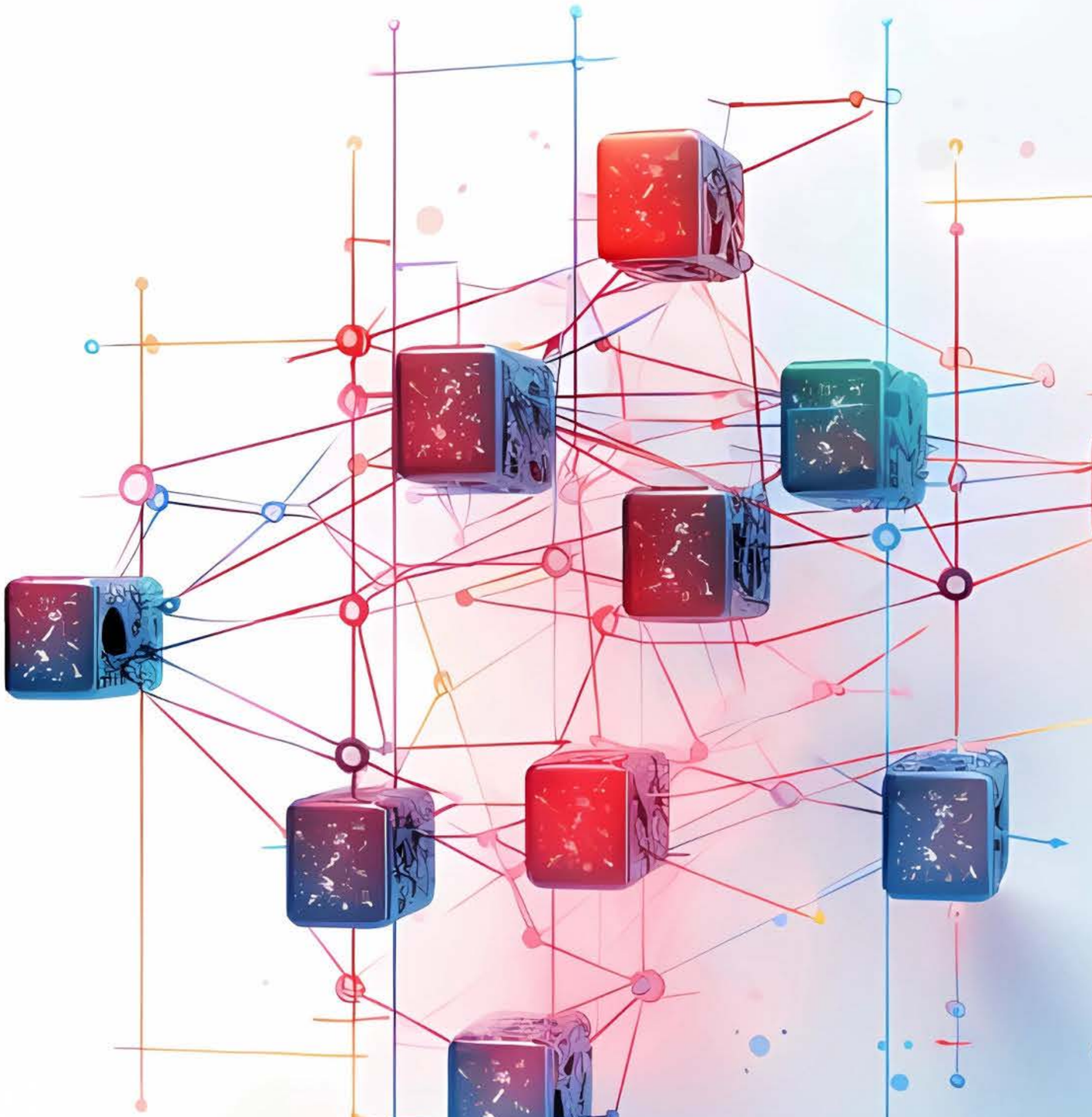
MASSA

White Paper v1.1



Massa Foundation - January 2024

MASSA

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VISION

At the heart of Massa's vision is an unwavering belief in the transformative potential of decentralization.

The concentration of power in traditional internet, financial, and governance systems is straying from the interests of their constituents, resulting in a lack of transparency and accountability, as well as manipulation, dominance abuse, conflicts of interest, and single points of failure.

Bitcoin ushered in a new era with the deployment of blockchain technology —a shared database collectively managed by its users in an open peer-to-peer network. This innovation paved the way for new horizons in global value transfers, applying rules set in code without intermediaries. This development was quickly followed by the advent of general-purpose smart contracts in Ethereum.

In its infancy, the blockchain community propelled decentralized currencies to the trillion-dollar mark, facilitated the construction of billion-dollar permissionless protocols on top of others, and fueled unprecedented collaborative innovations and impactful DAO decisions.

However, it also experienced a staggering array of setbacks of hacks, censorship, manipulation, and rug pulls, all derived from instances of centralization occurring in various stages of the blockchain stack.

Massa aims to be the first truly decentralized blockchain aligned with the interest of its users, demonstrating a fair and balanced distribution of control with no compromises on performance and security, and nurturing a developer-friendly ecosystem with cutting-edge smart contracts and accessible web3 tools. This is a result of combining a balanced coin distribution and a parallel block technology able to sustain 10,000 transactions per second with over 10,000 consensus nodes. Massa distributes power among its user community while defending against its concentration in a few dominating entities, as evidenced by its Nakamoto coefficient standing above 1,000.

To bolster decentralization, Massa has introduced two innovations. The first is Massa's Autonomous Smart Contracts, capable of self-activation based on predetermined conditions. This eliminates the need for centralized bot networks continuously monitoring the blockchain to trigger contract activity. The second innovation is on-chain web, allowing DApp front-ends to be hosted on *.massa websites. This allows DApps to operate with complete immutability and transparency, all the way to users accessing them via Massa Station, thereby mitigating prevalent front-end hacks in the so-called web3. Collectively, these advancements deliver a safer and more authentic web3 experience for developers and users, laying the groundwork for a genuinely decentralized web.

Accessibility is a vital condition for facilitating direct peer-to-peer interactions with minimal intermediaries. Massa strives to make staking, smart contracts building and DApp usage accessible. With minimal hardware and token requirements, anyone can operate a node and participate in securing the network by locking native tokens, as evidenced by the 7,000+ nodes in Massa testnet. With Massa, builders can write smart contracts in TypeScript, a language familiar to all web2 developers, making it well-suited for adoption.

Massa's mission is to create a more fair, efficient, accessible and safe blockchain ecosystem where users have greater control over their assets and experiences. By staying true to its core principles of decentralization and continuously innovating in smart contracts and their usage, Massa is poised to become a driving force propelling blockchain towards mass adoption.

Massa is the new host for Web3, empowering builders to shape the future of decentralized applications and users to participate in truly decentralized experiences.

	Web2 Server	Web3 Server			
		Bitcoin	Ethereum	Other L1/L2	MASSA
Decentralization (Nakamoto Coefficient)	1	4	3	1-10	1000+
Scale	∞	5 op/s	20 op/s	1-2,000 op/s	10,000 op/s
Reactive Backend	✓	✓	✓	✓	✓
Autonomous Backend	✓	✗	✗	✗	✓
Frontend Hosting	✓	✗	✗	✗	✓

The Centralization Crisis in Web 3

Blockchain technology, not controlled by intermediaries or a single entity, facilitates peer-to-peer interactions that offer a level of security, censorship resistance, and trust unachievable with centralized systems. This is why decentralization is the very essence of blockchains.

However, a centralization crisis that compromises its foundational principles has disrupted the blockchain landscape. The past few years have shown how power concentration can infiltrate various aspects of Web3:

- Centralization of mining hardware production can create monopolies, raise entry barriers, and heighten the risk of 51% attacks.
- Disproportionate coin ownership among a small group can trigger market manipulation and skewed governance outcomes.
- Centralized data services can create single points of failure, disrupting network access for many users and applications.
- Centralization of access points to dApps can result in censorship and hacks, hindering users' access to decentralized services.

The Nakamoto coefficient, which quantifies the minimum number of entities needed to compromise an essential subsystem, provides a straightforward measure of decentralization. A higher Nakamoto coefficient signifies a more decentralized network. When considering block production, Bitcoin has a low Nakamoto coefficient of 4, Ethereum has now a coefficient of only 3. All other networks have a remarkably low coefficient ranging between 1 and 10. Some have already experienced outages or hard forks due to centralization. Block production is only one of the potential influence points; others include coin distribution, voting power, codebase updates, and so on. The negative outcomes resulting from centralization are not merely theoretical, but have surfaced in the guise of manipulation, censorship, failures, and hacks, jeopardizing the fundamental notion of decentralization and casting doubt on the ecosystem's future.

Alarming examples of manipulation within the blockchain ecosystem have revealed the potential for power and decision-making to be concentrated in the hands of a few well-funded entities. This is evidenced when conflicting interests arise, for instance in Uniswap governance. The failure of the centralized cryptocurrency exchange FTX can largely be ascribed to the considerable power held by its founder, Sam Bankman-Fried. The temporary halt of the BSC network displayed the extent of centralized control within the network and the potential for manipulation by a lone entity. These are but a few examples when data is available.

Overall, the centralization of staking power can lead to 51% attacks, where a group of colluding entities gain control of the majority of the network's block production, enabling them to double-spend or reverse previously confirmed transactions.

Censorship in the Web3 ecosystem has also emerged as a pressing concern, highlighting the dangers of power concentration. OpenSea, the largest NFT marketplace, faced backlash when it was revealed that it had secretly delisted certain NFTs without any prior warning or clear rationale, raising questions about the platform's commitment to decentralization and transparency, and highlighting the potential for censorship in centralized services. Uniswap, a popular decentralized exchange, faced criticism when it delisted 100 tokens from its interface, effectively cutting off access to these tokens for many users, sparking a debate about centralized decision-making and the potential for censorship. And GitHub, a centralized code repository platform, has occasionally removed or restricted access to repositories containing code for decentralized applications or protocols, in response to requests or pressure.

Numerous Web3 failures can be traced back to centralization, as centralized control and infrastructure introduce risks and vulnerabilities that can cause network outages or other disruptions. In February 2023, the Fantom network experienced a significant incident that led to a temporary halt in block production, indicating the risks associated with centralized control of block production. In November 2020, Ethereum's Infura service suffered a major outage that disrupted numerous DApps and services, exposing the ecosystem's heavy reliance on a single, centralized infrastructure provider. In August 2021, Polygon experienced a network outage due to issues with its centralized infrastructure, also disrupting its ecosystem of DApps and services. In October 2021, Amazon Web Services (AWS) suffered a major outage that impacted several regions, causing disruptions to applications built on top of the Web3 ecosystem. These failures underscore the crucial need for prioritizing decentralization at all levels of the Web3 stack, from infrastructure and software design to governance and decision-making.

Hacks also have become increasingly prevalent in the centralized aspects of Web3, resulting in significant losses for users. In December 2022, BadgerDAO, a DeFi platform focused on Bitcoin yield farming, fell victim to a sophisticated hack to the front-end of the platform, enabling hackers to manipulate user transactions and steal approximately $120 million in digital assets.

Blockchain bridges, which enable the transfer of assets between different networks, have become popular targets for hackers, resulting in billions of dollars of losses on Ronin, Harmony, and others. DeFi platforms have also faced numerous hacks due to centralization vulnerabilities, such as the August 2021 Poly Network hack ($600m) and the February 2022 Cream Finance hack ($130m). And centralized cryptocurrency exchanges, which facilitate the trading of digital assets, have also been frequent targets of hacking incidents, such as at Mt. Gox, once the largest Bitcoin exchange ($400m in 2014) and Coincheck, a Japanese cryptocurrency exchange ($530m in 2018). All of these incidents highlight the risks associated with centralization and the problems of single points of failure.

Massa was created to confront the Web3 centralization crisis, ensuring a robust and secure ecosystem through meticulous system design, coupled with well-considered incentives and safeguards against centralizing forces. Our purpose is to uphold the core principles of decentralization and establish a decentralized internet that empowers individuals, lower power concentration in intermediaries, and fosters innovation.

True Decentralization with Massa

To mitigate the centralization crisis, the Web3 community must genuinely adopt decentralization: distributing control fairly among users and eliminating hidden centralized bottlenecks. The community must ensure stakeholder alignment with users, granting everyone a substantial role in shaping the platform's future.

Massa Labs, the initiating operational company behind Massa, is committed to fostering decentralization throughout its tenure, until it transitions to a mere participant within the community.

Decentralization must extend across its three core dimensions: technical, economic, and legal. In terms of technical decentralization, our focus lies in securing our protocol without the reliance on centralized intermediaries. Moving to economic decentralization, our aim is to establish self-contained economies within our decentralized system. Moreover, we foster legal decentralization by carefully designing legal entities that align with our protocol's vision, ensuring compliance with legal frameworks.

For the time being, nine key measures have been determined to safeguard decentralization, most of which have already been implemented.

1. Conducting a fair, transparent and balanced coin distribution

Massa aims for widespread ownership and participation within its ecosystem, guaranteeing that no single entity or small group can disproportionately influence the network. This begins with the wide distribution of Massa coins, the essential unit used for weighting validator nodes in Proof-of-Stake and votes in the on-chain governance system.

Analysis of coin distribution in Proof-of-Stake blockchains reveals three issues: a significant bias towards founders and other insiders/VCs from inception, major portions of these coins sold to other VCs without transparency on the terms, and no tendency towards further decentralization. That's why we've implemented several measures concerning the initial coin distribution to avoid such a situation:

- Massa Labs will own a very small proportion of the token supply.
- Each buyer in private sales is limited to a relatively small quantity.
- Rather than holding a large token pool within the team and selling it at our discretion, we have established a decentralization program to foster broader participation with full transparency.

Detailed explanations of these mechanisms are provided in the tokenomics section.

2. Using Proof-of-Stake instead of Proof-of-Work

As a block producer selection mechanism, Proof-of-Work drives concentration of block production in a limited number of actors in the long term. The larger a miner, the cheaper their electricity and mining equipment, thus yielding higher profitability per unit of investment. Also, due to professional actors, personal mining became minimally rewarding —maybe one significant reward every ten years—prompting people to join pools to share the rewards. These factors have resulted in a scenario where less than four large pools or professional miners now generate the majority of Bitcoin blocks, effectively controlling the blockchain.

In contrast, Proof-of-Stake rewards participation linearly and regularly: each coin staked yields the same reward, with rewards allocated daily to amateur stakers. Furthermore, Proof-of-Stake consumes a way less energy than Proof-of-Work. These reasons drove Massa's choice of Proof-of-Stake.

3. Solving the blockchain trilemma

The blockchain trilemma emphasizes the competing demands of scalability, decentralization, and security in any blockchain. Massa employs a consensus mechanism similar to Bitcoin's – the Nakamoto consensus – to determine the final blocks. However, rather than being sequential, blocks can now be generated simultaneously, in parallel, to scale the number of operations per second.

Demonstrably, the technology can support thousands of operations per second in a decentralized network where thousands of nodes actively contribute to the consensus.

This capability is not just theoretical or simulated, it has also been confirmed on the testnet, where over 7,000+ community nodes validated over 4,000 operations per second. This accomplished scalability comes with no compromise on decentralization or security.

4. Maintaining low hardware requirements for node operation

While superior hardware can enhance network scaling, it would make node operation less affordable for many. Consequently, we have established the minimum hardware requirement at the level of a contemporary personal computer.

5. Avoiding the implementation of delegations

Examining the block production power in delegated Proof-of-Stake blockchains reveals the rise of new intermediaries between users and control - the delegators. Delegators take delegations from those who lack sufficient coins to stake, thereby staking on their behalf.

Usually, this delegation mechanism is coupled with a high minimum staking requirement to limit the number of consensus participants. This is because the technology used (BFT variations) does not allow 10,000+ consensus nodes and sacrifices decentralization for scaling – thus does not solve the blockchain trilemma.

Massa can support this number of nodes, so we refrain from implementing delegation, and encourage operating active nodes to validate and control the blockchain .

6. Prohibiting custodial staking

A handful of centralized exchange platforms and staking providers collectively control 20 to 50% of most blockchains, holding sway from block production to voting power by staking the pooled coins of their millions of users.

To curb this behavior and safeguard decentralization, we created a community charter that applies to Massa community members, particularly node runners.

This charter prohibits the practice of staking coins for others beyond a certain threshold. More information is provided in the community charter section.

7. Ensuring the accessibility of Smart Contracts for all developers

Existing blockchain smart contract languages, from EVM's Solidity to others like Cairo, Rust, or Move, boast a limited developer base, complicating the transition from Web2 to Web3 for most developers. Massa utilizes a WebAssembly virtual machine and constructs smart contracts in AssemblyScript, a language akin to TypeScript and specifically designed for WebAssembly. TypeScript, one of the fastest-growing programming languages, has gained prominence due to its strong ties with JavaScript. With the vast majority of Web2 developers already well-versed in TypeScript, Massa is poised to easily draw and integrate new developers, thereby nurturing a dynamic and innovative Web3 community.

8. Eliminating the requirement for centralized keepers

Web2 servers typically depend on background processes. Current blockchains lack the capability to autonomously execute operations; they can only run code when prompted within blocks. This limitation has compelled developers to devise centralized solutions, such as servers that monitor the blockchain and trigger operations like position liquidation. These servers not only incur costs but can also experience failures, shutdowns, crashes, or even manipulation of the supposedly immutable DApp.

Massa’s smart contracts have the unique ability to autonomously activate to handle operations, thus eliminating the need for centralized bots or keepers.

9. Building the on-chain web

DApps exhibit decentralization only in their backend smart contracts. For a more user-friendly experience requiring a frontend, they invariably resort to Web2 centralized servers, like uniswap.org or opensea.io. These frontend servers are perpetually vulnerable to hacking and censorship.

Massa introduces a method for on-chain storage of frontends on *.massa websites, offering the same level of transparency and immutability to the frontend that smart contracts enjoy. This allows users to interact with the DApp without any error-prone intermediaries. Users can initiate their authentic Web3 journey by accessing these decentralized websites through Massa Station.

Alongside TypeScript and autonomous smart contracts, these features furnish developers with a seamless and intuitive development experience. They can use the blockchain as more than just a shared database, rather as a fully-equipped Web3 server.

Massa's vision for true decentralization stands as a beacon of hope in the Web3 landscape, where many other protocols have struggled to achieve genuine decentralization. Massa, through its design, emerges as a truly decentralized ecosystem, directly addressing the centralization issues that afflict other networks.

This steadfast dedication to decentralization bestows valuable benefits to the web3 ecosystem: amplified participation harmonized with common interests, and bolstered security characterized by resistance to attacks, manipulation, and censorship.

With Massa, Web3 can adhere to its foundational promise and empower individuals to play a substantial role in the digital landscape, thus laying the groundwork for a future that is equitable and ripe with innovation.

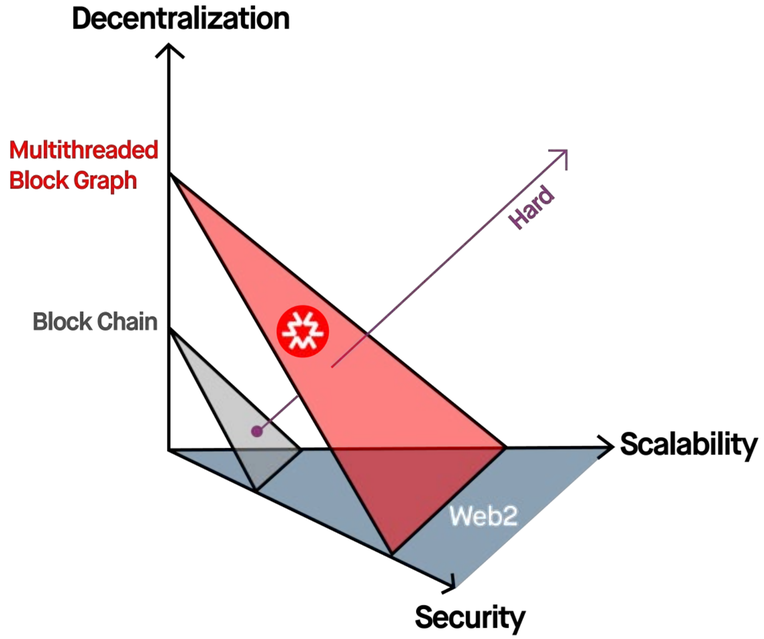
Technology

The exponential rise and acceptance of blockchain technology have brought about considerable challenges, encompassing aspects like energy consumption, scalability, and accessibility. There is a pressing need for innovative approaches that can overcome these limitations and unlock the full potential of blockchain technology while keeping the core principle of decentralization. Massa aims to address these challenges through the power of its parallel block technology, the ease of staking and writing smart contracts, and keeping an innovative mindset.

The Blockchain Trilemma

A blockchain is a shared server controlled by its community of users, with no central authority, bank or company deciding which program should run or which information should be added to the database. If a greater number of independent users participate in decisions (decentralization), then it takes more time to reach decisions (scalability), while maintaining the same level of certainty that decisions will not be tampered with (security).

This elemental association is recognized as the blockchain trilemma, formally asserting the difficulty of enhancing one of these triad properties without adversely affecting the others. Solving the trilemma usually means improving the number of transactions per second without sacrificing decentralization nor security.



The Blockchain Trilemma

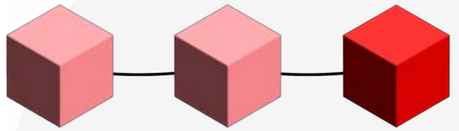
All blockchains that accomplish a scale of thousands of transactions per second actually compromise decentralization in the process, curtailing the number of independent users genuinely participating in consensus formation. Massa's technology addresses the blockchain trilemma utilizing a parallel block architecture, facilitating thousands of transactions per second with a Nakamoto coefficient exceeding 1,000.

Parallel Block Architecture

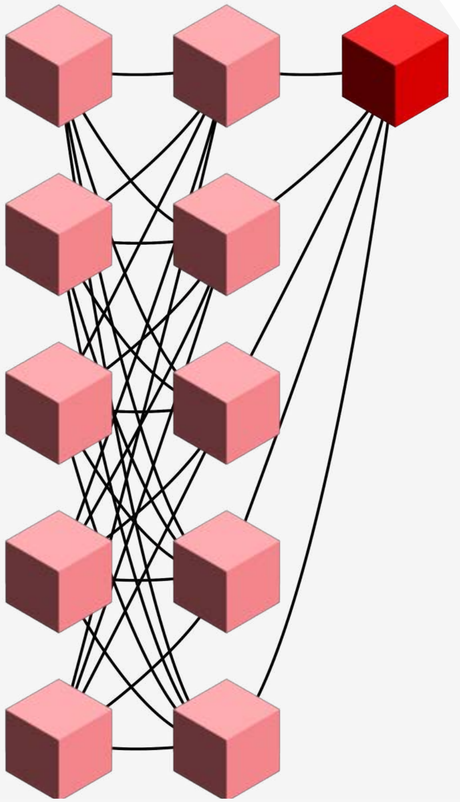
In Bitcoin, each block refers back to a previous one, forming a tree of blocks, and the Nakamoto consensus algorithm determines the optimal chain of blocks in that tree—known as the blockchain. This chain structure slows block production because each node must receive the immediately preceding block to have a reasonable chance of creating a block that will be included in the blockchain.

Massa's parallel block architecture allows nodes, when selected by Proof-of-Stake, to create blocks in parallel and still to make them all compatible with each other. Blocks are incorporated into a multithreaded graph, with each block referencing one block per thread, thus constructing a multithreaded Directed Acyclic Graph (DAG). Within Massa, a chain is a subset of the graph, termed a clique, and the consensus algorithm determines the most suitable clique to proceed from. Massa employs an adapted version of the Nakamoto consensus algorithm that aligns with the multithreaded graph. It selects the clique that demonstrates the most work—or fitness as it's referred to here.

Blockchain
A Chain of Blocks



Massa
Multithreaded Block Graph



One implication of enabling parallel blocks is the possibility of the same transaction appearing or being executed multiple times concurrently, which could result in space waste or double-spending. To circumvent this issue, Massa implements transaction sharding. Each transaction is allocated to a specific thread and can only be included in blocks within this thread, thereby eliminating the risk of duplicate inclusion in a clique.

Contrary to their claims of high scalability, most blockchains employ a consensus algorithm that can't support a large number of significantly contributing nodes. Typically, these are variants of Byzantine Fault Tolerance (BFT) algorithms that require a majority stake concentration in fewer than 100 nodes.

The technical paper demonstrates that Massa significantly outperforms traditional blockchain systems reliant on sequential block creation, with a transaction throughput of approximately 10,000 tx/s. This high performance is achieved while preserving decentralization due to the Nakamoto consensus, allowing meaningful participation of thousands of nodes in the network.

Testnet Program

The objective of the Massa testnet program is to evaluate and enhance the security, scalability, and overall usability of the blockchain architecture under real conditions during its development phase. We released the first version of the testnet very early, in July 2021, when basic consensus, peering and transaction processing were ready.

Engaging a large group of participants in the testnet enables the network to approximate future mainnet conditions, particularly with respect to hardware diversity and heterogeneous connectivity. The Massa testnet drew 350 participants in its inaugural month of July 2021, and this number has progressively grown to over 8,000 stable nodes in the last months. The widespread adoption of Massa and its straightforward staking process surprisingly helped in building this extensive network of node operators. Presently, the Massa testnet holds the distinction of being the most decentralized network in blockchain history. It continually offers insights into the functioning of decentralized networks. The main features and improvements released since the first testnet are shown in the next figure.

A heartfelt note of thanks to all node runners for their unwavering support in the rigorous testing of the Massa blockchain. Your perseverance in managing the bugs, system reboots, and load tests – integral aspects of any testnet environment – is sincerely appreciated. Thanks to your continued dedication and the vibrant community you've helped to cultivate, we're advancing steadily towards the highly anticipated launch of our mainnet.

The testnet enabled our team to evaluate the scalability of the Massa blockchain under real-world conditions, rather than in simulations or labnets, amidst thousands of nodes operating with limited CPU, bandwidth, and memory. We gauged the network's performance by populating the transaction pool with valid transactions. The network consistently processed 500 transactions per second in January 2022, and following numerous optimizations, it gradually scaled up to 4,000 transactions per second by mid-2023.

Practical application of the testnet demonstrated that Massa's parallel block architecture can handle thousands of transactions per second in a truly decentralized network, with thousands of nodes significantly contributing to the consensus.

- **Jul '21:** Testnet Launch
- **Sep '21:** Endorsement System
- **Nov '21:** Robust API
- **Jan '22:** Smart contracts
- **Mar '22:** Efficient operation propagation
- **Apr '22:** Autonomous smart contracts
- **Sep '22:** Storage limits and costs
- **Oct '22:** On-chain websites
- **Nov '22:** Efficient bootstrap
- **Jan '23:** Full gas system
- **Mar '23:** Multi-staking protection
- **Apr '23:** Denunciations and Slashing
- **Jun '23:** Versioning system

Staking is easy

For a blockchain network to truly embody the principles of decentralization, network participation should be straightforward, thus distributing power and control across a broad network of participants.

Massa employs an energy-efficient Proof-of-Stake algorithm to select block producers. Block producers are randomly selected to generate new blocks, contingent on the number of coins they possess and are prepared to stake. Staking rewards are frequent and linear: each staked coin gives the same reward, and rewards are distributed every day to any amateur node.

To facilitate validation and minimize entry barriers, the bare minimum hardware required for staking in Massa equates to that of a contemporary laptop – 8 cores, 16GB RAM, and 1TB of disk space. These requirements may increase over the years to follow improvements in personal equipment. Furthermore, the minimum quantity of coins – a roll – needed to stake is set at 100 Massa coins, allowing in theory up to 10 million validators.

Blockchain	Staking Requirement	Hardware Requirement
MASSA	100 Massa	8 cores / 16GB RAM / 1TB SSD
Ethereum	32 ETH / $74k	4 cores / 16GB RAM / 2TB SSD
Solana	5k SOL / $329k	24 cores / 128GB RAM / 2TB SSD
Polygon	50k MATIC / $42k	8 cores / 16GB RAM / 8TB SSD
Polkadot	360k DOT / $2.2m	4 cores / 32GB RAM / 1TB SSD
Avalanche	2k AVAX / $53k	8 cores / 16GB RAM / 1TB SSD
Aptos	1m APT / $8m	16 cores / 32GB RAM / 2TB SSD
Sui	30m SUI / $19.8m	16 cores / 128GB RAM / 2TB SSD

Staking rewards come in the form of newly minted tokens, with a maximum of 1.02 Massa per slot. These rewards add up to a maximum of 64,377,504 Massa minted per year and distributed to active staking nodes, with a ratio of approximately 6.4% during the first year, and decreasing each year. In addition, staking nodes will share gas fees and slashed coins. As less than the total coin supply is anticipated to be staked at any given moment, the actual annual yield for active stakers should surpass this percentage.

To preserve decentralization in Massa and thanks to the low hardware and staking requirements, we do not need to implement delegations. Without delegation, the only way to access the staking rewards is to directly run a node. Also, centralized custodial staking providers are limited in size thanks to the community charter. Hence, running nodes to validate and control the blockchain becomes significantly more incentivized, with staking rewards earmarked solely for the node runners.

Massa Virtual Machine: an innovative mindset

To facilitate greater accessibility and powerful innovations, Massa abandoned the EVM as its virtual machine and crafted a custom WebAssembly (WASM) virtual machine for executing smart contracts. This approach provides benefits such as enabling developers to create and deploy smart contracts using familiar programming languages like TypeScript, and swiftly integrating new innovations, which would be unfeasible while adhering to EVM compatibility.

Smart Contracts in Typescript

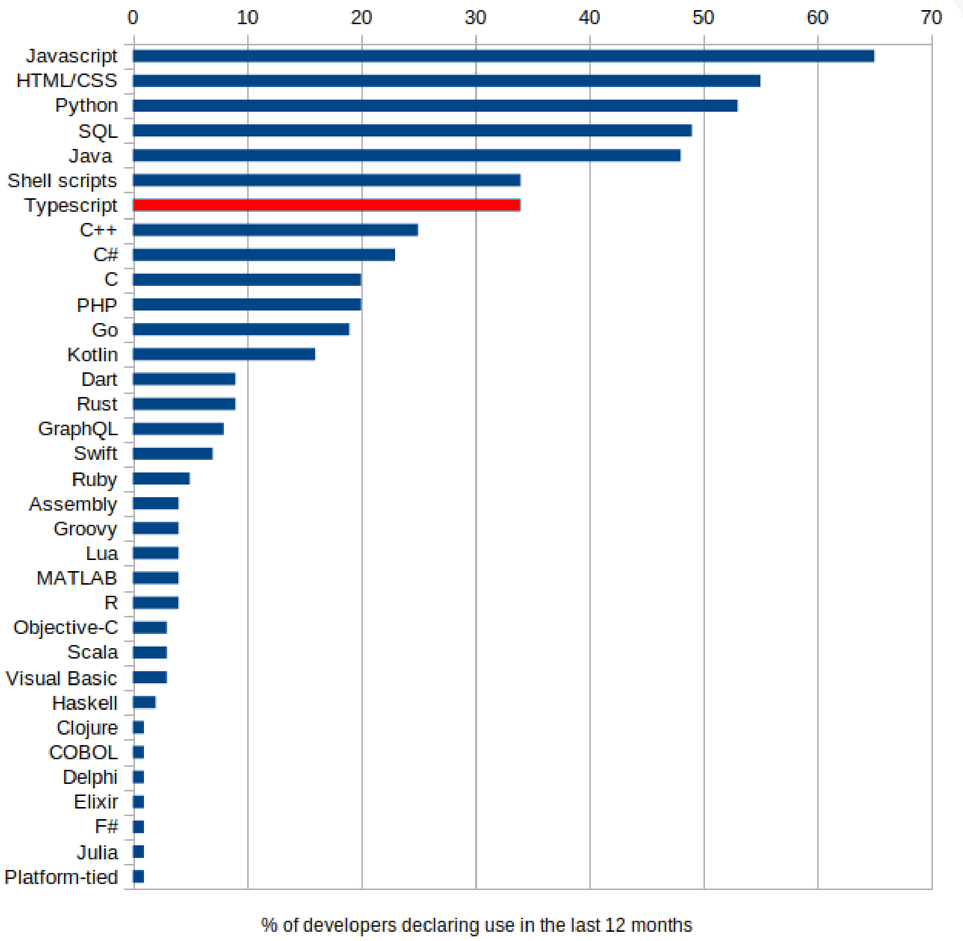
The first supported language for writing smart contracts on Massa is AssemblyScript, a subset of TypeScript optimized for WebAssembly. TypeScript is one of the most widespread languages, in particular in web2 development. TypeScript, with its intuitive syntax and JavaScript compatibility, allows developers to draw on their existing skills and knowledge, thereby reducing the learning curve for building smart contracts on Massa.

In 2022, 34% of developers have used typescript while blockchain-specific languages such as Solidity, Cairo or Move have a negligible developer base. Given that all Web2 developers are already familiar with TypeScript, Massa is well-positioned to easily attract and integrate new developers. This decision has fostered an environment conducive to efficient and secure smart contract development, while also making it accessible for those familiar with JavaScript. This approach demonstrates Massa's commitment to nurturing a robust, secure, and developer-friendly ecosystem, positioning itself to draw a wide array of developers and foster a dynamic, innovative blockchain community.

Massa addresses today's blockchain scalability and accessibility challenges by solving the blockchain trilemma, reducing entry barriers, making staking attractive, and providing a developer-friendly stack.

Innovation is integral to Massa's ethos, ensuring it remains cutting-edge and poised to stay at the forefront of blockchain technology and usage. Massa has introduced two significant innovations that warrant individual discussion: autonomous smart contracts and on-chain web.

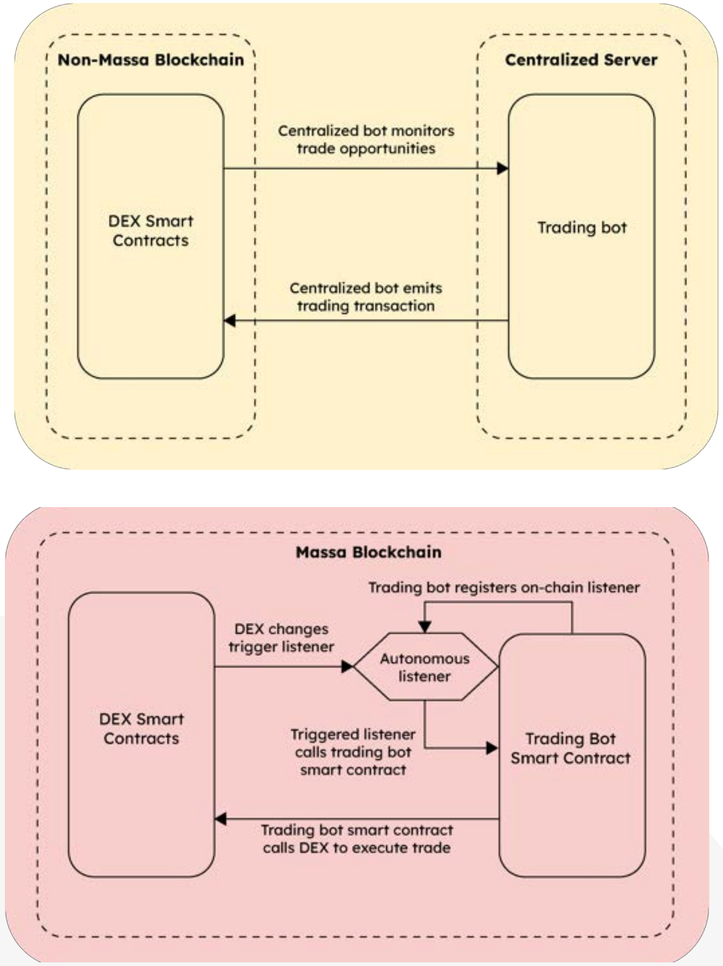
Massa demonstrated its innovative capacity and will continue to anticipate future trends and challenges, enabling it to incorporate new mechanisms that enhance usability or performance without compromising decentralization.



Autonomous Smart Contracts

Massa's autonomous smart contracts (ASCs) are a groundbreaking innovation in the blockchain ecosystem, pushing the boundaries of decentralization and opening up new possibilities for a wide range of applications. ASCs are designed with a unique architecture that allows them to function asynchronously and self-wake, without the need for explicit off-chain human or bot interactions.

Whereas traditional smart contracts rely on external triggers to initiate actions, Massa's ASCs can register actions for later execution and emit signal events that other contracts can listen to. When an event is triggered, the corresponding handler functions are automatically executed, reducing the need for bots or human interaction and pushing the limits of decentralization.



Example of a bot trading on a DEX. With Massa's autonomous smart contracts, the bot lives on-chain, with no need for a centralized server, and reacts instantly to changes on the DEX.

To achieve this level of autonomy, Massa employs a combination of innovative features. Timers and Schedulers in Massa's ASCs enable them to schedule tasks for future execution, allowing for time-based actions to be performed autonomously. This feature allows smart contracts to wake up and execute tasks at predetermined intervals or specific times. Event Listeners are also present in Massa's ASCs, allowing them to listen for specific events emitted by other smart contracts and react to changes in the blockchain environment. This functionality enables the creation of interconnected and dynamic decentralized applications.

The implementation of autonomous smart contracts on Massa addresses the limitations of traditional blockchain platforms, which are unable to compute autonomously and only execute requests from external sources. Developers have had to build complex workarounds, such as centralized services like Gelato, to overcome these limitations. Massa's ASCs eliminate the need for such centralized solutions, allowing for more decentralized, efficient, and secure operations. The benefits of ASCs on Massa are numerous, including enhanced decentralization, as the reliance on off-chain human or bot interactions is reduced.

Use Case 1: DeFi

Decentralized Finance, or DeFi, is an arena where the transformative potential of Massa's autonomous smart contracts is fully realized. These unique contracts empower applications to harness the exclusive advantages of DeFi, such as increased transparency, security, and decentralization.

Developers can now build innovative DApps such as the ecosystem project Dusa, which is a pioneering decentralized exchange (DEX) with automatic order execution. Leveraging Massa's autonomous smart contracts, it is possible to execute limit orders without the need for centralized keeper bots, enhancing both the security and decentralization of the platform. This advancement improves the user experience by allowing assets to be sold at a set limit price, circumventing consensus delays, bot failure points, or competition from other sell orders.

The advantages extend to automated order execution, which is streamlined by Massa's autonomous smart contracts. These contracts also enhance interoperability. Their integration enables seamless interaction between different decentralized applications on the Massa platform, creating a DeFi ecosystem that is more cohesive and dynamic.

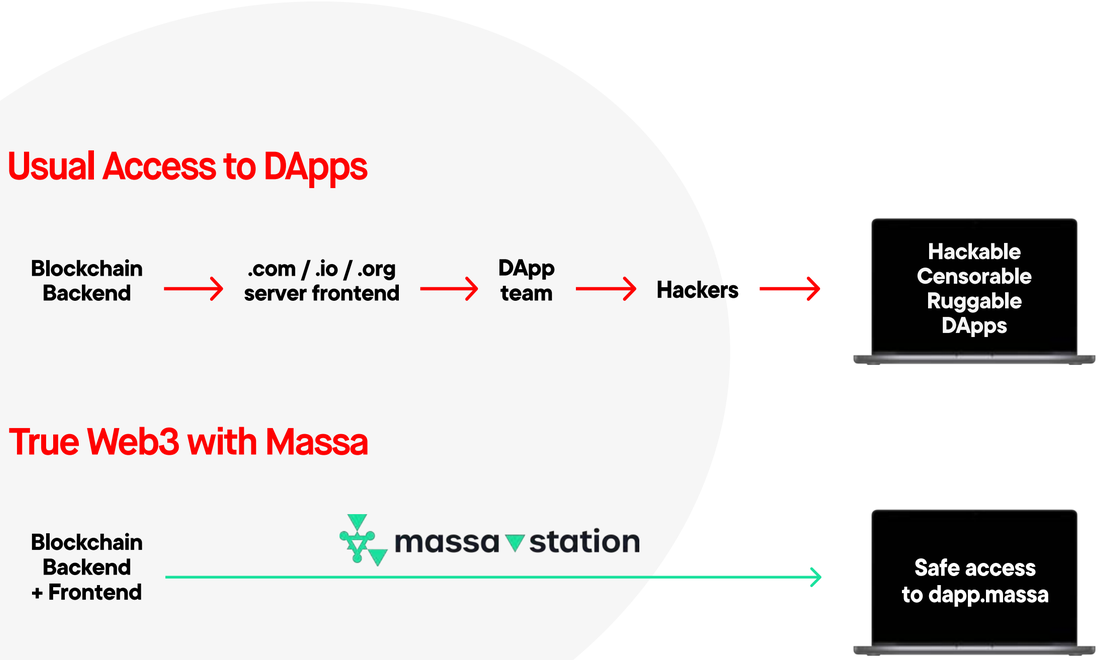
Use Case 2: NFTs and Games

The potential of autonomous smart contracts in the realm of non-fungible tokens (NFTs) and games is tremendous, and it is an area where Massa can revolutionize the gaming experience and streamline the NFT market. For instance, Massa's ASCs can facilitate autonomously breeding virtual pets like CryptoKitties, creating a dynamic and immersive gaming experience. The technology can also generate AI-created NFT art that evolves and learns on its own, offering new possibilities for digital art collectors and enthusiasts.

Decentralized in-game economies can benefit from Massa's ASCs by operating autonomously, allowing for more complex and engaging gaming experiences. By removing the need for centralized control, these economies become more resistant to manipulation and hacking. Furthermore, autonomous smart contracts on Massa can facilitate seamless interaction between different games and NFT platforms, fostering a more interconnected and vibrant gaming ecosystem.

Massa's autonomous smart contracts represent a groundbreaking innovation in the blockchain space, offering new possibilities for decentralized finance, non-fungible tokens, and games.

On-Chain Web and Massa Station



The proliferation of decentralized applications (DApps) has spurred numerous advancements in the digital sphere – yet, a vast majority of DApps still rely on centralized servers for hosting their front-end components, leading to security and reliability issues. Massa Station, an on-chain web access tool built for the Massa blockchain, addresses these concerns by providing an intuitive platform for creating and interacting with DApps entirely on-chain. This unique approach has the potential to revolutionize the development, security, and adoption of decentralized applications, setting the stage for a truly decentralized web.

Centralized websites are fraught with various issues, including single points of failure and vulnerability to hacks. For instance, in December 2021, a BadgerDAO website hack led to a staggering $120m loss. Similarly, in August 2022, a front-end hack of Curve Finance resulted in a $575k loss. These incidents underscore the necessity for more secure and decentralized solutions for crucial applications such as DeFi platforms.

Massa Station counters these challenges by offering a tool that enables developers to build and host their projects directly on the Massa blockchain. By doing so, it eliminates reliance on centralized servers, mitigating the risks of censorship and hacking while providing a seamless Web3 experience for users. Developers can register ".massa" domains and store their websites' logic directly on the Massa blockchain, ensuring applications are accessible directly from any browser of a user who installed Massa Station, without any intermediaries. This innovative approach bolsters the security and reliability of critical applications, like DeFi platforms; Dusa, a project in the Massa ecosystem, distinguishes itself in the DeFi landscape with its decentralized front-end, ensuring resistance to censorship and hacks.

This revolutionary approach to web hosting includes several key features and components that make it stand out from traditional web hosting solutions:

1. Domain Registration:

Massa Station allows users to register their own ".massa" domain names on the Massa blockchain's decentralized domain name system (DNS). This feature facilitates the creation of unique, easily recognizable web addresses for on-chain websites and applications, enhancing their discoverability and credibility in the decentralized web ecosystem.

2. Back-End Hosting:

With its custom-built smart contract engine, Massa supports the development and hosting of smart contracts in TypeScript, a robust and widely-used programming language. This feature offers developers a familiar environment for creating the back-end logic of their DApps while ensuring the integrity and security of the underlying blockchain infrastructure. Moreover, the autonomous smart contract capability allows for fully autonomous back-end operations, akin to what a web2 server would be able to do, transitioning from a static database-like approach to a complete stack, genuine web3 service.

3. Front-End Hosting

In addition to back-end hosting, Massa enables developers to design and host their application's front-end directly on the blockchain, using HTML, CSS, JavaScript, and other familiar web technologies. This feature allows for the creation of user-friendly, visually appealing interfaces for DApps. By hosting front-end components on-chain, Massa eliminates the need for third-party hosting services and ensures that the user interface remains consistent with the decentralized nature of the underlying application.

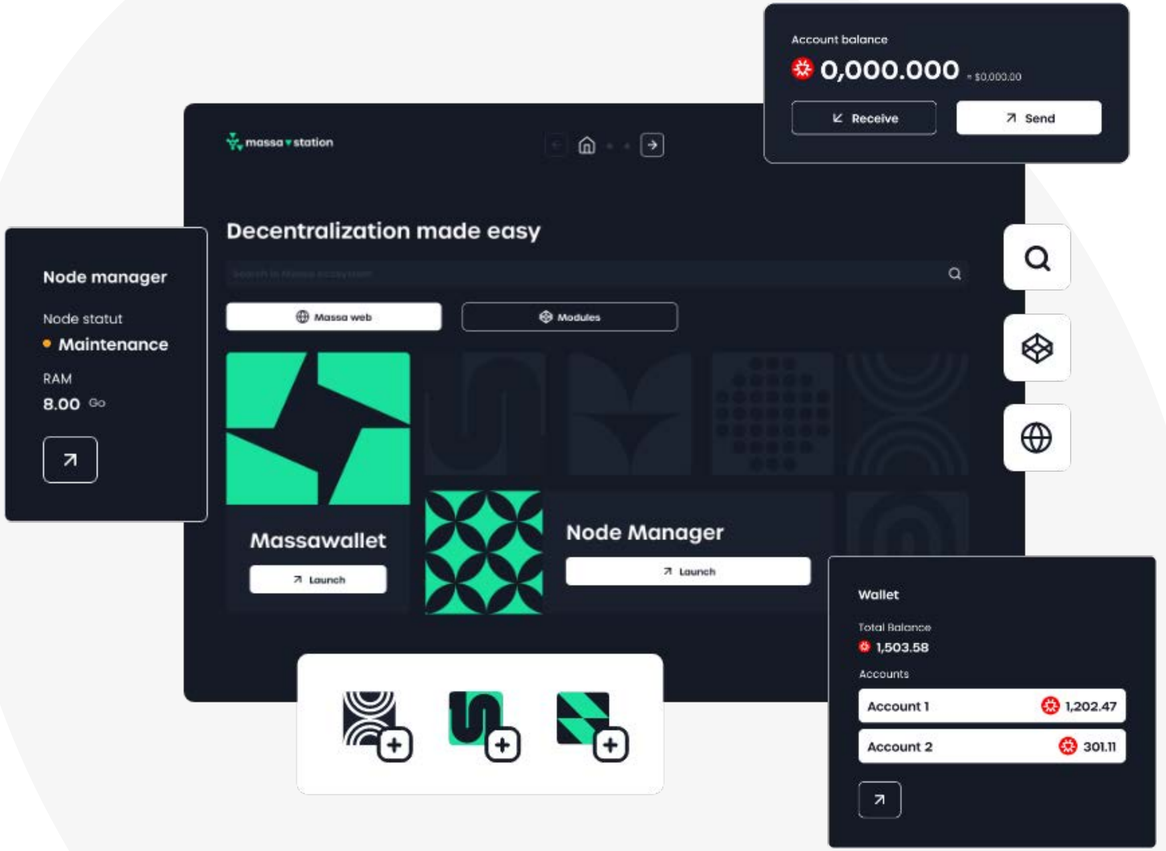
4. Seamless User Experience:

Massa Station's on-chain web access solution allows users to interact with DApps through their preferred web browsers, providing a seamless transition between web2 and web3 experiences. By hosting both the front-end and back-end components of DApps directly on the Massa blockchain, users can enjoy a consistent and secure browsing experience without the need for intermediary services or third-party hosting providers.

Massa Station's user-friendly design allows users to interact with on-chain web applications just as they would with traditional websites. The platform's familiar and intuitive interface can encourage greater adoption of decentralized applications, contributing significantly to the growth and development of the decentralized web ecosystem.

The pioneering on-chain web access offered by Massa Station holds the potential to significantly impact the development and adoption of decentralized applications across various industries and use cases. By providing a comprehensive and user-friendly platform for creating and interacting with DApps, Massa Station can:

1. Drive increased innovation in the decentralized web space: With its robust on-chain web solution, Massa Station empowers developers to create more advanced and sophisticated DApps, driving innovation in the decentralized web ecosystem. This platform can inspire new ideas and solutions for addressing the challenges and limitations of traditional web hosting, ultimately leading to a more diverse and dynamic range of decentralized applications.



Massa Station prototype: Browse Massa DApps & explore the module store

2. Enhance the security and resilience of decentralized applications: By hosting both the front-end and back-end components of DApps directly on the Massa blockchain, Massa Station ensures these applications benefit from the security and reliability inherent in decentralized systems. This approach can help protect DApps from potential censorship, hacking, and other risks associated with centralized hosting services, resulting in a more secure and resilient decentralized web.

3. Promote greater adoption of decentralized applications: Massa Station's user-friendly on-chain web access solution can help bridge the gap between web2 and web3 experiences, making it easier for users to discover, interact with, and adopt decentralized applications. By providing a seamless and familiar browsing experience, Massa Station can contribute to increased adoption of DApps and the broader growth of the decentralized web.

4. Foster a more equitable and decentralized internet: By lowering the barriers to entry for creating and interacting with decentralized applications, Massa can contribute to a more equitable and decentralized internet ecosystem. The platform's commitment to accessibility and ease of use can enable a wider range of developers and users to participate in the decentralized web, encouraging greater diversity and inclusivity in the digital landscape.

Massa represents a significant leap forward in the evolution of the decentralized web. By offering a comprehensive, user-friendly, and secure on-chain web access solution, Massa Station can help bridge the gap between web2 and web3, making it easier for users to discover and adopt safe DApps and contributing to the growth of the decentralized web ecosystem.

Community and Ecosystem

A thriving ecosystem is at the heart of Massa's success as a decentralized, accessible layer-1 blockchain. Comprised of diverse projects, tools, and applications, the Massa ecosystem is experiencing significant growth, underpinned by a dynamic community driving innovation and adoption. To further support this, the Massa Foundation will roll out various programs that nurture both the community and the broader ecosystem.

Testnet

The expansion of Massa's testnet attests to its scalable and accessible network, which continues to grow, now boasting over 8,000 nodes. This number outpaces other popular chains, like Avalanche, with its 1,209 validators, and Cardano, with around 3,200 validators. Massa's capability to accommodate a larger number of nodes not only underscores our commitment to true decentralization but also ensures enhanced security and reliability within the ecosystem. This significant network expansion sets a solid foundation for a truly decentralized web, illustrating Massa's potential for a leading role in the blockchain sphere. Contributors to this growth are rewarded through the Testnet incentive program.

Community Growth on Social Media

Massa’s ecosystem also extends to social media platforms, enabling users to connect and share their experiences with the Massa community. By integrating with these platforms, Massa aims to build a more inclusive and interconnected community, encouraging collaboration and growth. As of November 2023, Massa has 5,000+ Stars on Github, 102,500+ people on Discord, 45,000+ followers on Twitter, 20,000+ people on Telegram, and over 10,000 people participating in our unofficial Massa communities all over the world.

Massa Ambassadorship Program

The Massa Ambassadorship Program is a crucial component of the Massa ecosystem, designed to encourage community engagement, promote platform adoption, and foster a strong, supportive network of users and developers. This program empowers individuals who are passionate about Massa's vision and values to take an active role in the platform's growth and development. By providing Ambassadors with the resources, support, and opportunities to engage with the community, Massa ensures a vibrant and sustainable ecosystem for its users and partners.

Throughout the program's various stages, from its beta launch to the end of the first Crew3 sprint, the Massa team has worked closely with Ambassadors to refine and improve the program. The Massa Ambassadorship Platform and Questboard provide a central hub for Ambassadors to connect, collaborate, and contribute to the platform's growth. Through the Questboard, Ambassadors can participate in various quests that align with their skills and interests, earning rewards and recognition while driving the platform's success.

The Ambassadorship Program has achieved significant milestones, including the onboarding of numerous Ambassadors who are contributing to the platform's growth in various ways. By producing content, participating in events, and promoting Massa's vision, Ambassadors are actively driving the platform's adoption and success. The Massa team continually iterates on the program to ensure that it remains aligned with the platform's goals, provides opportunities for Ambassadors to grow and develop, and fosters a strong sense of community. MassAdopted is a prime example of a community-driven initiative resulting from the Massa Ambassadorship Program.

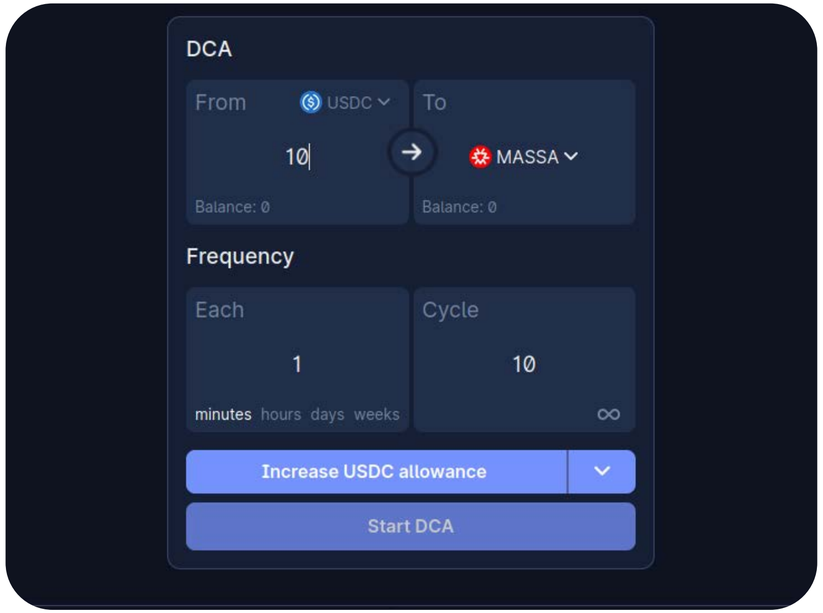
Grant Program

A cornerstone of Massa's initiatives is the Grant Program, designed to accelerate the development and widespread adoption of applications, tools, and infrastructure within the Massa ecosystem. Recognizing the essential role of community builders, developers, researchers, and educators, the Massa Foundation is committed to offering financial support, driving innovation, and nurturing a sustainable, thriving community around Massa.

The Grant Program champions teams focused on open-source projects that align with Massa's mission. We prioritize proposals with innovative features that can spark mass adoption, and which demonstrate a feasible roadmap towards significant traction and product-market fit. Emphasis is placed on projects that show the potential to draw a sizable user base or achieve high total value locked on-chain. An integral part of our grant allocation process involves assessing the team's strength and the project's capacity to make a meaningful impact on the world. We also offer special consideration to projects that take advantage of Massa's unique blockchain features, such as autonomous smart contracts and on-chain web capabilities.

The Grant Program has aided projects that align with Massa's mission, one such beneficiary being Dusa—a revolutionary decentralized exchange characterized by its decentralized front-end and automatic order execution. By leveraging Massa's autonomous smart contracts, Dusa has redefined trading norms by enabling limit orders to be executed without centralized keeper bots, thus boosting platform security and decentralization.

Massa's autonomous smart contracts underpin this optimized order execution process, providing a streamlined approach to trading. Dusa's successful integration facilitates interaction between various decentralized applications on the Massa platform, thereby enhancing the ecosystem. This innovative approach carries the potential to attract a wider user base to the Massa chain, enabling operations in Web3 DeFi that were previously unattainable. Additional information about Dusa and its contributions can be found on its official website, Medium and Mirror.xyz blog posts, and its link3.to profile.



DCA strategies on the Dusa platform

Community Charter

At Massa, our commitment to the foundational principles of blockchain - security, transparency, self-governance, and above all, decentralization - has always been unwavering. This steadfast belief in these values shapes every step we take and every decision we make. We owe it to our vibrant community, the lifeblood of our ecosystem, to stay true to this commitment.

That's why we're thrilled to announce a significant milestone in our journey - the **Massa Community Charter**. Set to be integrated into Massa's ledger, this Charter embodies our resolve to foster a truly decentralized and inclusive environment for all our users. It provides a clear framework for our community to understand our position on important aspects of our ecosystem, guiding us in upholding the values we hold dear.

One critical area the Charter addresses is our stand on practices that potentially sidestep our standards of decentralization. In our continued quest for a truly decentralized environment, it's essential we scrutinize and address potential attempts to subvert this decentralization, through clever maneuvers that could lead to significant centralization within the system.

In this section, we will shed light on such practices, exploring their implications and why we, at Massa, believe it necessary to prohibit them as per our Community Charter. As we traverse this complex landscape, our goal is to deepen our shared understanding of these issues and reinforce our unwavering commitment to the core principles of blockchain.

The Spirit of Decentralization and the Potential Pitfalls

Decentralization is the lifeblood of blockchain technology. It enables a trustless, permissionless network where power and control are distributed evenly among all participants. However, the evolution and growth of blockchain projects sometimes introduce challenges to this ideal. It's not unusual for practices that seem to deviate from the core spirit of decentralization to arise, often masked as measures for convenience or efficiency.

Consider a scenario where a third-party, either centralized or decentralized, offers a service that allows users to transfer their tokens to a specific address. This third party then adds these tokens to one or more of its validator nodes on the network. At first glance, this may seem beneficial, particularly to users who may not have the resources to run their own nodes. However, this seemingly benign service could inadvertently lead to significant centralization.

As users transfer their tokens to this third party, they effectively relinquish their share of the network's control to a single entity. This entity can then grow disproportionately influential by controlling a large portion of the network's validator nodes, contrary to our ethos of decentralization. This situation could threaten the network's resilience and even its governance, as this entity could wield considerable voting power.

At Massa, our system has been designed to avoid any form of Delegated Proof of Stake (DPoS) mechanism. This decision is a conscious effort to prevent the emergence of overly influential entities that could undermine the network's decentralization. Unfortunately, the service described above is a clever method to sidestep this prohibition, creating a de facto DPoS situation.

The Charter, therefore, expresses our disapproval of such practices. It serves as a foundational pillar of our governance, safeguarding our decentralization principles.

This document delineates the boundaries of our operations, acting as a robust and legally sound framework that preserves the integrity of our network against actions that could compromise our commitment to decentralization. By aligning our practices with the Charter, we stay true to our mission and vision, ensuring our community members the benefits of a genuinely decentralized ecosystem.

Safeguarding Decentralization: Our Measures

At Massa, we don't just talk about decentralization, we act to protect it. To ensure that our vision remains strong and secure, we have codified certain guidelines in our Community Charter. The Charter will be made available ahead of the mainnet launch, allowing our community to familiarize themselves with its contents and principles. We describe its main mechanisms here.

One of the main centralization factors in blockchains is custodial staking, by which users deposit coins to centralized entities –banks, such as exchange platforms and staking providers, which stake their aggregate coins. This staking is done with or without users' consent, often giving them a part of the staking rewards and sometimes not. As a result, a few centralized exchange platforms and staking providers together control 20 to 50% of most blockchain networks, from the block production to voting power in proposals. This behavior annihilates the block rewards incentive put in place to motivate people to run independent nodes, secure the network and participate in governance.

To prevent this behavior and protect decentralization, we designed the Massa Community Charter. This Charter applies to all members of the Massa community and in particular node runners. The goal of this Charter is to protect the interest of the Massa community, expressing that decentralization of staking is a key collective concern, and excluding the behavior of staking coins on behalf of other people above a significant threshold: 1,000,000 Massa in aggregate.

The Community Charter is not tied to any legal entity, it is included in the ledger and implicitly accepted when participating in the community and in particular when running nodes and connecting to the network. In the future, when the governance is implemented in the core blockchain, it is expected that the community of token holders will be able to update the Charter automatically through a proposal and votes of the Massa core DAO.

Any infringement to the community charter can trigger legal action by any party feeling damaged by this behavior. The Massa Foundation will monitor the state of decentralization in the Massa ecosystem and in particular the staking component of the Massa blockchain stack.

Note that while custodial staking is discouraged, solo staking is made very accessible, as we discussed in the previous technical section, such that holders are incentivized to stake and help secure the decentralized network.

Our Community Charter is not just an aspirational document; it's an instrumental tool in our ecosystem. It lays down a set of clear rules for everyone within the Massa network. The Charter does not only illustrate our commitment to decentralization, but it also signifies our stance against any activities that could potentially compromise this ideal. The Charter provides a fundamental framework that defends and reinforces our vision of decentralization.

Moreover, we firmly believe that education and awareness serve as the best defenses against any practices that could undermine our pledge to decentralization. Our community lies at the heart of Massa, and an informed community member is our strongest ally. Therefore, we dedicate substantial effort to educate our community about our values, the significance of decentralization, and how to discern practices that could threaten it. We encourage regular interactions, discussions, and educational campaigns within our community to make sure everyone understands the importance of a truly decentralized network and their part in preserving it.

The Vital Role of the Community in Upholding Decentralization

Massa's vision of a truly decentralized network is only possible through the active participation of our community. Our network thrives on the collective effort of each community member to uphold the principles of decentralization. Every user in the Massa network, from a single token holder to a node operator, has a unique role to play in maintaining our ecosystem's decentralized structure. It's a collective responsibility that calls for a collaborative spirit.

Moreover, our users aren't just passive participants; they're active contributors to our mission. They directly contribute to the network's security and robustness. Even in their interactions with each other and in making decisions about network governance, they embody the principle of decentralization that we so fiercely advocate.

Yet, this role comes with the responsibility to act against practices that could undermine our commitment to decentralization. The Massa Community Charter acts as a guide for our community in identifying such practices and responding appropriately. We ask each Massa community member to be vigilant, to stay educated, and to respect the principles laid out in our Charter.

By standing together as a community committed to our mission, we can ensure the continued success of a truly decentralized Massa.

Towards a Fully Decentralized Future with Massa

The principles enshrined in our Massa Community Charter reflect our enduring commitment to decentralization, a commitment we believe is fundamental for the future of blockchain technology. This future is only possible with an active, educated, and engaged community supporting and advocating these values.

By issuing the Charter, we not only lay out clear rules to guide our community in their participation but also reaffirm our position against activities that compromise our vision of a truly decentralized network.

Maintaining this strong stance against practices that jeopardize decentralization is our collective responsibility. We firmly believe that by empowering our community with the knowledge and tools to uphold this commitment, we are one step closer to a more transparent, democratic, and decentralized future.

With the support of our community, the path forward for Massa is clear. We will continue to grow, innovate, and lead the charge towards a decentralized future. Our Community Charter is just the start. Together, we can shape the blockchain landscape, ensuring Massa stands as a beacon of decentralization, now and for years to come.

Tokenomics

Massa, true to its values, has implemented a unique tokenomics model that emphasizes fairness and decentralization. This model ensures that the Massa token is distributed widely among the community, reducing the risk of centralization that can result in unfair voting practices, price manipulation, and security compromises:

- **Unfairly-distributed voting:** When a small number of entities control a significant portion of a blockchain's tokens, they can disproportionately influence governance decisions, undermining the democratic principles that underpin decentralized systems.
- **Price manipulation:** Token centralization can also lead to price manipulation, as large holders can exert undue influence on the market, creating artificial fluctuations that distort the true value of the token.
- **Security compromises:** A centralized token distribution can lead to security vulnerabilities, as malicious actors can target the limited number of entities controlling a large portion of the token supply. It also generates centralization in block production, leading to protocol-level risks.

Massa is committed to maintaining the highest standards of decentralization, with the goal to achieve a Nakamoto coefficient of over 1,000, ensuring that control and decision-making power are widely distributed across the community. Achieving this not only requires efforts on the technical and legal design, but also on the coin distribution. On this aspect, we crafted three main particularities compared to other L1 blockchain coin distributions:

- **Less tokens for the company/founders:** Massa Labs and founders are allocated 12% of the total supply.
- **Less tokens for insiders:** The maximum number of tokens bought per entity in all our token sales is relatively small. For instance, the cap was 1% of the total supply in the seed sale, allowing a record number of 100 backers in such a sale. Also, the supply allocated to these private sales is only 16% in total.
- **More tokens for future builders and stakers:** the Decentralization Program sets aside 30% of the supply to grow the future builders and stakers community, with the aim to achieve full decentralization in a transparent way.

These steps together improve the token decentralization, limit the influence of early insiders and VCs, and limit the formation of whales whose only remaining option is to buy on the market.

Massa Token

The Massa token is the native token of the Massa L1 blockchain. It has two main uses in the blockchain: it serves as gas for operations so that nodes include them into blocks, and it can be staked to give power to a node to create blocks in the Massa blockchain.

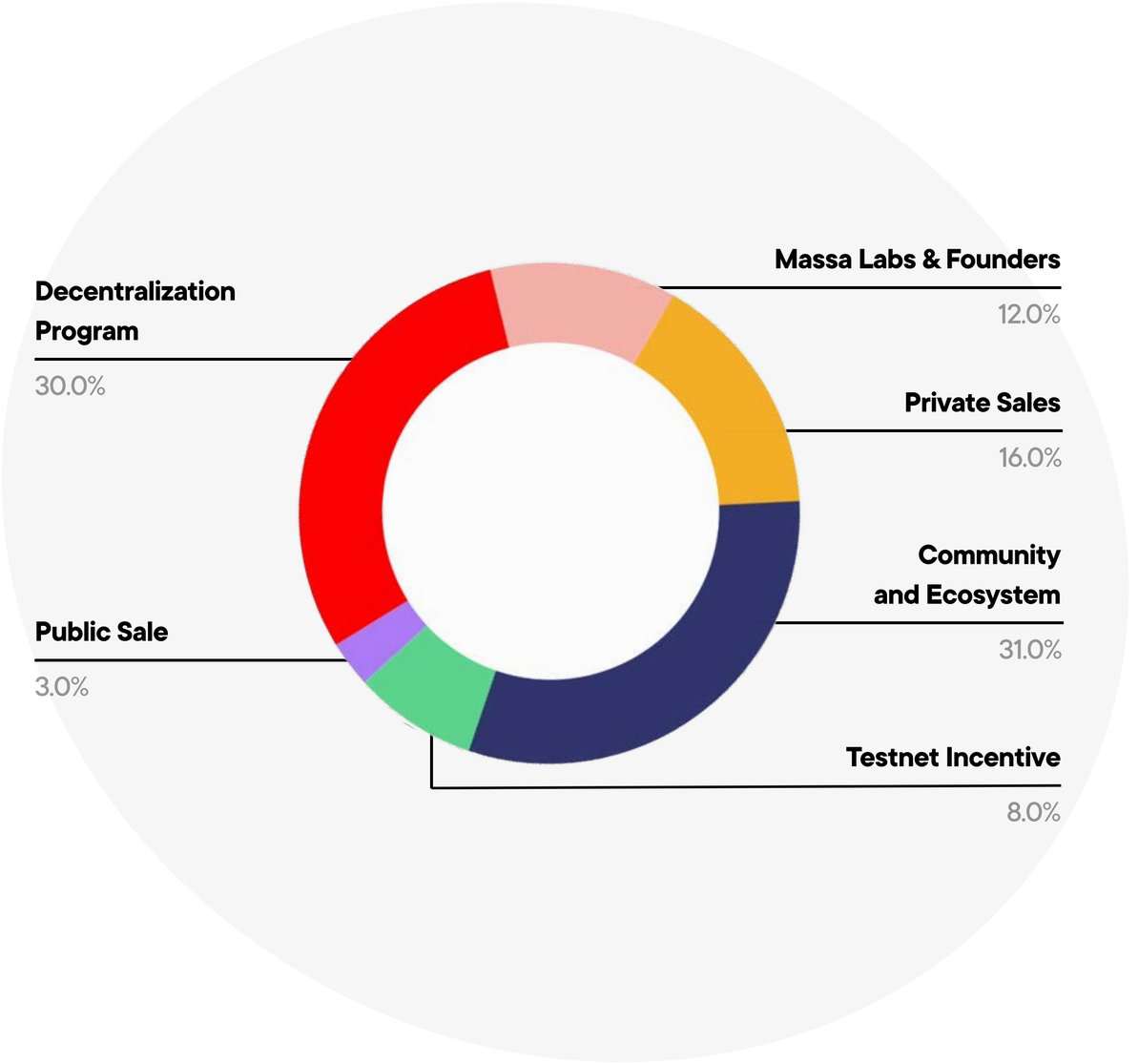
Initial Token Distribution

The total initial token supply is 1,000,000,000 Massa tokens. These initial tokens are set up in the genesis ledger. They are distributed as follows.

Massa Labs & Founders: 12%, 120,000,000 tokens. This allocation goes to the team, the founders and a reserve for Massa Labs, to ensure that the main development team is invested in the project's long-term success.

Private Sales: Up to 16%, 160,000,000 tokens.

Community and Ecosystem: 31%, 310,000,000 tokens. This allocation is managed by the Massa Foundation. Its purpose is to foster the growth of the Massa community and ecosystem in the long term through grants, marketing actions, partnerships and other programs.



Testnet Incentive Program: up to 8%, 80,000,000 tokens. The Testnet Incentive Program rewards the thousands of node runners who successfully participated in the testnet.

Public Sale: 3%, 30,000,000 tokens.

Decentralization Program: 30%, 300,000,000 tokens. Composed of:

- **100k-nodes Program:** 20%, 200,000,000 tokens. The goal of this pool is to grow the number of individual stakers participating in the security of the network and in the core governance. Compared to the coin distribution of other L1s biased towards insiders who later sell large chunks in opaque deals or on the market, this alternative mechanism provides more transparency and decentralization. This pool, managed by the Foundation, can be bought by new node runners with a cap of 20 rolls (2,000 tokens) per person, at a slow pace between 2 and 8 years post-mainnet, with vesting. Tokens not distributed after 96 months are burnt.

- **2k-builders Program:** 10%, 100,000,000 tokens. The goal of this program is to grow a larger builder community with many grants, involving the Massa holders in the decisions to give grants. These grants have a smaller size than with the main grant program: they are capped at 50k tokens per project. Tokens not distributed after 96 months are burnt.

Nakamoto Coefficient Computation

With this data, we can compute the Nakamoto coefficient of the coin after distribution. The Nakamoto coefficient is computed as the minimum number of independent entities/persons required to reach 50% of the total supply. We take the most concentrated categories and count the expected number of entities/people until we reach 50%:

- **Massa Labs:** 12%, at least 100 people;
- **Private sales:** 16%, at least 100 people;
- **Community and Ecosystem:** expecting 1,000+ people in the first 22%.

Thanks to the fair distribution with smaller pools for insiders and larger pools dedicated to the community, the Nakamoto coefficient of Massa is well over 1,000.

Staking Rewards

Staking is the process of running a validator node verifying the blockchain and creating blocks. In Massa as in other Proof-of-Stake blockchains, nodes are selected to create blocks based on their deposited coins –their stake in the blockchain.

As staking improves the decentralization and security of the network, this behavior is incentivized by staking rewards: the higher the number of staked coins, the higher the number of created blocks and received rewards.

To improve decentralization and dedicate rewards to independent node runners, there is no delegation mechanism in Massa, and custodial staking is limited by the community charter.

A minimum number of coins must be deposited to be able to stake, corresponding to one roll. The number of coins in a roll is set to 100. Users deposit coins to get a number of rolls and stake with these rolls. When they want to stop staking, they can get back their coins after a small locking period and lose the corresponding rolls. When the staking address is selected to produce a block, the node is expected to produce exactly one block.

If the node is offline for some reason, it misses the opportunity to produce the block and to get the reward. If the node is missing these opportunities too often, it is automatically deactivated and its rolls are lost and fully given back as coins. If the node produces more than one block in a selected slot, this is considered as bad behavior and is punished with slashing: one roll is slashed, completely lost and no coins are given back.

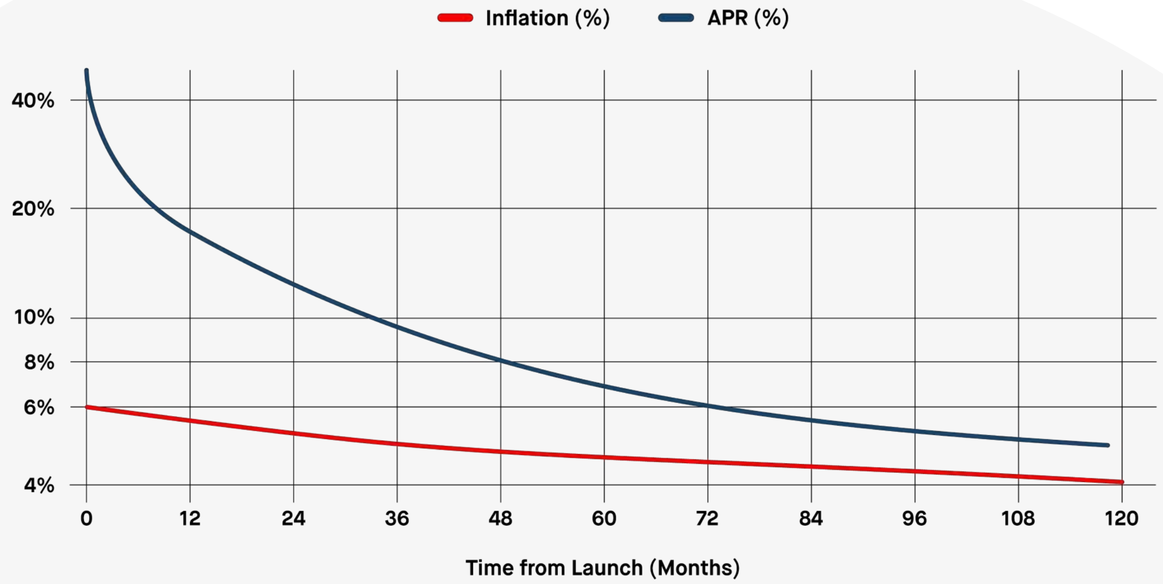
At each slot, one staking address is selected to produce a block, and in order to improve consensus speed, 16 other addresses are selected to create endorsements —votes about the best blocks. A maximum minted reward of 1.02 tokens is distributed per slot. If there was a block in this slot, the reward is distributed as follows:

- 0.06 tokens are given to the block creator,
- For each endorsement included in the block (up to 16):
  - 0.02 tokens are given to the block creator,
  - 0.02 tokens are given to the endorsement creator,
  - 0.02 tokens are given to the creator of the endorsed block

Block and endorsement creators also share the gas fees of all transactions included in the block, and half of the slashed coins, the other half being burnt. However, all the fees of autonomous smart contracts are burnt as they run outside blocks.

There are 2 slots per second in Massa architecture, so these rewards add up to a maximum of 64,377,504 newly-minted Massa tokens per year, distributed to active staking nodes. The inflation rate is therefore approximately 6.4% during the first year, and decreases each year as the total supply increases.

As less than the total supply is expected to be staking at any point in time, the actual return per year for active stakers will be higher than this percentage. The next figure shows the maximum inflation rate and an estimation of the annual percentage return (APR) for staking nodes over time.



Launch Staking

On mainnet launch, the genesis ledger distributes coins to the different holders, and also includes genesis rolls granting staking rights for the first cycles. For the utmost community involvement and decentralization, genesis rolls will be allocated to node runners from the testnet incentive program who showed success in stable testnet staking and who are willing to be part in the creation of the first blocks of the mainnet. These node runners will have their coin rewards from the testnet program converted to rolls in the genesis ledger.

Massa's tokenomics model is designed to ensure a fair and decentralized token distribution, contributing to the platform's overall security, sustainability, and user empowerment. By allocating a significant portion of its tokens to the public, Massa fosters widespread community engagement and ownership, reducing the risks associated with token centralization.

Team

Massa Genesis

Sébastien, Damir, and Adrien started the Massa project in 2017 as a research endeavor on consensus protocols. Their primary aim was to resolve the scalability issues of blockchains, all while maintaining its fundamental principle—decentralization. The Massa Labs company was founded later in 2020, accelerating the protocol development with a growing team of dedicated developers. Additional information about the project's genesis is available in the Meet the Founders blog post.

As the story goes, there are two origins to the Massa name. The first origin traces back to the ΜΑΣΣΑ coins minted 2,500 years ago in Massalia. Founded by a Greek colony, Massalia was an autonomous city minting its own silver coins. The coins typically featured a lion on one side and Artemis on the other side. Now Marseille, it is also the city where Damir and Sébastien first crossed paths and pursued their studies. The second inspiration for the Massa name is that it also signifies “Mass adoption”, reflecting the ultimate goal of this decentralized independent currency.

Current Team

The Massa team is now composed of 23 people with diverse backgrounds in blockchain, computer science, banking, gaming and media, all working together to fulfill the promise of Web3. Each member of Massa's diverse and talented team brings a unique skill set and experiences, playing a pivotal role in the platform's success.

The varied backgrounds of the Massa team help foster a culture of innovation and collaboration. By drawing from their varied experiences, the team members can approach problems from multiple angles, leading to creative and effective solutions.

The strong research and development team within Massa is one of its pillars, ensuring that the platform remains at the vanguard of technological advancements in the blockchain space. Investing in cutting-edge research allows Massa to develop distinctive, innovative features and technologies.

Furthermore, a strong focus on marketing and business development is crucial for the success of the project. Key members of the team, armed with experience and expertise, help realize the potential of Massa in the blockchain landscape, effectively conveying our vision and mission to an enthusiastic community and ecosystem.

Massa Foundation

The Massa Foundation, incorporated in Geneva, Switzerland, is a vital component in the Massa ecosystem. Its main responsibility is fostering the ecosystem's growth while safeguarding its core principle of decentralization. The Foundation's operations will primarily be funded through proceeds from the public sale and the decentralization program.

In its early stages, the Foundation will orchestrate various incentive programs to stimulate both the Massa community and the wider ecosystem. These programs include testnet, airdrops, bounties, ambassadorship, and grants. In addition, the Foundation will ensure compliance with the Massa community charter and oversee the distribution of the decentralization pool.

Name	Massa Foundation
Type	Swiss Foundation
Registration number	CHE-403.846.550
President of the Council	Sébastien Forestier

Massa Labs

Massa Labs is the original company behind the Massa project, it was created in 2020. After initial research, Massa Labs raised €5m in a seed round in 2021 to develop the full blockchain stack and to bootstrap the community. Massa Labs' role is to provide features, maintenance and security updates to the first Massa blockchain client and to the first Massa tools.

The Massa Foundation will provide funding to Massa Labs to continue its work on the blockchain client and tools after the mainnet launch. In order to decentralize the development of the blockchain and its tools, it is expected that the Foundation also funds other development entities when the development ecosystem matures and diversifies.

Name	MASSA LABS
Type	Société par actions simplifiée (SAS)
Registration number	881320592
Founders	Sébastien Forestier Adrien Laversanne-Finot Damir Vodenicarevic
Team size	23
Awards	FrenchTech Emergence i-Lab 2021

Key Members of the Massa Labs Team

Sébastien Forestier
Massa Foundation's President of the Council

Sébastien Forestier is a graduate of Ecole Normale Supérieure and holds a Ph.D. in Computer Science from Inria. His leadership role is underpinned by a strong vision that combines robust technical knowledge with ambitious goals for Massa.

Adrien Laversanne-Finot
CEO of Massa Labs

Adrien Laversanne-Finot is a graduate of Ecole Polytechnique and holds a Ph.D. in Quantum Cryptography. His background in advanced cryptography research ensures that Massa's technology remains cutting-edge and secure.

Damir Vodenicarevic
Co-Founder & CTO of Massa Labs

Damir Vodenicarevic brings a wealth of experience to his role as CTO at Massa, including a Ph.D. in Computer Science and Physics and a track record of successfully launching a tech startup. Prior to this, he worked in the banking sector at Treezor, where he focused on detecting fraud.

Grégory Libert
Head of Innovation of Massa Labs

As the former CTO at Treezor, Grégory Libert is well-versed in payment flows and has a strong background in technology and innovation. His expertise in fintech and payment systems is instrumental to Massa's development.

Brian Felsen
CMO of Massa Labs

With a comprehensive marketing background, Brian Felsen has served as the head of marketing at Harmony and the President of AdRev, CD Baby, and BookBaby. His marketing expertise is crucial to Massa's growth and brand recognition.

Jean-Christophe Baillie
Massa Foundation's Council Member

Jean-Christophe Baillie is the former head of Softbank Robotics Europe AI Lab and the founder of Novaquark, one of the pioneers of the Metaverse sector. Holding a Ph.D. in AI, his combined expertise in artificial intelligence, strategy, and management offers valuable insights and direction to Massa.

Roadmap

Since the project's inception in 2017, we have focused on achieving the necessary technical milestones, propelled by years of research and community-driven testnet enhancements. With these milestones accomplished, the mainnet is now being prepared as we embark on a new chapter. While the next steps are in sight, the future direction has been charted by the Massa community itself.

The Massa Foundation has been established in time to oversee the birth of the ecosystem. In particular, the Massa public sale and mainnet launch represent the most significant upcoming events. Listing on exchanges will then serve to bridge Massa to the blockchain ecosystem at large.

The community will help choose the next directions for technical upgrades, potentially focusing on scalability and enhancing user experience. In this respect, we will explore L2 and sharding solutions to scale Massa further, and study decentralized interoperability and account abstraction to improve user experience.

By year eight through mainnet, the decentralization program will end, handing full control over to the community and marking the ultimate decentralization step.

past

- **Mar ‘18:** Technical Paper
- **Feb ‘20:** Incorporation of Massa Labs
- **Jul ‘21:** Testnet Program
- **Apr ‘22:** Autonomous SC
- **Oct ‘22:** Grant Program
- **Oct ‘22:** On-chain Websites
- **Apr ‘23:** Security Audits
- **Jul ‘23:** White Paper Release
- **Oct ‘23:** Incorporation of Massa Foundation

future

- **Q1 ‘24:** Mainnet Launch
- **From 2024:** Continuous Improvements on Scaling and User Experience
- **2025-2030:** Decentralization Program

Legal Disclaimer

This Whitepaper of Massa Foundation is presented for informational purposes only and does not constitute an offer to sell, or a solicitation of an offer to buy, any tokens or other digital assets. Massa Foundation is disclosing this document solely to provide insight into its project and to gather feedback from the public. The information contained in this Whitepaper is subject to change without notice.

Massa, a layer 1 blockchain project, outlines its current plans and objectives in this Whitepaper. However, these plans are subject to modification and may be altered at the discretion of Massa Foundation. The success and realization of the project will depend on various external factors beyond the control of Massa Foundation, including market conditions, regulatory changes, and developments within the blockchain and cryptocurrency industries.

This Whitepaper does not guarantee or promise the future development, utility, or value of any tokens associated with the Massa project. The statements made in this Whitepaper regarding future events or performance are based on the analysis and assessments made by Massa Foundation at the time of publication. However, these statements are inherently subject to risks, uncertainties, and assumptions that may cause actual results and outcomes to differ materially from the expectations and projections described in this document.

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