 2014.

NEO Global Development (NGD)

Realizing NEO's Vision, Executing NEO's Strategy.

 Johnson Zhao 赵晨 General Manager	 Peter Lin 林德涛 Director of R&D	 Caterina Zhang 张可可 Director of Marketing & Community	 Sharilyne 李江玲 Senior Manager, Marketing & Community Operations	 Malcolm Lerider Senior R&D Manager	 Chris Chen 陈志同 Senior Engineer
 Ray Fan 樊收收 Engineer, Test	 Yan Mingxia 严明霞 Engineer, Front End	 JC Huang 黄书鑫 Community Operation	 Robin Fang 方宇婷 Translator	 Kris Zeng 曾程 Community Operations	 Celia Yu 俞皓 Senior Engineer, Documentation
 Nikkor Wang 王思磊 Community Operations	 Tamar Salant Global Business Development Manager	 Miki Hayama Head of Japan Operations	 Miles Graham Global Regulatory Affairs Officer	 Grace Gui 桂海芳 Marketing Specialist	 Fengda Sun 孙宇达 Senior Newswriter
 Rita Zhang 张籽沁 HR Assistant	 John Wang 王佳强 Global Development Manager	 Lemonie Gao 高童文 HR Manager	 Chris Xue 徐慧静 Financial	 Tian Li 田力 Senior R&D Manager	 Ellie Li 李小雨 UI Designer

Strengths

- Developers do not need to learn a new programming language to create a smart contract as NEO supports multiple widely-used languages. This reduces the learning curve for developing smart contracts.
- NEO runs a dBFT consensus mechanism where users will earn GAS by holding NEO in their wallets, essentially earning passive income assuming NEO price doesn't decline.
- It is one of the few blockchain protocols to have ICOs conducted successfully, which helped build a large community and awareness of NEO.
- Transactions on NEO are free.

Strengths (continued)

- NEO is supported by Onchain, another company founded by NEO's co-founders. According to Onchain's LinkedIn profile, the company is a governing member of the MIIT blockchain development forum in China and is working with the Chinese government to establish blockchain technology standards for the country. Companies that are reportedly working with Onchain include Hyperledger, NASA, Microsoft China, Alibaba, and Fosun Group.
- The project is supported by a large development community from City of Zion.

The screenshot displays the Onchain website interface. At the top, the 'onchain' logo is on the left, and navigation links for 'HOME', 'MISSION', 'DNA', 'TEAM', 'APPLICATIONS', 'ONCHAIN HISTORY', 'FORUM', and 'CONTACT' are on the right. Below the navigation, a main text block states: 'Based on DNA, enterprise level consortium or private chain can be quickly implemented', 'Self-coded, open source, no IP risk', and 'Hyperledger global standards + Onchain local (China) practice'. A link 'Explore more >>' is provided. Below this is a section titled 'Onchain Distributed Networks Architecture' which includes a horizontal menu with categories like 'Digital Assets', 'Notary', 'Supply chain', 'Shares', 'Financial derivatives', 'Sharing Economy', 'Internet of things', and 'More...'. Underneath is a grid of 'Onchain DNA services' categorized into: 'Predefined Business Items' (Asset, Evidence, Token, Share, Contract, Services Oracle), 'Identity Management' (Participant Identity, Account System, Resource Identity, Account custodian), 'Policy Management' (Policy Configuration, Access Control, Data Security & Privacy, Regulation & Audit), 'Application Services' (Application SDKs: .java, .NET, JS, Python, More...), 'System Management' (System Configuration, System Monitor, Content Explorer, System Analyst), and 'Smart Contract' (Smart Contract Registry, Smart Contract Template, Language Converter, Life Cycle Management). A vertical label on the right side of the architecture diagram reads 'Onchain DNA Cross-chain Adaptor'.

Weaknesses

- NEO has a theoretical speed limit as the dBFT consensus mechanism takes approximately 15 to 20 seconds to generate a block with transaction throughput measured up to about 1,000 transactions per second (versus 15 for Ethereum). While NEO has the potential to reach 10,000 transactions per second through further optimization, there is still a limit and there are blockchain solutions out there that are working on the ability to process hundreds of thousands of transactions per second.
- NEO currently has only 8 nodes running (7 nodes run by the project's team and 1 by an independent party). This is considered centralized and not permissionless, but the team is gradually decentralizing the protocol and is planning to have 7 more independent consensus nodes to be voted in by the end of 2018.

Weaknesses (continued)

- As transactions on NEO can be free, it is susceptible to spams. In order to counter spams, users can add GAS to their transactions as a priority fee to avoid delays.
- Network have been down or even experienced outage during heightened activities, for example, during ICO crowdsale hosted on NEO.
- The fee to deploy NEO smart contracts is high – it takes 500 GAS, or around \$4,500 at current GAS price, to deploy a smart contract on NEO. As a result, only 10 smart contracts have been deployed on NEO in June 2018 and 8 in July.
- There are a lot of upcoming smart contract platforms that will compete with NEO that claims to be superior, such as Quarkchain, Fantom, Hashgraph, ICON, aelf, etc.

Weaknesses (continued)

- Inflation is fairly high in the next few years. Currently, there are 65 million NEO in circulation. The number will increase to 80 and 95 million in each of the next two years, which is equivalent to an inflation of 23% and 18% per year. The number of NEO in existence is capped at 100 million.
- NEO is non-divisible. This means that while a fraction of a NEO can be purchased or sold on an exchange, only whole units can be transferred between wallets. At current price, users cannot transfer less than \$29, making micro payments impossible.

Our conclusion

Overall Rating: B.

- NEO had a successful rebrand in 2017 and conducted the most ICOs after Ethereum out of any blockchain protocols. This helped built a large community and awareness around the project.
- However, the market awareness is waning compared to last year partly because there are so many new projects coming up.
- As a smart contract platform, there are a lot of competing projects that promise better scalability/decentralization/security.
- Even if NEO's throughput reaches 1,000 transactions per second as promised by the team, it is not considered high in today's standard.

CrushCrypto