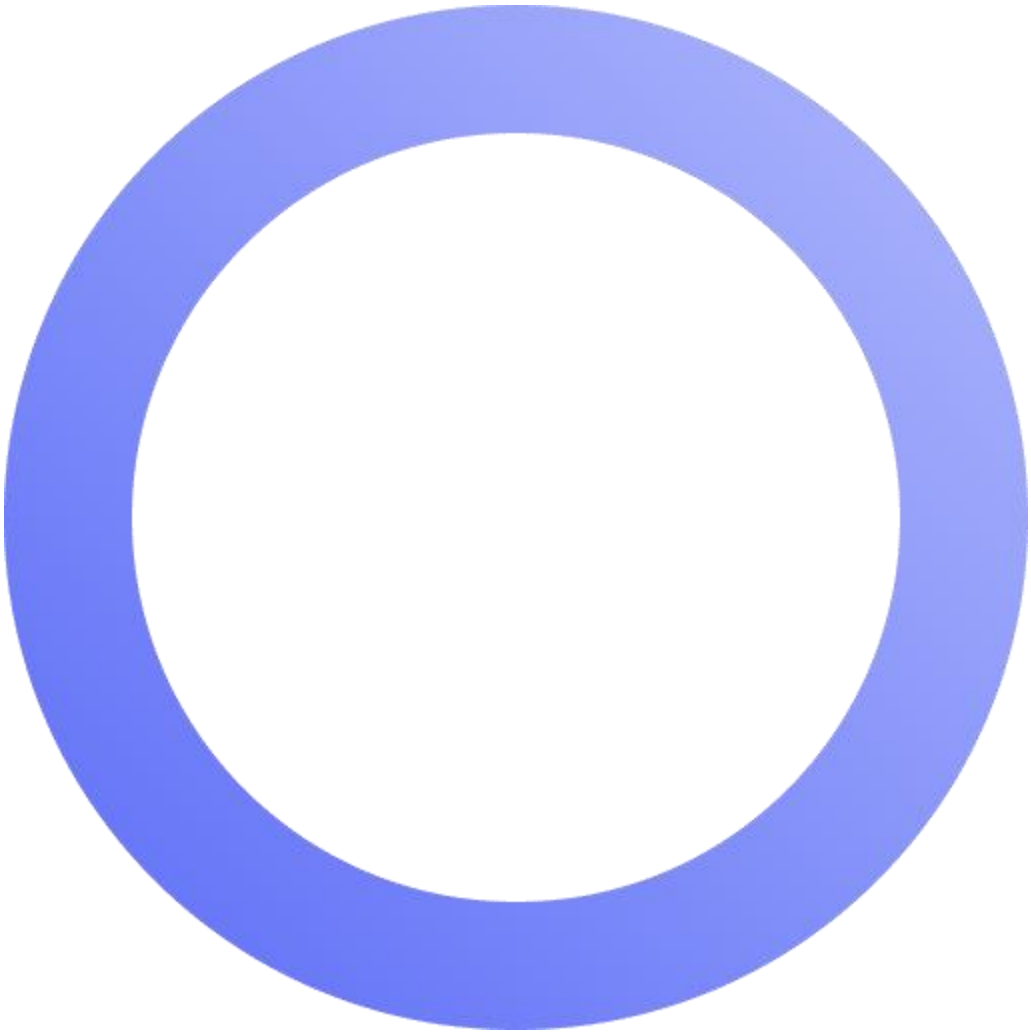


nOS

Whitepaper 2.0

Introduction

Motivation

While blockchain technologies introduce **new possible business models** for app creators to expand their revenue generating strategies with, they are often **unable to leverage these opportunities** due to the technical limitations and policies set forth by OS-managed services (e.g. *Apple iOS/macOS, XCode* and *App Store*, *Google Android* and *Play Store*, *Microsoft Windows* and *Windows Store*)

There also exists a lack of development solutions (blockchain APIs and SDKs) that support efficient implementation of these new business models.

On the consumer side, it is virtually impossible to discover and use apps on the internet without participating in **opaque** and **monopolized** services that are provided by these same OS-managed services.

This **monopolization** of app development, distribution, and discovery introduces a number of other relevant issues:

- There is **no transparency on how applications are ranked** in an App Store.
- Providers (e.g. Apple and Google) can orchestrate **deliberately disadvantageous environments** for apps that compete with the provider's own services.
- Providers take a **large percentage of app revenue**.
- App business models are generally **limited** to sales, subscriptions, advertising, referrals, data mining, or other potentially **intrusive** and **privacy-violating methods**.
- **Free and Open Source** (or *FOSS*) apps often have no other revenue model than to rely heavily on donations and sponsorships from their users.

nOS aims to solve these issues by **overhauling** the app-, web-, and cryptocurrency experience for consumers and creators alike, by introducing new solutions for app and content development, monetization, discovery, and interaction.

nOS: Executive Summary

nOS is an all-in-one platform that introduces **new implementable business models** powered by blockchain technologies. Any application can leverage nOS to **extend its revenue generating strategies** without surrendering user privacy.

The platform also introduces an **App Store** that is **decentralized** (maintained entirely by multiple voter-elected parties) allowing for **fair and transparent** distribution and discovery of applications.

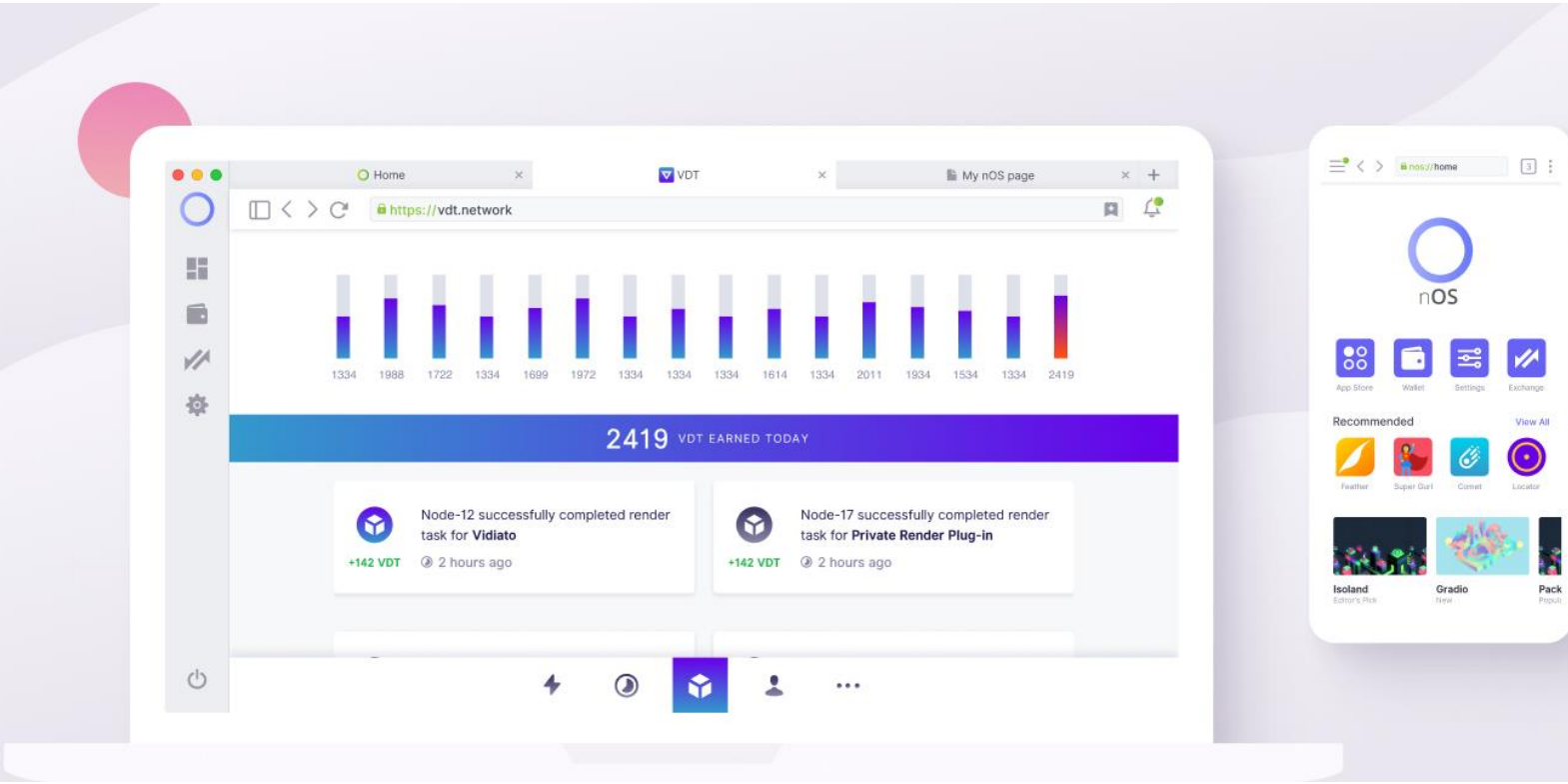
With nOS's new approaches to app monetization and distribution, even *Free and Open Source* applications can scale on both technological and financial levels.

As nOS consists of a powerful blockchain, cross-platform wallet and browser software, and novel solutions for app development and distribution, the platform can be defined as a **Virtual Operating System**.

Features and definitions

- **nOS:** The platform's **public blockchain network**, employing a unique delegated proof of stake consensus model and native features for building, deploying, monetizing, and discovering apps and services.
- **NOS (Symbol: ◎):** The **cryptocurrency** that powers all aspects of the nOS ecosystem, including: staking and voting, app deployment, name registration, transaction fees, block rewards, and decentralized filesystem resources.
- **Wallets:** Accounts, accessible by private keys, that can interact with the nOS blockchain.
- **Delegates:** Nodes that verify or relay transactions on the blockchain. The top forty-seven delegates forge new blocks and receive ***block rewards*** (a fixed number of NOS that is minted on each new block) and transaction fees.
- **nOS Browser:** An interoperable multi-blockchain cryptocurrency wallet, web browser with extensive *Web 3.0* support and solutions to integrate blockchain/cryptocurrency into any app, and an App Store with decentralized curation.
- **Curators:** Entities that curate and index apps for the nOS App Store and its search engine. Similar to delegates, curators are **elected by NOS holders** and receive ***block rewards***.

- **nOS App Store:** Portal where apps can be listed and discovered, managed in a decentralized manner by voter-elected curators. The App Store also serves an *"App Store-as-a-service"*; a solution that allows any website or app to retrieve and filter App Store data from nOS and present it in their own custom fashion.
- **Apps:** Web applications that are usable on nOS. Apps can be of any type e.g. traditional (*"Web 2.0"*), decentralized (*"Web 3.0"*), hybrid (interacting through server-side cryptocurrency gateways such as nOS ID), FOSS, paid, etc. Curators index apps in the App Store so that they can be browsed and filtered by their unique properties such as keywords and interacting blockchain and/or cryptocurrencies (if any).
- **Voters:** nOS Wallets that vote for delegates and curators. As only the top forty-seven delegates and top ten curators with the most votes can be active at any given time, voting plays an important role in the ecosystem. Any wallet can vote, with the wallet's voting weight calculated by the wallet's NOS balance and *stake*.
- **Block Rewards:** Fixed number of NOS that are added to circulation on each new block, distributed to the top forty-seven delegates and top ten curators.



nOS Details

ARK Core

nOS is built on the **ARK Core** (https://ark.io) blockchain framework.

ARK Core provides many features that allow for a modular and secure approach to blockchain development, including:

- Fast and efficient consensus algorithm (DPoS)
- Typescript codebase
- Modular directory structure
- Plug-in framework
- Generic Transaction Interface (AIP-29)
- Open-source ecosystem resources (wallet, block explorer, SDKs, etc.)

Furthermore, nOS is compatible as a **bridgechain** in the ARK ecosystem; Bridgechains have the ability to interact with the ARK mainnet and any other bridgechain-compatible blockchain built on ARK Core.

nOS and ARK are engaged in a productive strategic and technical partnership, contributing to the development and growth of both platforms.

To learn more about ARK Core, bridgechains, and DPoS: refer to the ARK whitepaper.

Delegated Proof of Stake

nOS adopts a ***Delegated Proof of Stake*** - or **DPoS** - consensus model.

DPoS enables high performance with fast block times, while governance of the network resides with the holders of the network's native cryptocurrency: **NOS.**

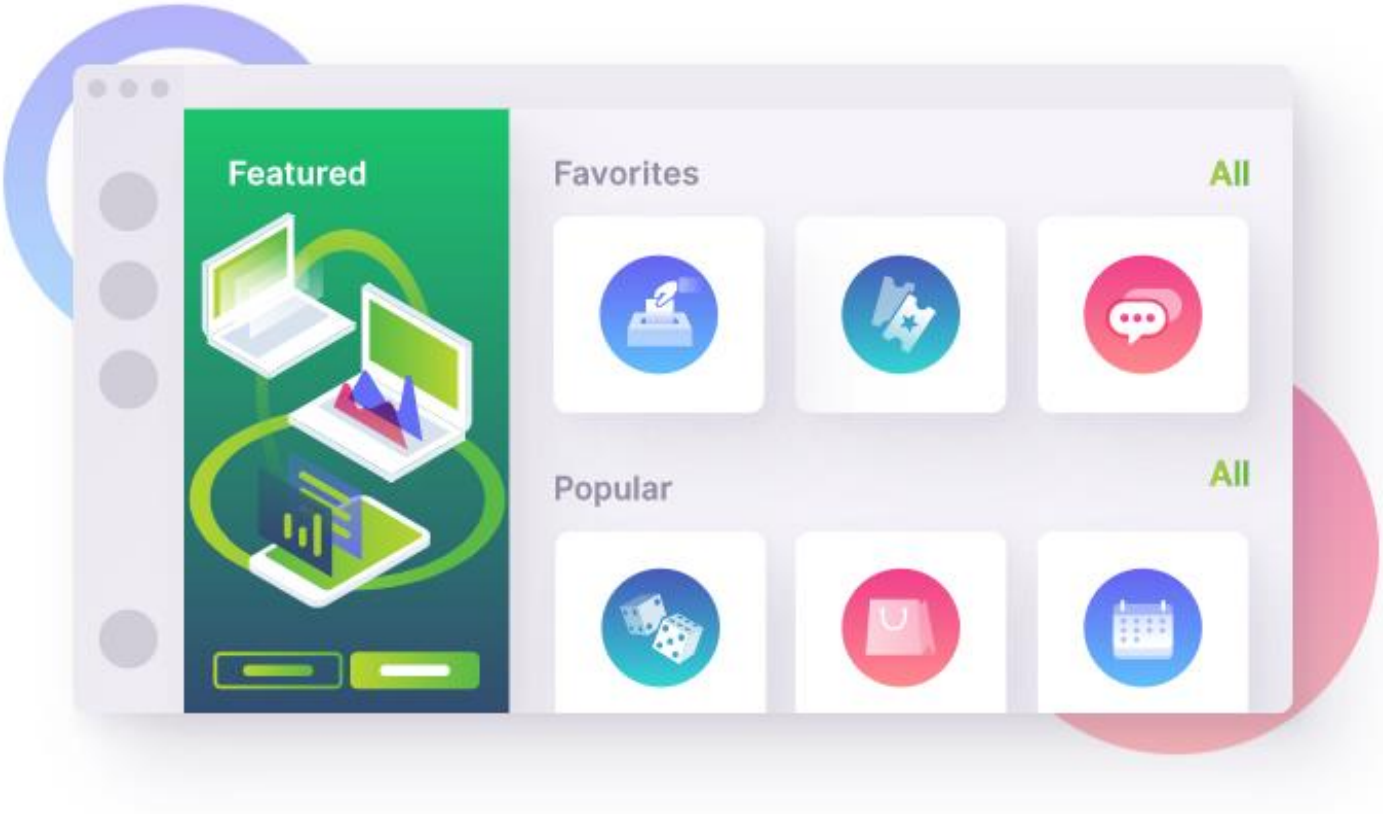
The nodes that seek to verify transactions and secure the network are called ***delegates***.

Wallets with a NOS balance and/or stake can vote for delegates.

The top forty-seven delegates (ranked by vote balance) will forge new blocks. These *forging delegates* receive a fixed ***block reward*** for every block that they forge.

Delegates that are not among the top forty-seven can still function and contribute to the network as **relay nodes**; servers that maintain a full copy of the blockchain and host API endpoints that serve blockchain data, increasing general availability and stability of the network.

App Store, Search Engine, and Curation



nOS's blockchain and browser interoperate to serve the ***App Store:*** an accessible, decentralized portal and search engine for discovering and using app (as defined in the [Executive Summary]).

Next to the App Store being available in its entirety in nOS Browser, **any application or website** can pull App Store data from the nOS blockchain and present the data in their own custom fashion. For example, an Ethereum-exclusive wallet can pull data from the nOS App Store and display only Ethereum apps within their client, and a gaming site (e.g. a Steam alternative) could choose to exclusively list games in their respective categories, such as FPS, RPG, VR.

There are no specific restrictions as to what type of apps can be listed on the App Store. Apps do not necessarily have to be decentralized nor do they need to interact with blockchains, though nOS *does* offer extensive features and resources for building and deploying such apps.

The App Store is managed in a decentralized manner by voter-elected **curators.**

Curators are similar to delegates in the sense that they are ***voted in*** by NOS holders.

The top ten curators with the most votes have the ability to curate App Store content, and receive a fixed amount of NOS with every new block.

Curators that are not in the top ten can still curate apps and share their content with voters and followers, but they only receive block rewards when they are among the top ten.

In order to register a wallet as a curator, it must first be registered as a delegate. However, a curator does not have to be an *active* (top forty-seven) delegate.

Curators have the ability to upload database files containing their curated content to nOS. Such a database file is hereafter referred to as an ***app index***.

A curator's app index contains a list of objects consisting of app data. A single app object consists of several properties, including:

- **Title**
- **Description**
- **Author**
- **Author website**
- **Thumbnail** (file hash)
- **Images** (file hashes)
- **Type** (*string: "web", "nos", "ipfs", "swarm"*)
- **Location** (string: *filehash, nameservice domain, or http url*)
- **Blockchain** (*optional: "nos", "eth", "btc", "ark", "eos", "neo"*)
- **Categories**
- **Keywords**
- **Metadata**

On the user side, nOS Browser periodically downloads the top ten curators' index files and aggregates them into a single database. The aggregate database is stored on the user's local machine and is utilized for the user's App Store.

Curators can deploy custom solutions for generating app indexes. Some possible solutions include:

- Periodically indexing apps listed on third-party services (e.g. apps that are shared on a specific subreddit).
- Providing a self-hosted app submission and voting portal, where the curator's voters receive special features (such as the ability to submit or vote for apps).
- Smart contract-powered submission and voting system.
- Manual curation.
- AI-powered app discovery and indexing.

Curators may also integrate commercial and for-profit features in their curation model. Voters have the power to decide whether such activities are beneficial to the curator's product and can vote accordingly.

Voting and Staking

Voting is the primary component that powers delegate and curator selection.

Only the top forty-seven delegates and top ten curators with the most votes are **active** and will earn block rewards.

Any wallet with a NOS balance and/or *stake* can vote for *one* delegate and *one* curator, influencing their respective rankings accordingly.

A wallet's vote for a ***votable entity*** (delegate or curator) is reverted when the wallet has had more than two years of zero submitted transactions.

The wallet's ***vote weight*** - or ***VW*** - decides how many votes a single wallet is worth.

A wallet's VW is calculated by the wallet's *balance* and *stake*.

Staked NOS grants significantly more VW than non-staked NOS.

Staking NOS means for a wallet to *lock* an amount of NOS for a duration. Staked NOS cannot be transferred out of the wallet until after the stake expiration date.

The possible staking durations and their respective granted *voting weight per staked NOS* are as follows:

Stake Duration	VW per staked NOS
No Stake	0.1
3 Months	1.0
6 Months	1.5
1 Year	2

As shown in the above chart, NOS that has been staked for 3 months would grant 10x more voting weight than its non-staked equivalent.

After the stake expiration, its granted VW is halved and the stake can be redeemed at any time. When redeemed, the staked NOS goes back to the wallet and the stake's VW is removed.

For example: If a wallet owner with **100 NOS** (thus 10 VW) stakes all their NOS for **1 yea**r, their VW becomes **200**. After the stake's expiration (1 year after creation), the granted VW is **halved to 100** and the stake can be **redeemed at any time**. When redeemed, the **100 NOS** stake goes back to the owner's balance and their VW goes back to 10.

A wallet can have multiple stakes (with varying amounts and durations) at any given time.

Benefits of Voting and Staking

Network benefits

The primary role of delegates is to secure the network, and the primary role of curators is to provide the network with valuable content.

DPoS gives votable entities an incentive to acquire votes.

If an entity has enough votes it would become *active*, thus earning block rewards.

A delegate is active if it's among the top forty-seven delegates, and a curator is active if it's among the top ten curators.

In an effort to garner votes, votable entities may pledge to provide **various services that contribute to the ecosystem**. Such services can include:

- nOS codebase contributions and development.
- Distributing rewards to creators of curated apps, based on usage and reputation.
- Marketing and bounty campaigns.
- Hosting events (conferences, hackathons, competitions).
- Building new applications that integrate with the ecosystem.

Voter benefits

Votable entities may also choose to **offer certain services exclusively to their supporters**, with tiered benefits provided to a voter based on their VW (*vote weight*, calculated by the voter's coin balance and stake).

Such **vote-weighted services** could attract new voters and persuade existing voters to increase their VW. This would increase the votable entity's votes, strengthening their position as a delegate or curator.

Examples of vote-weighted services include:

- Voter-exclusive bounty programs and competitions.
- The amount of resources made available to a voter in a delegate's filesystem node or web server.
- A number of advertising credits granted to a voter in a curator solution.
- An online store with discount levels based on the customer's VW.

Of course, virtually endless unique services and incentives can be created and offered by votable entities.

As votable entities compete for votes by maintaining services that attract more voters and network participants, the ecosystem grows.

Attention-Based Rewards

At this point, the whitepaper described two blockchain-powered concepts that apps and services can leverage to expand their business models, both relating to votable entities (delegates and curators):

1. App creators can become (or work together with) votable entities. Apps can offer vote-weighted services in an effort to direct votes to a specific votable entity and generate earnings through (a share of) block rewards.
2. Votable entities can share a portion of their block rewards with app creators, based on each app's reputation and popularity.

Another key business model that apps on nOS can apply is **attention-based rewards.**

"Attention-based rewards" is a feature that is in part similar to **Brave Rewards**. With Brave Rewards, the Brave company and their advertising partners reward users in the Brave Attention Token (BAT) for viewing advertisements. Users automatically forward a portion of those rewards periodically to content creators. All contributions are charged with a 5% fee by the Brave company.

nOS is different in that its attention-based rewards system works in an **entirely peer-to-peer fashion**. The platform allows users to take **full control** over how they contribute to creators: they can periodically contribute **any amount of any cryptocurrencies, without any middleman, service fees, or exposure to advertisements**.

This level of customizability also allows users to set their periodic contributions as a portion of specific cryptocurrency earnings, for example:

- **NOS** rewards distributed by votable entities on the nOS network.
- **ARK** rewards distributed by delegates through *voluntary reward sharing* on the ARK network.
- **GAS** generated on a NEO wallet.
- **Dividend payouts** from digital securities (e.g. Nash Exchange NEX).

How much of the user's periodic contributions are received by each app or content creator is **based on the user's relative attention** for the respective content as measured by nOS Browser.

As nOS Browser aims to support all popular blockchains, automatic app contributions are easily customized and configured for all common cryptocurrencies and tokens.

For Users

1. The user configures the types of cryptocurrencies they wish to contribute to creators, along with the amounts and frequency.
2. nOS Browser automatically measures the attention that the user gives to apps (e.g. games and trading apps) and pages (e.g. articles and videos), locally and privately on the user's own machine.
3. The amounts configured in the first step are automatically contributed to the creators periodically. How much each creator receives is based on the user's relative attention for each of their visited apps and pages.

For Creators

To activate an app for attention-based rewards, creators only need to add their cryptocurrency addresses to the app's metadata (i.e. HTML meta tags).

The metadata should follow the **Open Wallet protocol** specification.

If the creator owns the app or website, they can insert the metadata directly into their page. If they are a publisher on a third-party app, the app should let the creator configure their addresses on their personal content, which the app can then utilize for inserting the metadata automagically.

Difference from Brave Reward Sharing

Brave's automatic contribution system includes the following properties:

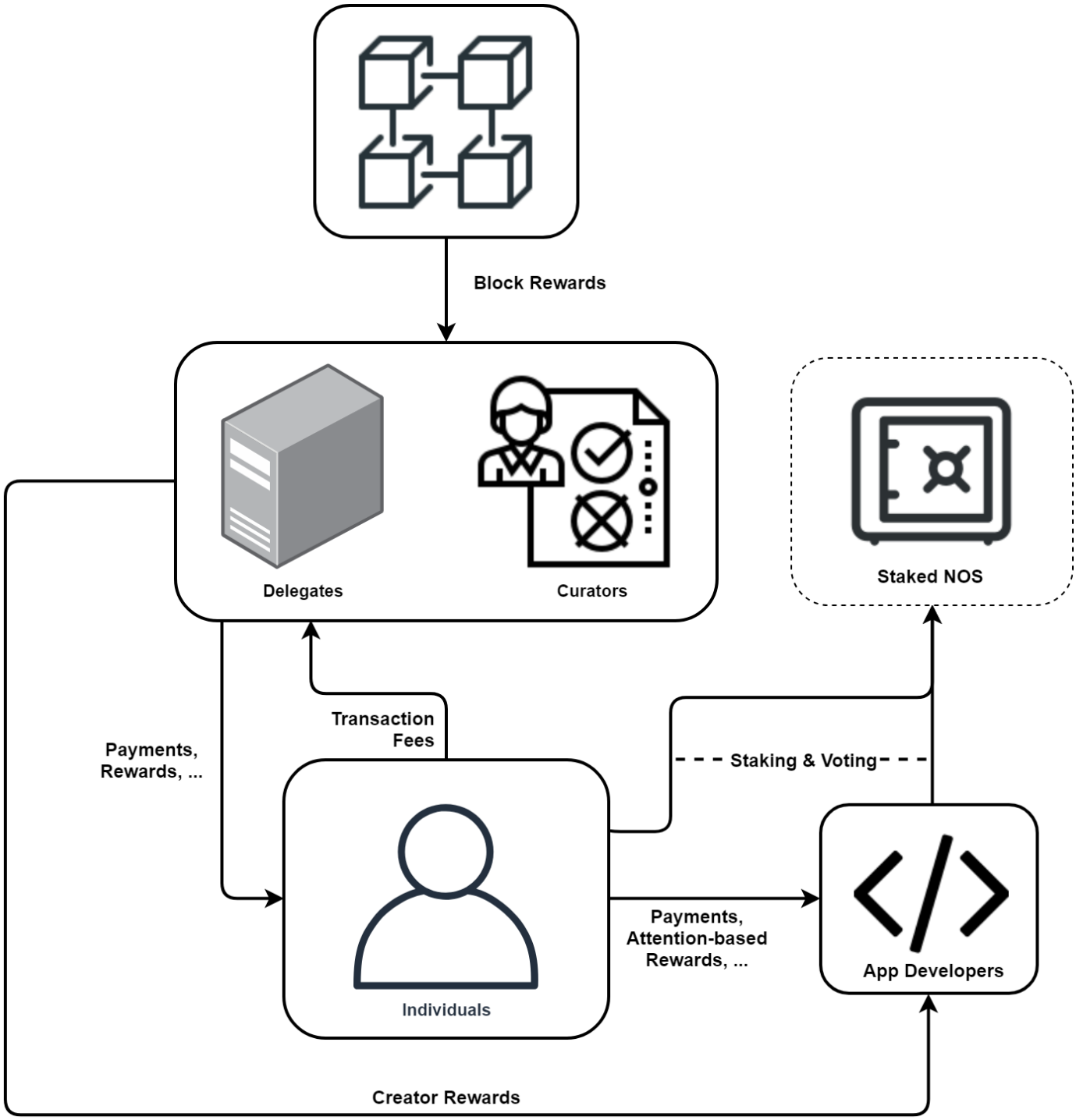
- No direct peer-to-peer contributions.
- 5% of all contributions volume goes directly to the Brave company as a fee.
- Mandatory use of third-party hosted cryptocurrency wallets.
- Users are restricted to solely sharing rewards in BAT (Brave Attention Token).

As where **nOS**'s solution contains the following properties:

- Direct peer-to-peer contributions.
- Zero additional fees.
- Users use their own cryptocurrency wallets.
- Users can share rewards in any cryptocurrencies of their choosing.

NOS Circulation Hypothesis

Should voters choose to elect delegates and curators that integrate services such as those described under [Benefits of Voting and Staking](), NOS may circulate as depicted in the below chart:



Economics

Key Details

Block Time	6	Seconds
Transactions per Block	150	Transactions
Delegates	47	Delegates
Curators	10	Curators
Block Reward	4	NOS
Delegate Reward Factor	0.9	Factor
Curator Reward Factor	0.1	Factor
Top Delegates	5	Delegates
Top Curators	3	Curators
Initial Circulating Supply	330,000,000	◎NOS

The ◎4 block reward is a fixed number that is distributed to delegates and curators on every new block. The block reward halves every four years (see **Block Reward Halving**). 90% of the block reward is distributed to delegates, and 10% to curators (see *Reward Factors* in the above chart).

The **top five delegates** and **top three curators** receive a **relatively larger reward** (which is included in the ◎4 block reward) to motivate **ongoing competition**, even if these entities already established a position as an active delegate or curator.

The **block reward distribution** is as follows:

	Individual	**Collective**	**After Delegate Cycle**
Forging Delegate	3.45	3.45	3.45
Top 5 Delegates	0.03	0.15	4.86
Curators	0.037	0.37	1.739
Top 3 Curators	0.01	0.03	2.209

The "**Individual**" column displays how much each individual entity receives from a block reward.

The "**Collective**" column displays the collective amount of NOS distributed on each block *(i.e. ◎0.03 * 5 Top Delegates = ◎0.15 total distributed to Top Delegates*

collectively). Adding up all rows under the **Collective** column results in the total block reward of ◎4.

The **After Delegate Cycle** column displays how many NOS a single party would have received in total after one delegate cycle (47 blocks). For example, a Top 5 Delegate is awarded ◎4.86 after one delegate cycle (*◎3.45 as a Forging Delegate + ◎0.03 * 47 blocks = ◎1.41 from the Top Delegate reward)*.

Block Reward Halving

To maintain a balance in voting weight distribution between voters and votable entities, the block reward (including its relative Top Delegate/Curator rewards) will be halved every four years for the next eight years.

Network participants can discuss and decide how the block rewards should be handled after the twelfth year.

The block reward reductions are visualized below:

Years after genesis block	Block Reward
Years 0-4	◎4
Years 4-8	◎2
Years 8-12	◎1

Transaction Fees

To submit a transaction to the network, the signing wallet must pay a **transaction fee**. This is to discourage network abuse and to appropriately scale the rewards for delegates to process any volume of transactions.

The transaction fees for each transaction type can be configured by delegates independently.

A delegate receives a portion of the fees collected from all transactions made during their block, while **the majority of collected fees are removed permanently from circulation**.

The fee collection model is as follows:

- 100% of collected fees up to the amount equal to the block reward in a block are permanently removed from circulation.
- 50% of any remaining collected fees are also removed from circulation.

- The other 50% are awarded to the forging delegate.

This fee system helps combat possible shifts in voting weight going from voters towards delegates during times of increased transaction activity on the network.

Example

1. A block has collected ◎**10** in transaction fees.
2. ◎**4** from the collected fees (the amount equal to the block reward) are removed from circulation.
3. *(10 - 4) * 0.5 =* ◎**3** from the remainder are also removed from circulation.
4. The other ◎**3** are awarded to the forging delegate.

The block's forging delegate receives ◎6.45 (◎3 from collected fees awarded in step 4, plus ◎3.45 delegate block reward).

The transaction fee logic **deducted ◎7 from circulation,** while the fixed block reward **added ◎4 to circulation**.

Therefore, the circulating supply was **reduced by ◎3** (*4 - 7 = -3*) in this example block.

Mainnet Launch and Future

The nOS blockchain codebase and public testnet are planned to launch publicly in late September 2019, followed by the mainnet shortly after in Q4 2019.

In an effort to establish an ecosystem of high-quality delegates, contributors, and applications, the nOS mainnet will initially launch ***with*** the delegate system and ***without*** the curator system. Any entities who are interested in becoming a curator will have the opportunity to work on their execution strategy before curation becomes available on the mainnet.

Initial Block Rewards

As the curation system will not be live on mainnet launch, initially only **delegates** will receive block rewards. The total block reward will remain as ◎4.00:

- ◎3.85 to forging delegate.
- ◎0.15 to top 5 delegates (◎0.03 per top delegate).

When the curation update is deployed to mainnet, the block reward distribution will be updated to the model described under heading **Economics**:

- ◎3.45 to forging delegate.
- ◎0.15 to top 5 delegates.
- ◎0.37 to curators.
- ◎0.03 to top 3 curators.

Roadmap

Separate roadmaps for the nOS blockchain and browser are being worked on simultaneously (e.g. nOS blockchain support in the browser will be released together with the nOS blockchain itself). The roadmap items under each header respectively are listed in chronological order.

Blockchain

1. nOS codebase and devnet with delegates, staking, and voting.
2. nOS mainnet.
3. Curation system.
4. Token solution with native support for token issuance, transactions, and other token-related features.
5. Native decentralized filesystem and name service.

Browser

1. nOS Blockchain integration (paired with nOS mainnet release).
2. Support for NOS, Bitcoin, Ethereum, and EOS (next to ARK and NEO).
3. Native fiat currency gateway for purchasing cryptocurrencies and tokens with credit, debit, and bank cards.
4. Scatter protocol integration for ScatterApps - applications that utilize the Scatter SDK to interact with cryptocurrencies and smart contracts.
5. nOS App Store and search engine (paired with the nOS Curator update).

6. “App store-as-a-service” allowing nOS App Store data to be imported and utilized by any website or application in their own custom fashion.
7. Browser logic overhaul (native support for extensions, ad blocking, and privacy tools).
8. Mobile browser.

Legal Disclaimer

Definitions:

1. “**The Company**” shall mean nOS Limited, with Company Registration Number C87299 and registered office at 136 St. Christopher's Street, Valletta, VLT 1436, Malta
2. “**Website”** shall mean the website of the Company on which the *Know Your Customer* procedures and Token Generation Event has taken place at https://nos.app.
3. “**Account**” shall mean an online account created by the user on the Website.
4. “**Affiliate**” shall mean a person, entity or organization associated with the Company.
5. “**Blockchain**” shall mean a type of distributed ledger, comprised of unchangeable, digitally recorded, data in packages called blocks.
6. “**Cryptocurrency**” shall mean a digital asset designed to work as a medium of exchange using cryptography to secure the transactions and to control the creation of additional units of the currency.
7. “**Private Key”** shall mean a personalized code which is paired with a public key encrypted with algorithms.
8. “**nOS**” (always spelled with a lowercase “n” and uppercase “OS”) shall mean a solution for application development, distribution, discovery, monetization, and interaction developed and created by the Company.
9. “**Services**” shall mean any service provided by the Company and/or its affiliates, including the services available to registered Users on the Website.
10. “**User**” shall mean any subscriber, acquirer and holder of NOS.
11. “**Virtual Token**” shall mean a form of digital medium recordation whose utility, value or application is restricted solely to the acquisition of goods or services, either solely within the DLT platform on or in relation to which it was issued or within a limited network of DLT platforms.
12. **“NOS”** (always spelled entirely uppercase) shall mean a Virtual Token, created by the Company, intended for practicing certain features on nOS as described and outlined in this whitepaper.
13. “**Whitepaper**” shall mean the document published on the Website containing the TGE conditions and describing the Company’s project model including an understanding and description on the features and characteristics of the nOS Token.

NOS Characteristics, Features, Rights and Attributes:

1. NOS may be used by You as an instrument for practicing certain features on nOS.
2. NOS forms a digital medium recordation whose utility solely entails the utilization of services on nOS.

3. Your use of NOS shall be subject to the Terms and Conditions of nOS which is available on the Website.

4. The Company provides no guarantees of the future use or value of NOS, which value may fluctuate and may be reduced to zero.

5. You are not expected to make a profit from the acquisition of NOS and shall have no expectation of profit from the future success of the Company's business and/or the efforts of the Company or other persons.

6. NOS do not in any way represent a share, debenture, stock or unit of the Company. NOS does not represent ownership interests or grant ownership rights, control and voting rights in the Company, nor do they grant any rights to receive a share of the Company's profit nor any distribution of assets upon the liquidation and winding up of the Company.

7. The Company is not obliged to redeem NOS at any given time.

8. NOS does not represent securities, commodities, swaps, future contracts, or either securities or commodities or a financial instrument of any kind. Purchases and sales of NOS are not subject to the applicability of any law which may govern or regulate any types of financial instrument. This Disclaimer and all other documents referred to in this Disclaimer including the Whitepaper do not constitute a prospectus or offering document, and does not represent an offer of sale to the public, nor is this Whitepaper solicitation of an offer to buy an investment, a security, commodity, a future contract or a swap on either a security or commodity.

9. The acquirement of NOS is not for investment purposes and the User should not acquire NOS with such intentions. NOS is not designed, developed nor intended to be used for investment purposes and should not be considered as a type of investment. You acknowledge, understand and agree that the holding of NOS does not constitute a guarantee, representation or warranty that the holder will be able to make sure of any assets or profits generated or held in the name of the Company.

10. You acknowledge and agree that You are not acquiring NOS for purposes of investment or speculation, arbitrage strategy, for immediate resale or other financial purposes.