2023
YEAR-END
REPORT

NERVOS
FOUNDATION

Overview

The Nervos Foundation's mission is to bootstrap a thriving ecosystem around CKB, a public blockchain launched in November 2019, secured by Proof-of-Work and driven by stakeholders & stateholders around the world.

Compared to other cryptocurrencies, CKB has unique utility, entitling a holder to storage of data on-chain, as well as governance functions through the on-chain Nervos DAO.

1 CKB = 1 Byte

Since 2018, our organization, among many others, has worked diligently to move forward the state of the art on CKB and increase adoption of what we know is technology that will deliver value creation and convenience to both the blockchain industry and the world at large.

In 2023, we saw the [4th anniversary](#) of CKB's mainnet launch, and the blockchain's first halving (which reduced real inflation of CKB from 7.9% to 3.7%). **To every CKB miner:** we speak for the entirety of this community and express our appreciation toward each and every one of you who ensure this network remains a secure, neutral and ownerless system we all can share.

In addition to a number of innovations that will be covered in this report, most notably we saw the activation of an industry-first on CKB: a trust-minimized super-light client ([Flyclient](#)) allowing anyone, with any device, to permissionlessly access a smart contract system without any trusted third party.

Additionally, across the industry this year we were encouraged to see an explosion of interest in [RISC-V](#)'s potential in blockchain systems from L2's, Polkadot, Cosmos & even Bitcoin ecosystems.

In contrast to 2022, which saw a focus on development and adoption of an EVM-compatible Layer 2, in **2023**, our foremost goals were: **1)** improve the developer experience for the pioneers building directly on top of CKB **2)** increase the density of CKB knowledge through educational events & articles, and **3)** cultivate community and culture, true to the values and principles that began this project.

As we take some time to walk you through our work for the year, we'd like to express sincere appreciation for your interest and attention and look forward to shaping the future of CKB and the Nervos Network **together** with you.

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The Elevator Pitch

For some of you, this may be your first introduction to the **Nervos Network** and **CKB**, we're glad you made it!

First, what is the Nervos Network?

From [Wikipedia](#):

> *Nervos Network is a blockchain platform which consists of multiple blockchain layers that are designed for different functions. The foundational layer is known as the "Common Knowledge Base", whilst the native cryptocurrency of this layer is called CKB.*

While almost all smart contract platforms have been designed to be all-in-one application platforms, the Nervos Network is a markedly different approach.

Taking inspiration from Bitcoin's layered scaling approach, the network separates concerns and enables customization of blockchain-based systems in ways no other platform is capable of.

This power has been used to create an application accessible by many different chains' wallets (in the case of [d.id](#)), to create an entirely new kind of wallet (in the case of [JoyID](#)'s Passkey wallet), as well as to architect common blockchain scaling solutions such as rollups ([Godwoken](#)), sidechains ([Axon](#)) and payment channels ([Perun](#)).

The possibilities are limitless, and we know that developers have only started to touch the possibilities unlocked by the unique blockchain underlying the Nervos Network: [CKB.](#)

Now, what is CKB?

CKB is a Layer 1 blockchain secured by Proof-of-Work and crafted for enduring robustness and versatility. It is written from the ground up, charting its own course in alignment with the foundational principles that have enabled Bitcoin's resilience, while striving to take a step further.

To do so, CKB employs a [RISC-V](#) virtual machine, capable of supporting any cryptography, as well as any programming language. Like Bitcoin, CKB is a [UTXO](#)-based blockchain, enabling parallel transaction verification, localized fee markets, [intents](#) and [native account abstraction](#).

Like Bitcoin, CKB prioritizes the blockchain's sustainability and the ability for end users to run nodes. 1 CKB entitles a holder to 1 byte of on-chain storage, [state rent](#) is collected from those occupying the chain, and an in-protocol DAO is implemented for eventual on-chain [protocol treasury](#) management.

[CKB](#) stands on the shoulders of giants, pursuing the goal of security, decentralization and verifiability comparable to Bitcoin, while surpassing Ethereum and other smart contract platforms in terms of flexibility.

Ecosystem

2023 was a year of transition for the Nervos ecosystem. While over the course of 2020-2022, extraordinary amounts of effort were invested in developing the L2 Godwoken network and moving its ecosystem forward, this year we saw the Godwoken team dissolve and a substantial effort to re-focus on improving the developer experience and ecosystem of CKB itself.

While the Godwoken team may have ceased operation, the chain and community continue on. Watching the small band of builders undeterred by these difficulties is inspiring and gives us confidence that the "community-driven" ethos the project has always carried is alive and well.

Turning toward CKB, we see a blue ocean of opportunity. Over the last few years, we have seen the modular blockchain narrative develop, but no execution layer framework or Layer 1 chain comes close to the flexibility offered by CKB and its RISC-V virtual machine.

In spite of the novel ground of the Cell model, we see a few projects pushing the limits of what's possible with blockchains, and are excited to see more innovation in the year to come.

Explore the ecosystem at ckbdapps.com. Let's take a look at highlights from the ecosystem in 2023:

JoyID

In November, we saw the mainnet launch of the JoyID wallet. Though Google, Apple, and Microsoft have rolled out support for Passkeys in their offerings, the web3 world has been slow to adopt the game-changing technology, which uses secure elements in consumer hardware for authentication instead of passwords.

JoyID is the world's first Passkey crypto wallet, and it supports more than just CKB, including Polygon, Arbitrum, and Ethereum support, with more on the way.

Over 162,000 wallets have already been created and 30+ dApps have integrated support, taking advantage of the wallet's 10-second onboarding time, as well as smart contract technology which syncs authorizations and recovery setups across devices.

Try it out with JoyGift!

NERVOS

Ecosystem

Spore

The Spore Protocol leverages CKB's unique "techonomics" to infuse digital assets with native value and utility. Unlike ordinary NFT's, digital objects created with Spore are stored entirely on-chain and backed by their underlying value in CKB (redeemable at any time).

Spore breaks free of restrictions imposed on on-chain art by less flexible smart contract platforms, solves the "gas asset" problem and even supports Passkey integration.

Mainnet launch is expected in January 2023.
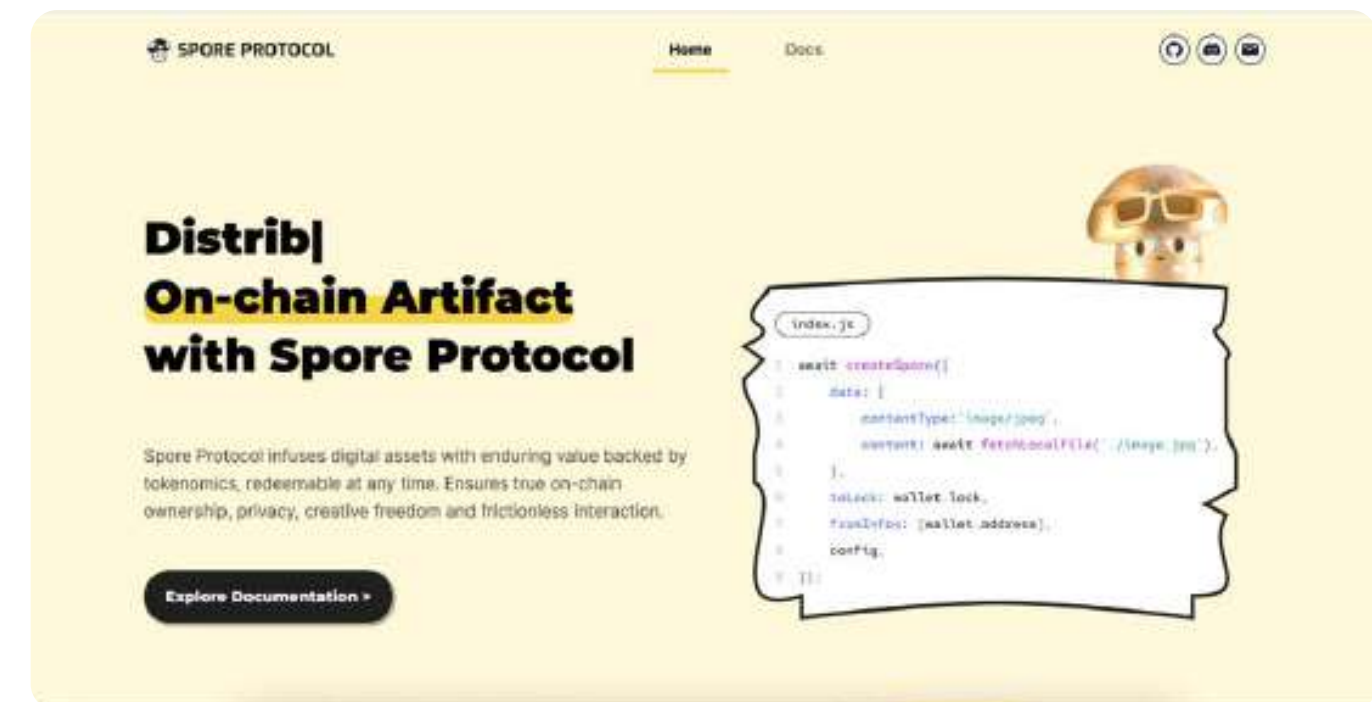
D.id (formerly .bit)

This year .bit rebranded to d.id, signifying the team's amplified commitment to creating a robust Decentralized Identity (DID) ecosystem.

Building on the success of 280,000+ .bit names registered and 140+ wallets/dApps integrated, the team has steered their efforts toward improving the relationship between communities and individuals, with products such as the new governance tool Voty.

Taking notice of the growth of AI and the importance of preserving digital human uniqueness, their DID solution has been rethought to begin with issuance of soul-bound tokens to each user.

.bit made a splash due to the product's understanding of user needs, we look forward to seeing how d.id revolutionizes community governance.
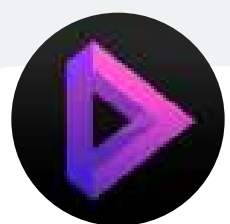
NERVOS

Ecosystem

Khalani

Khalani Network is ground-breaking infrastructure for intent-driven applications: a decentralized solver network.

Khalani is an open and permissionless solver collaboration platform, enabling intent developers to seamlessly onboard expressive and always-on solving capacity.

Founded by Nervos co-founder Kevin Wang and Nervos veteran Tannr Allard, Khalani is the most ambitious application of CKB's unique cell model we've seen.

It is still early days for Khalani, read the introduction and stay tuned for more updates from the team!

NFT Nation

The leading NFT store on CKB, NFT Nation has become the go-to hub for the Nervos community's digital artists and collectors.

It provides a platform for exploring, buying, and selling a diverse range of NFTs. Check out amazing collections such as the CKBees, CKBeasts, Bubble Machine, and Eggslys, all by and for the Nervos community.

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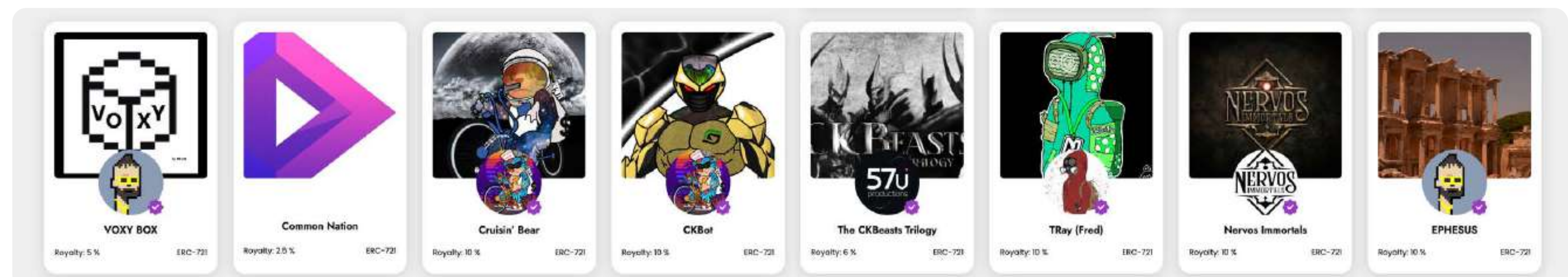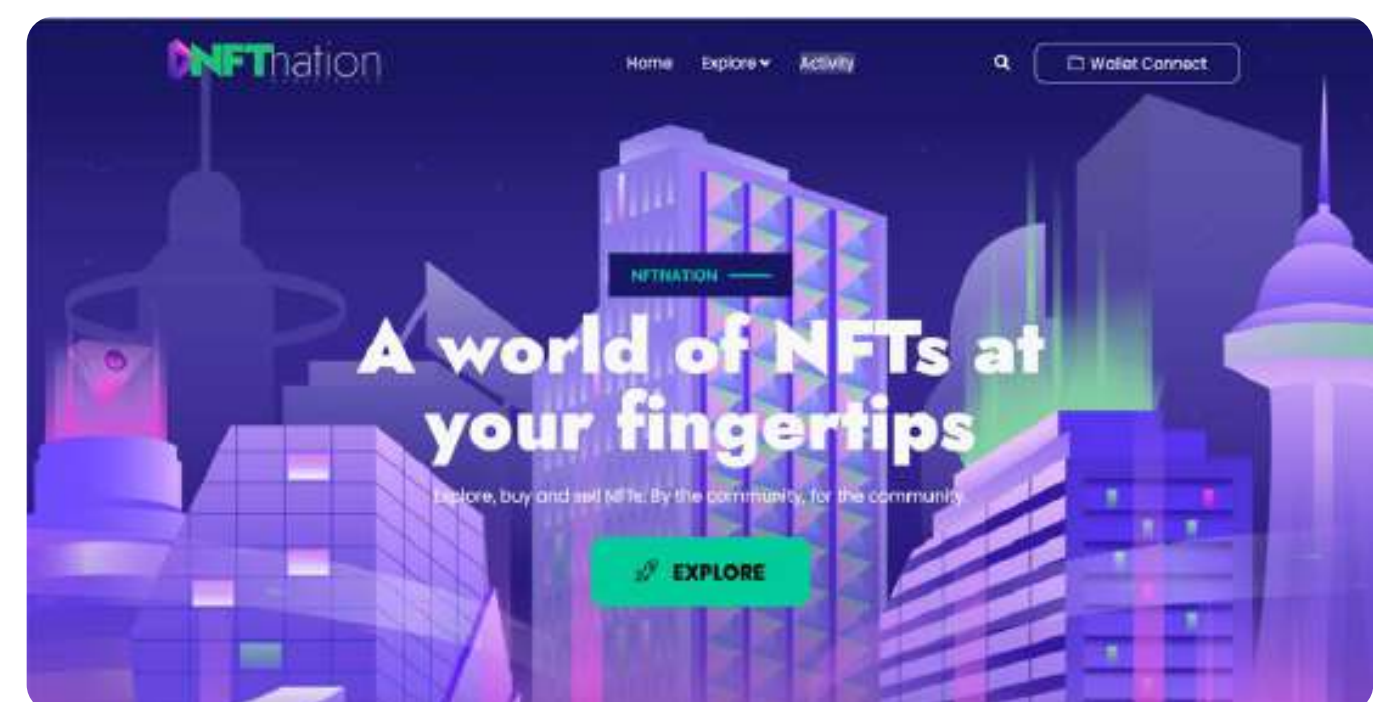
Ecosystem

Nervape

Nervape, an innovative metaverse experience on CKB, offers a vibrant, community-driven narrative, where users can engage with and influence the evolving story of the Nervapes through unique 3D NFTs. This project highlights the creative possibilities within the Nervos ecosystem, blending storytelling with digital asset interaction.

Check out the Nervape 2023 recap
https://medium.com/@Nervape/nervape-2023-recap-and-2024-outlook-edc220fa376a

iCKB

iCKB is a transformative protocol within the Nervos Network, designed to address the liquidity challenges of NervosDAO deposits by tokenizing them into a Standard Universal Token (SUDT) called iCKB.

This approach ensures that CKB locked in NervosDAO remains liquid and can be easily converted back to CKB without waiting for maturity.

Central to enhancing the Nervos ecosystem, iCKB paves the way for new applications such as CKB-based Initial Stake Pool Offerings (ISPOs), community voting mechanisms and expanded Layer 1 & Layer 2 functionality.
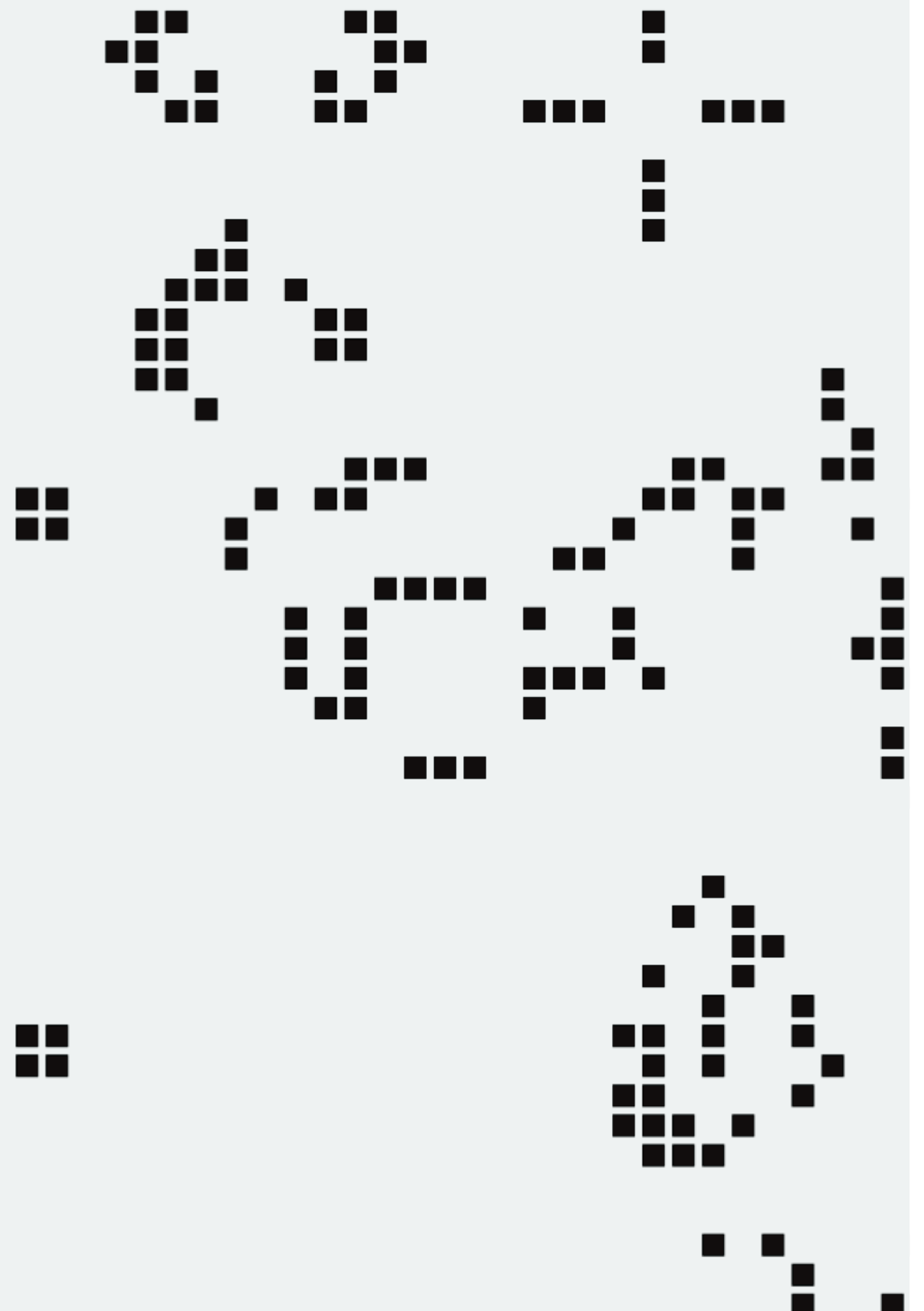
Grants

This year, we saw grant funding activity from the Nervos Foundation reduce compared with recent years, with most activity being directed toward the community governance of the CKB Community Fund DAO.

There are two important projects the foundation supported this year through grants: Payment Channels on CKB, from the Polycrypt team and the CKBull mobile wallet, from PeerSyst.

Payment Channels on CKB (PolyCrypt)

PolyCrypt's "Perun" channel framework improves transaction scalability and can enable a plethora of use cases. However, the first step towards more advanced use cases like payment networks (such as Bitcoin's Lightning Network), blockchain interoperability or application channels is a payment channel implmentation.

The goal of this grant project was to integrate Perun payment channels into CKB, fostering fast and secure payment settlement.

The PolyCrypt team adapted their go-perun framework, enabling two-party single-asset payment channels between users to be created, processed, closed and disputed.

Here are some benefits of Payment Channels:

- **Cost-effectiveness:** Payment channels can significantly reduce transaction fees, since only the final settlement transaction is recorded on the blockchain.

- **Instant transactions:** Payment channels enable fast transactions between parties, as the participants do not need to wait for blockchain confirmations.

- **Increased privacy:** By conducting transactions off-chain, payment channels can help protect the privacy of the parties involved.

Further evolutions of channels, such as app channels, virtual channel networks and cross-chain channels can add massively to the feature set.

This Nervos Talk thread summarizes the first phase of the project. The PolyCrypt team completed this grant in July (check out a video demo).

As of the end of 2023, the team has also nearing completion of a subsequent grant project to implement support for Perun payment channels inside the Neuron wallet.

NERVOS

# Grants

CKBull Mobile Wallet (PeerSyst)

The CKBull mobile wallet is a CKB-first wallet.

This year, the PeerSyst team completed a grant project which added support for new "Signer App" functionality, which allows developers to quickly integrate CKB into their web applications.

Learn more about the CKBull Signer App in this informational video, or check out the docs!

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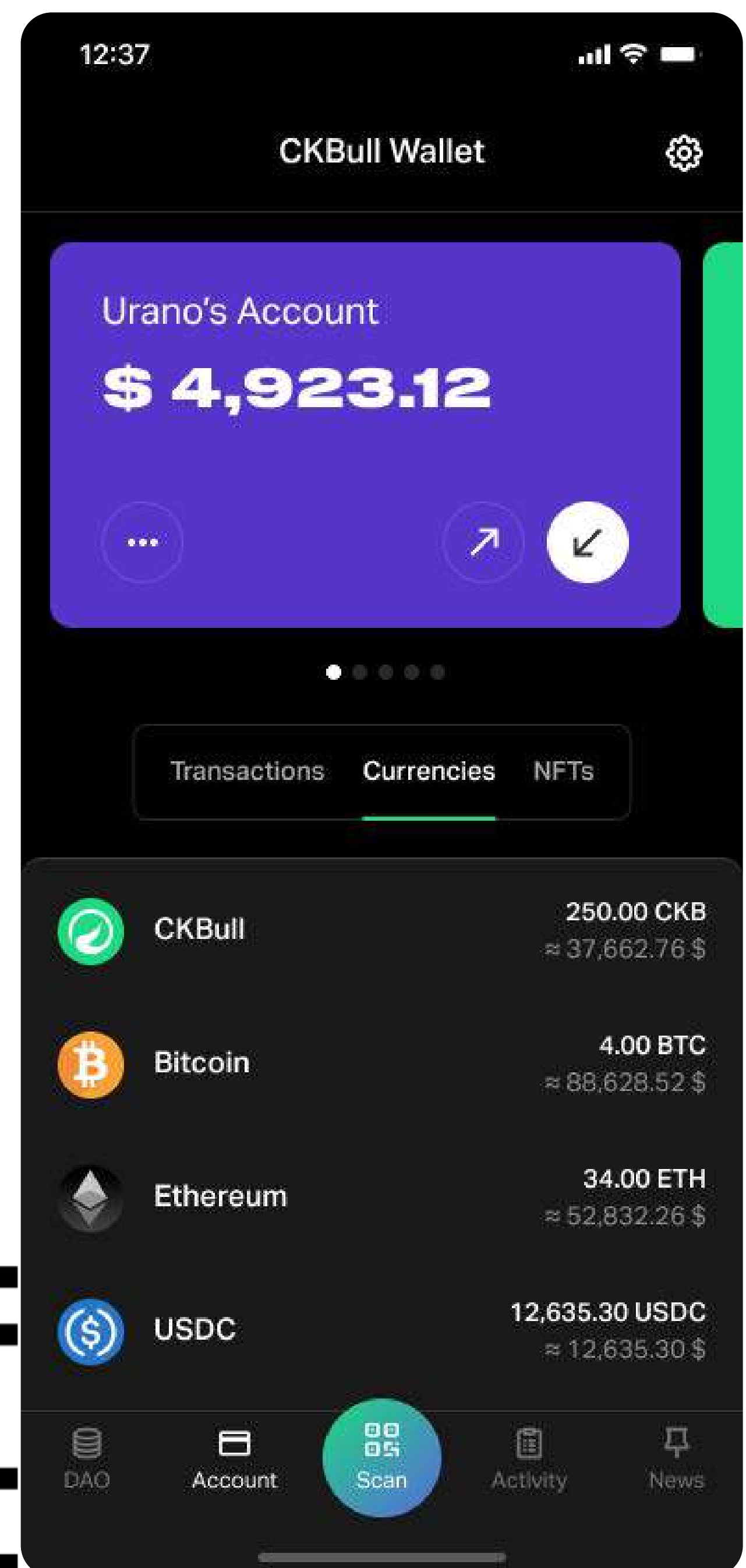
Core Development

2023 SUMMARY

NERVOS

CKB

Protocol & Reference Implementation

CKB Light Client

Successfully adapted the Flyclient protocol to CKB's novel NC-Max consensus algorithm and deployed it on the mainnet through a soft fork.

Additionally, supported the Neuron wallet team in adding a light client reference implementation into their CKB wallet. The result is a substantial increase in synchronization speed and a significant reduction in storage requirements, markedly improving user experience.

Using the CKB light client, new users can sync instantaneously, while syncing the entire history is benchmarked at roughly 5 hours with 45mb of storage required.

Transaction Pool (TX-pool) Optimizations

Conducted a comprehensive refactoring of legacy code and streamlined the TX-pool implementation. This development simplifies the addition of new features to TX-pool and minimizes the potential for bugs.

Replace-by-Fee (RBF)

Introduced the Replace-by-Fee feature to CKB's transaction pool (TX-pool), allowing users to replace a previously broadcasted transaction with a new one containing the same inputs but a higher fee.

This enhancement addresses scenarios where transactions may be stuck in the transaction pool due to low fees, allowing for adjustments to expedite confirmation or for other strategic transaction modifications.

JSON-RPC Re-implementation and Optimizations

Redesigned our RPC implementation to address limitations in client body read timeout and other potential issues, including halting maintenance on the old implementation. The new design also improves the document generation mechanism of JSON-RPC.

Block Synchronization Optimizations

Changed the process of downloading and validating blocks from synchronous to asynchronous, significantly improving block synchronization speeds during the Initial Block Download (IBD) phase.

CKB Second Hard Fork Dev Preview Version

Fully implemented all CKB2023 hard fork-related features in CKB 0.111.0, available for testing in dev chain.

CKB-VM Snapshot (Pause/Resume)

Enhanced resource allocation capabilities of CKB nodes by implementing a signal-based management mechanism for CKB-VM. This method allows for instantaneous halting and later resumption of CKB-VM execution, optimizing computing resource allocation and improving the overall performance and responsiveness of CKB nodes in dynamic blockchain environments.

CKB-VM RISC-V A Extension

Implemented the standard RISC-V atomic-instruction extension "A" to support synchronization between multiple RISC-V harts in the same memory space. This inclusion means developers don't need to manually tune the compiler to block the A instruction set, allowing for more efficient and broader adoption of third-party libraries by default.

CKB-VM Spawn Syscall

Introduced the Spawn syscall, an essential upgrade to CKB-VM in CKB2023. This feature allows execution of another script within a script, without terminating the parent script's execution context. It aims to boost the development of decentralized applications by reducing a developer's attention on non-business aspects.

Spawn is already used by the ckb-auth library, which supports numerous different chains' signing algorithms, enabling a wide variety of blockchain users to access CKB.

NERVOS

CKB

Toolchain

Launched CKB Lua Scripting, enabling on-chain script development in Lua, a programming language known for its efficiency and lightweight nature. This expands the development possibilities within the CKB ecosystem, making it more accessible and versatile.

Introduced JavaScript to CKB, allowing developers to write on-chain scripts in JavaScript, a widely known and used language, thereby expanding the versatility and accessibility of CKB development.

Advanced our C toolchain by incorporating LLVM/clang for RISC-V assembly code generation and explored the use of CompCert for building more secure and reliable CKB on-chain scripts. A technical report has been written to cover progress in this area: Compiling CKB Contracts Using Alternate C Compilers. This work will replace our patched GCC C toolchain.

We revisited the Rust toolchain used to build CKB on-chain scripts. It was originally our vision that with a customized Rust toolchain, we would be able to further push the boundary of generated code for CKB-VM. For example, B extension could be enabled, atomic builtins could also be mocked, std might also be enabled on CKB-VM, etc.

We built a customized Rust toolchain along the way, however extensive testing has made it clear that an infeasible amount of work is required to support std in CKB-VM. We decided to sunset the customized toolchain, but fortunately we have found many desired script optimizations can be done via tweaking build-time flags.

Transaction Fee Estimation

Enhanced JSON-RPC and SDK methods, allowing users to more accurately estimate transaction cycles and fees and get fee rate history statistics. This includes improved documentation and support for CKB Explorer's fee-rate tracker.

Quantum Resistant Lock

Developed a CKB Lock Script known as Quantum Resistant Lock, utilizing SPHINCS+ and hash-based cryptography for signatures and verification to ensure long-term security against potential quantum attacks.

Secp256r1 Lock Optimization

Optimized the implementation of the secp256r1 primitive, which is crucial for user-friendly native wallets such as JoyID to leverage PassKey (WebAuthn) technology.

This enhancement led to a four-fold reduction in verification cycles, from 28 million to 6 million (CKB's block cycle limit is 3.5 billion).

CKB-Indexer

Enhanced the efficiency and functionality of data queries by introducing a new query mode in ckb-indexer, allowing for exact script matching. This feature addresses the inefficiency of client-side filtering and mitigates potential DoS attacks.

CKB-Auth

Developed CKB-Auth, an extensive library which brings together various different authentication techniques from various blockchain and web2 platforms on CKB-VM.

This comprehensive solution allows all users of these blockchains to manage assets on and interact with CKB, promoting interoperability across blockchain ecosystems such as Bitcoin, Ethereum, EOS, Tron, Dogecoin, Litecoin, Cardano, Monero, Solana, Ripple, and Toncoin, as well as traditional web2 infrastructure.

NERVOS

CKB

Toolchain

CKB-Rich-Indexer

Introduced Rich-Indexer, an advanced indexing solution built into CKB. Utilizing a relational database, it supports more nuanced and flexible SQL queries, significantly enhancing data retrieval and interaction capabilities.

Currently, Rich-Indexer supports SQLite for ease of use and PostgreSQL for high-concurrency and customizable development. The latest implementation makes querying retrieving cells based on a specific field in the cell data much more straightforward.

CKB-Standalone-Debugger

Launched the CKB Debugger, a standalone tool for off-chain script development and testing. It allows developers to perform unit tests without running a full node and incorporates a signal-based profiler for identifying performance bottlenecks in scripts.

This tool significantly enhances the efficiency of script development and optimization.

Molecule

Improved the deserialization process in the molecule framework by implementing a lazy reader mechanism. This development mitigates the limitations posed by CKB-VM's memory constraints, enabling more efficient data handling and processing within on-chain scripts.

Molecule-go

Integrated union custom serial numbers into molecule-go, streamlining the codebase and simplifying the discarding of deprecated items. This enhancement contributes to a more efficient development process within the molecule framework.

Capsule

Advanced the Capsule development framework, a scaffolding tool for CKB contracts, by integrating Lua language support, adopting cross for Rust cross-compilation, and enhancing the testing library by adding TypeID support and a helper method that dumps a transaction into a format recognizable by the CKB-Debugger.

These improvements facilitate smoother and more flexible contract development and testing processes.

CKB Node Probe

Implemented a network monitor tool, CKB Node Probe, to discover and display the number and geolocation of full nodes in the CKB network. This tool functions through core discovery of p2p messages, minimizing the impact on network performance.

We also provided tutorials to foster community involvement in the CKB p2p network.

NERVOS

Community

A blockchain is only as strong as the community behind it.

Driven by an open source ethos, the Nervos Foundation's primary directive is to facilitate community growth– in terms of numbers, capability and most importantly, empowerment.

The values and principles that began this project are uncompromising and forward-looking. They have attracted diverse contributors who are a world beyond the common archetypes of a crypto community. Their validation of the ideas contained in these RFC's are one of the greatest contributors to the staying power of CKB. Learn more at nervos.org.

r/NervosNetwork gets a new lease on life

While the Nervos community is constantly growing, we have to take some time to acknowledge the extensive work done to revamp the r/NervosNetwork subreddit.

While much of the blockchain industry's discourse happens on the "platform formerly known as Twitter," Reddit is full of passionate crypto enthusiasts, and we are proud to say that this network truly has a home on Reddit.

A huge shout out to Chema and Leigh for their tireless efforts to breathe new life into r/NervosNetwork.

You'll notice the new pages:

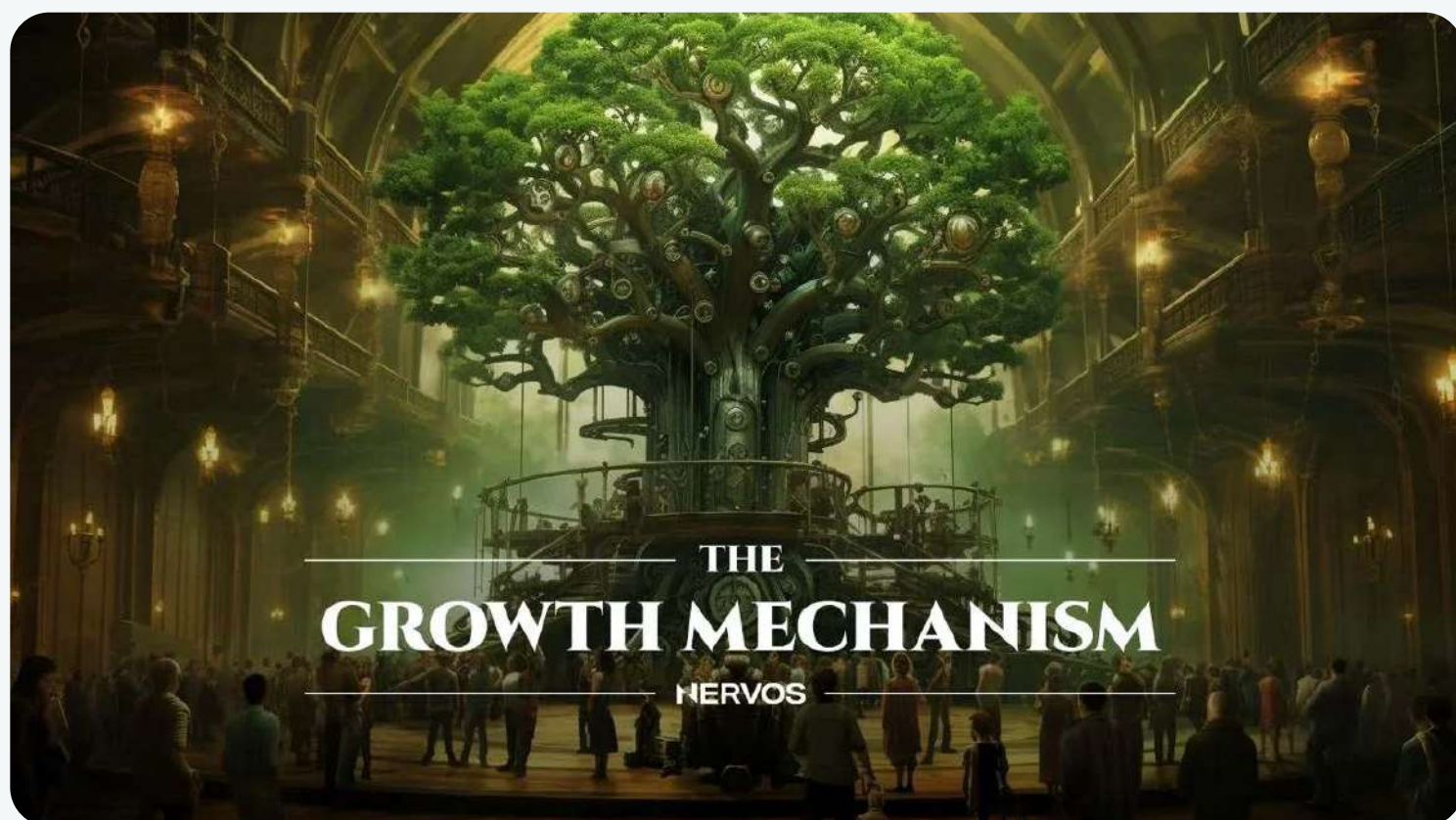Traveller's Guide to Nervos: A collection of links to documents, videos, articles and social channels to get anyone up to speed and immersed in the Nervos ecosystem.

Voice Box: All past AMAs, presentations and seminars and any other media from the Nervos community.
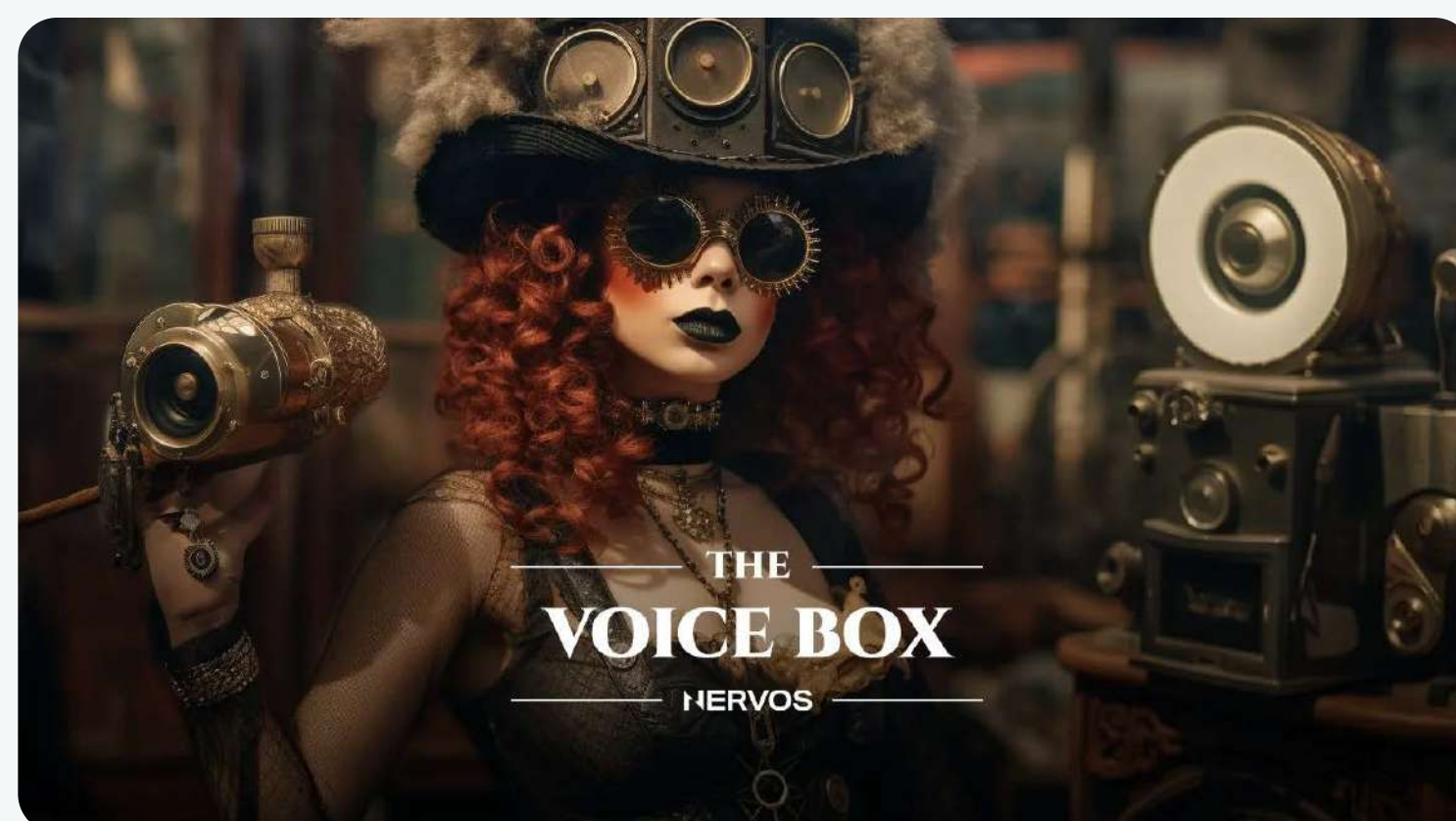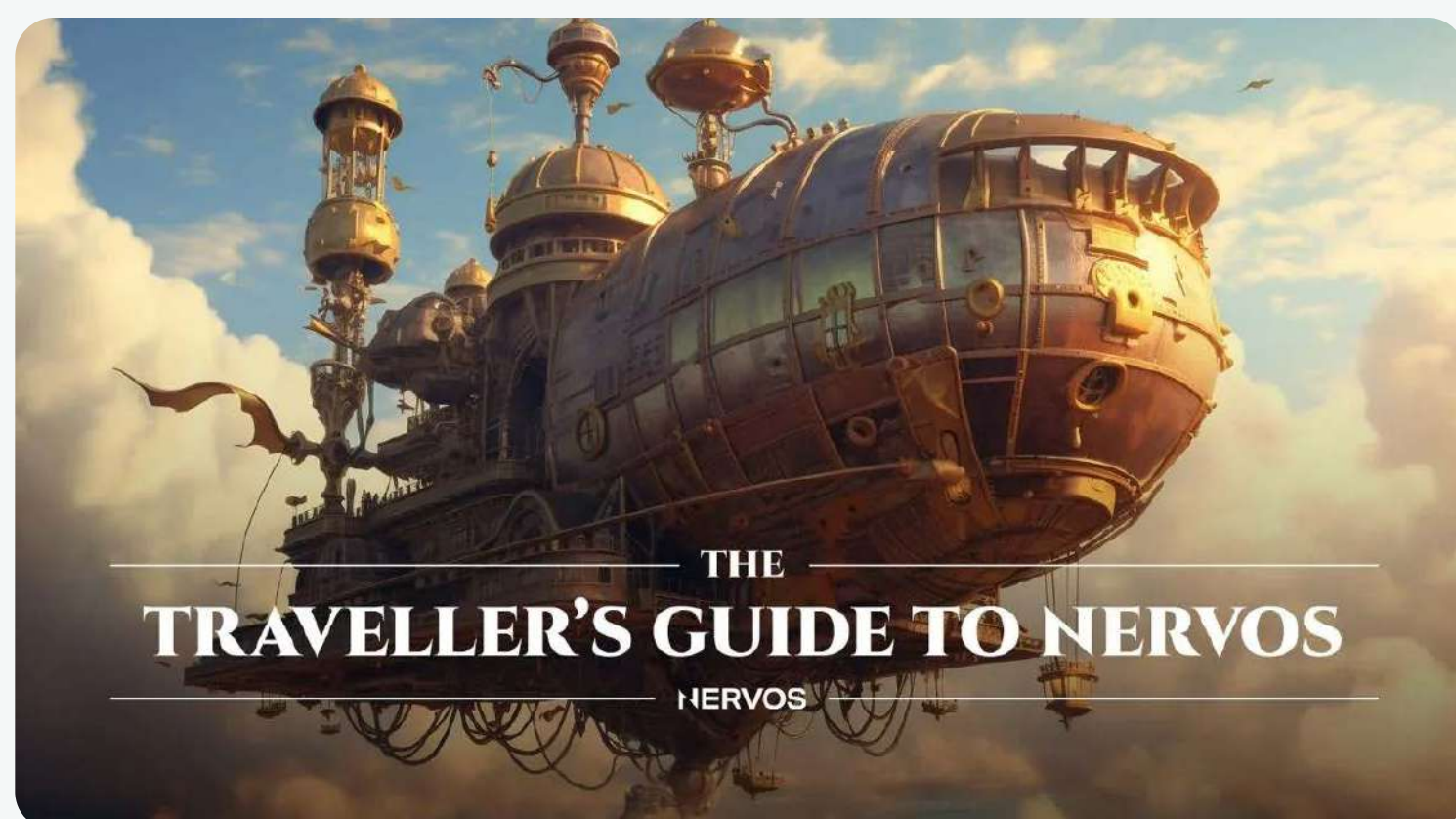
Community

Growth Mechanism: This project thrives because of the community of people passionate about its underlying ideas. Check out this thread of community contributors, including links to socials and important posts.

Cogs of GitHub - The gears of change are forever moving. Come and explore the ecosystem updates from in and around Nervos. It's a what's what and who's who of projects working within the ecosystem, including the Nervos Academy and essential tools.

Meme Engine: Feast your eyes on Nervos-themed memes, images, & NFTs!

Steam Room: Check out reference documents, RFCs, and SDKs to get the most accurate and in-depth understanding of the protocols and standards that underlie the Nervos Network.

Nervos FAQ section: Everything from "What is Nervos?" to nodes, account abstraction, Proof-of-Work and more is covered in this comprehensive guide to frequently asked questions.

Community

CKB Community Fund DAO: Willing to back every CKBuidler Up

This year, the CKB Community Fund DAO: a dedicated fund to support development of the Layer 1 (CKB) ecosystem, was initiated through a total donation of 276 million CKB from the Nervos Foundation and 6 ecosystem organizations: .bit, Cryptape, Nervina Labs, Unipass, Magickbase, and Cluster3.
.
Efforts to promote the development of the blockchain's ecosystem, such as project incubation, technical support, event organization, content production and education, can seek financial support from the CKB Community Fund DAO.

Disbursements from this fund, as well as the meta-rules governing the fund, are in the hands of Nervos DAO depositors, who express support for proposals through the Nervos Talk forum and ultimately vote using their Nervos DAO deposits through the Metaforo governance portal.

The design of the Nervos DAO is intended to form a full-fledged autonomous community mechanism before the second halving of CKB, and we are greatly encouraged by the CKB Community Fund DAO's contributions to the growth of the CKB ecosystem, as well as its growing social decentralization.

Learn more about the CKB Community Fund DAO in this announcement post and the rules governing the fund.

Here is a summary of the year's proposals:

2023 Passed Proposals
- → Nervos Nation Community Grant Proposal
- → CKB Community DAO Proposal
- → AMA on r/Cryptocurrency subreddit
- → JoyGift Phase 1 Sponsorship Proposal
- → CKBFans Community grant Proposal - ckbdapps.com

2023 Denied Proposals
- → Complete onboarding of the BR crypto community into the Nervos ecosystem
- → Etherion
- → Nervos Community Anthem
- → Mass market campaign in Nagpur India
- → LatAm Community & Ecosystem Grant Proposal - 2023 Q4
- → Infinity Wallet Nervos Integration
- → Nervos.Land Online NFT Strategy Game Development

And check out these wisdom-packed educational videos funded by the DAO and created by the Nervos Nation! And join the Nervos Nation Telegram to connect with the amazing community!
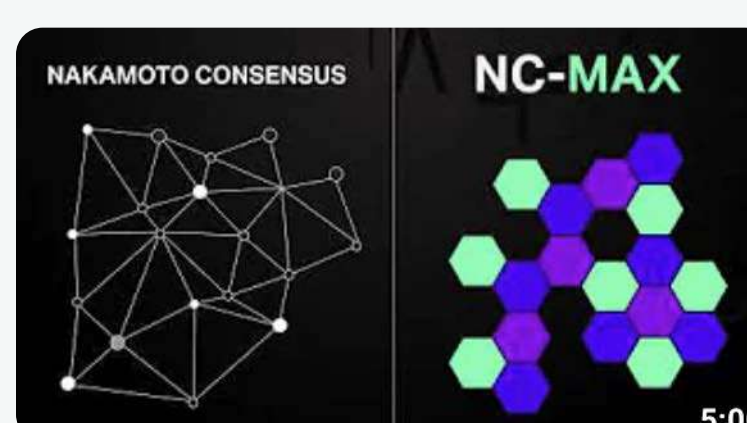
Nervos Nation videos

CKB-VM and RISC-V
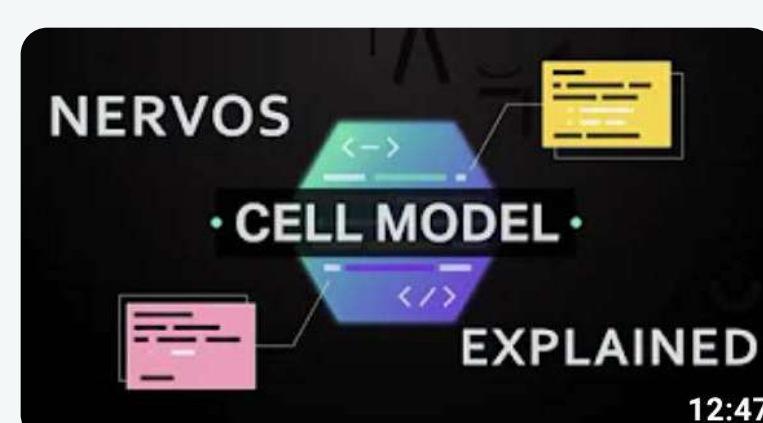
The Cell Model Explained

NC-Max

Why "CKB" Explained in a Nutshell
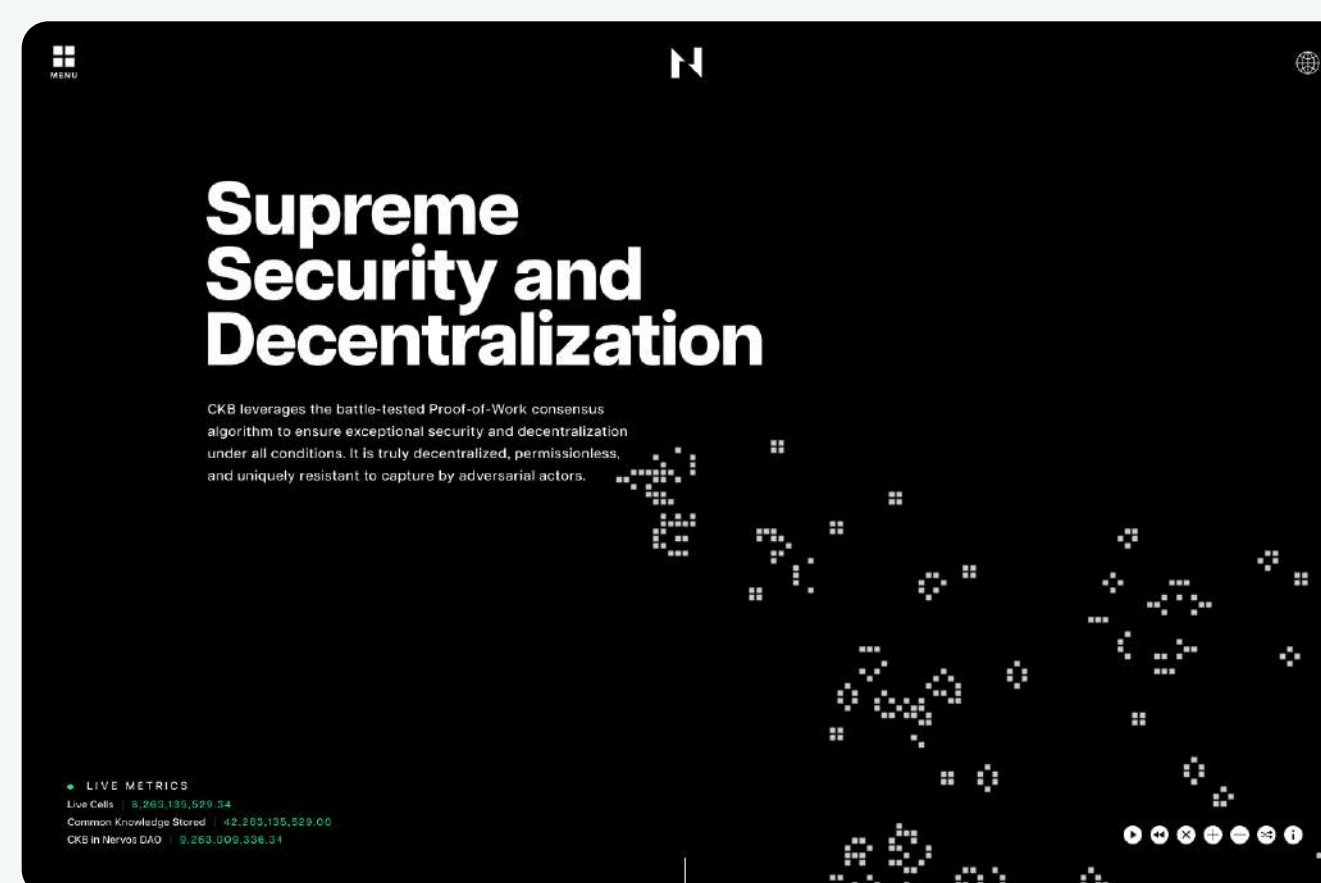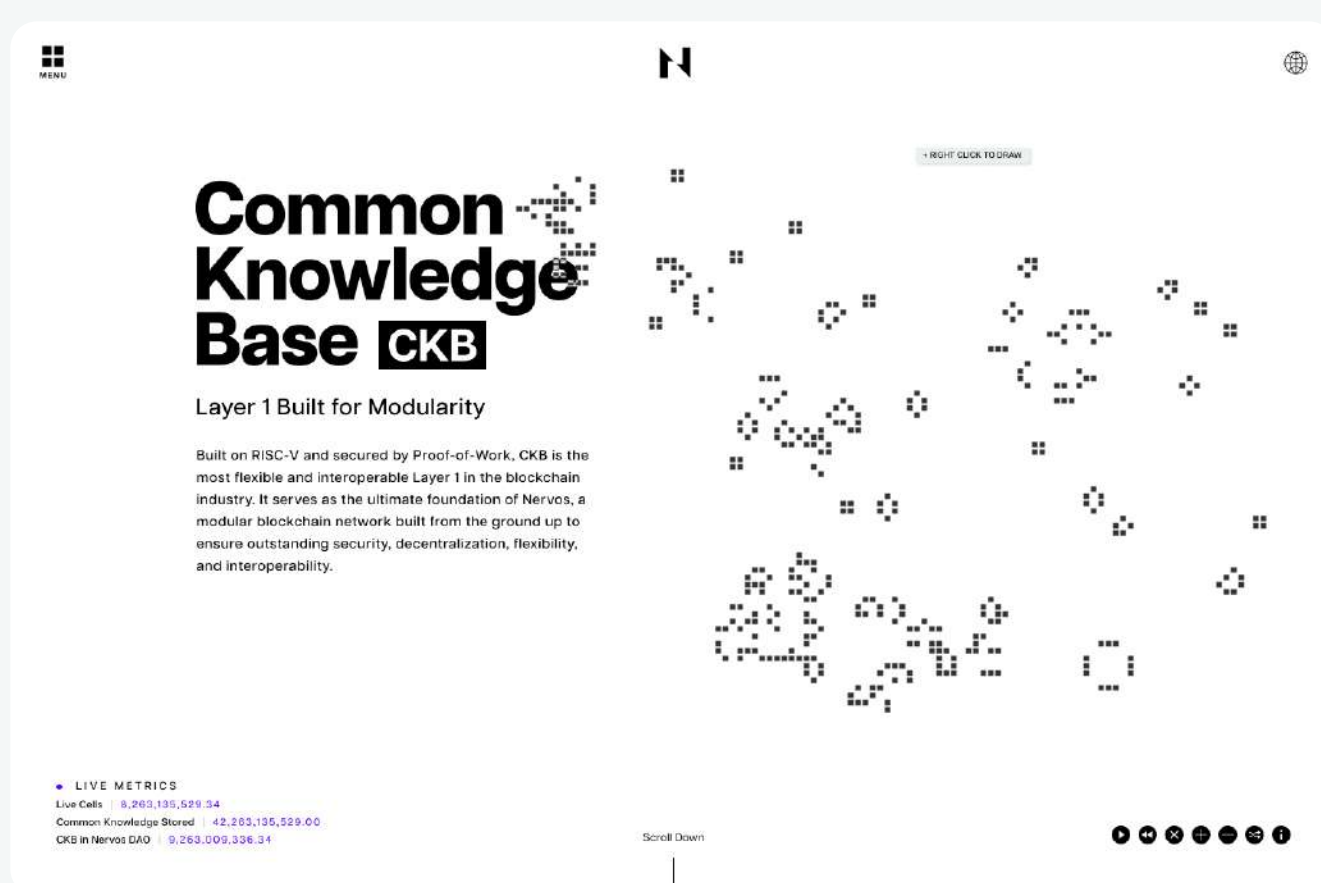
NERVOS

Community

A new Nervos.org, open to contribution

One of the loudest pieces of feedback received over the last few years has been that the first incarnation of Nervos.org was difficult to understand, and difficult to navigate.

And thus, after extensive efforts to solicit feedback and many iterations, Nervos.org is off to a fresh start. In addition to a new structure that simplifies finding important resources such as Wallets, Mining and Developer resources, the site also displays important metrics such as "Common Knowledge Stored" (CKB being used to store data on-chain) and "CKB in Nervos DAO".

The site is available for contribution on this Github repo. Wherever you see room for improvement, or important information you feel is missing, simply create an issue or PR to get things started!

One of the most common questions of any project is "what is the roadmap?". The most notable addition to Nervos.org is intended to address this question. This is the "Journey" page, which summarizes current projects in the Nervos ecosystem, expected milestones and details past achievements.

Like all pages on Nervos.org, the Journey page is open to contribution.

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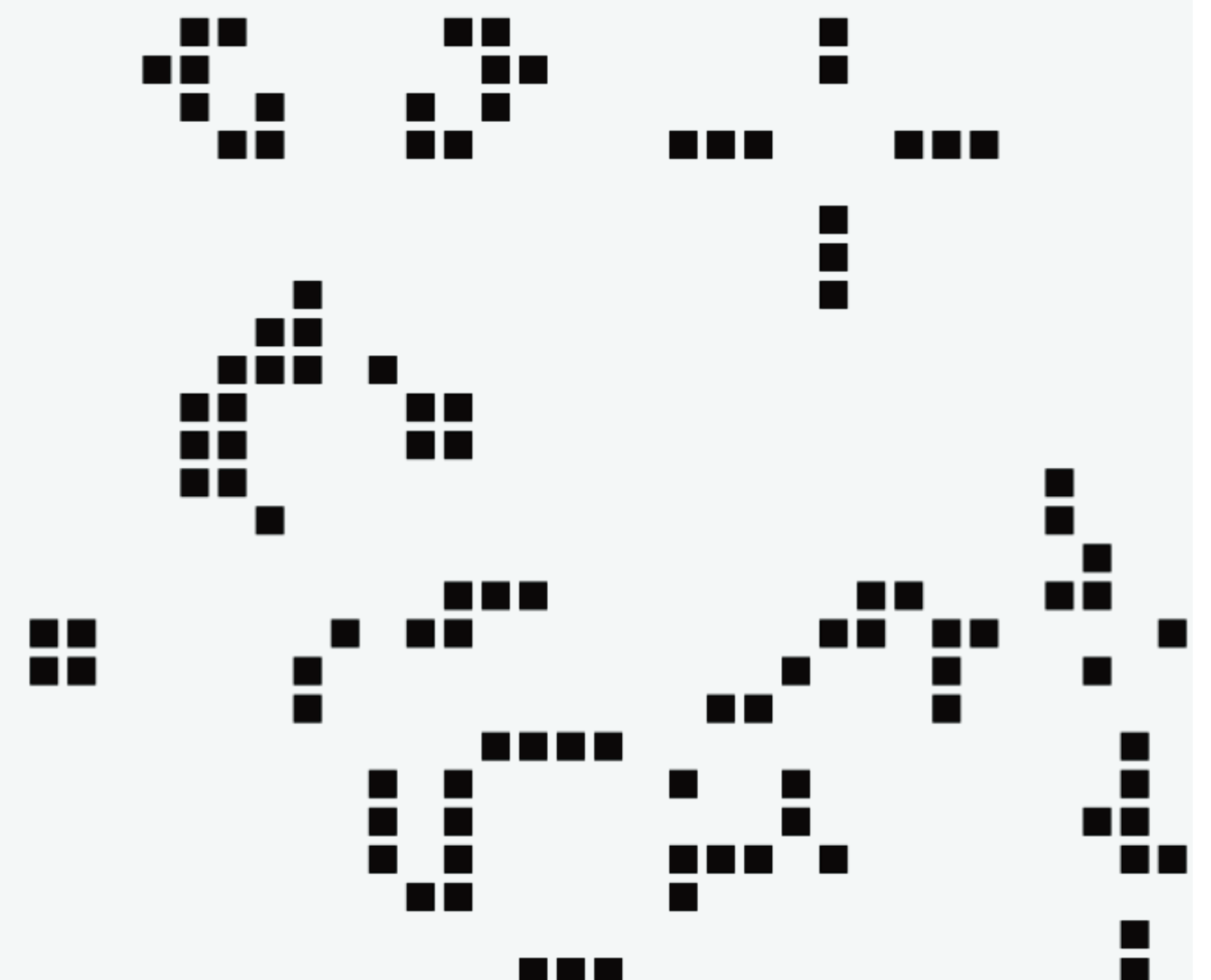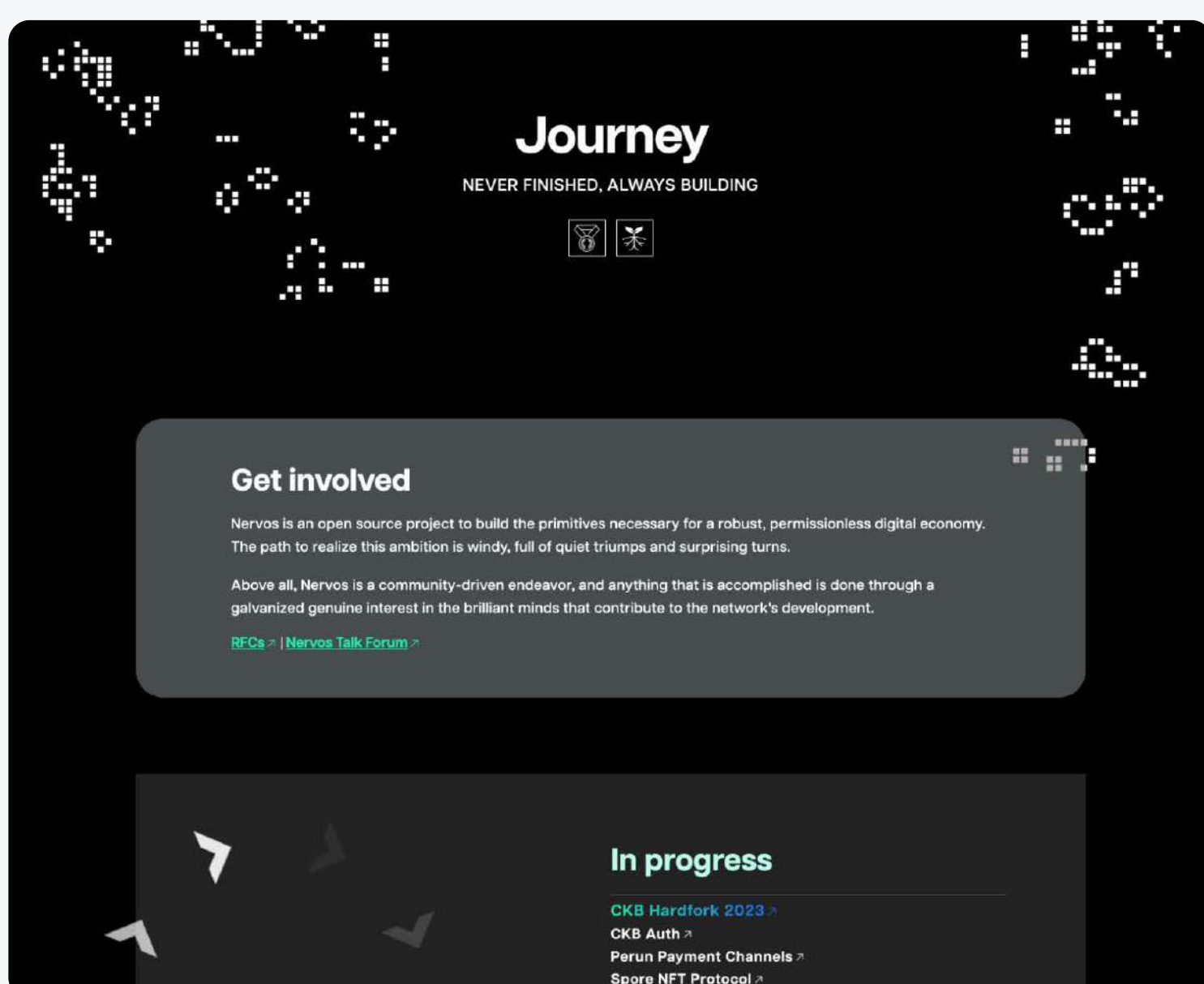
Community

Merch: Check it Out!

This year a new community merch store launched on W3W, the store is filled with options to choose from and worldwide shipping is available. If you prefer to make your own, all designs are available here.

Memes were an important part of 2023 for us, we've included those templates as well!
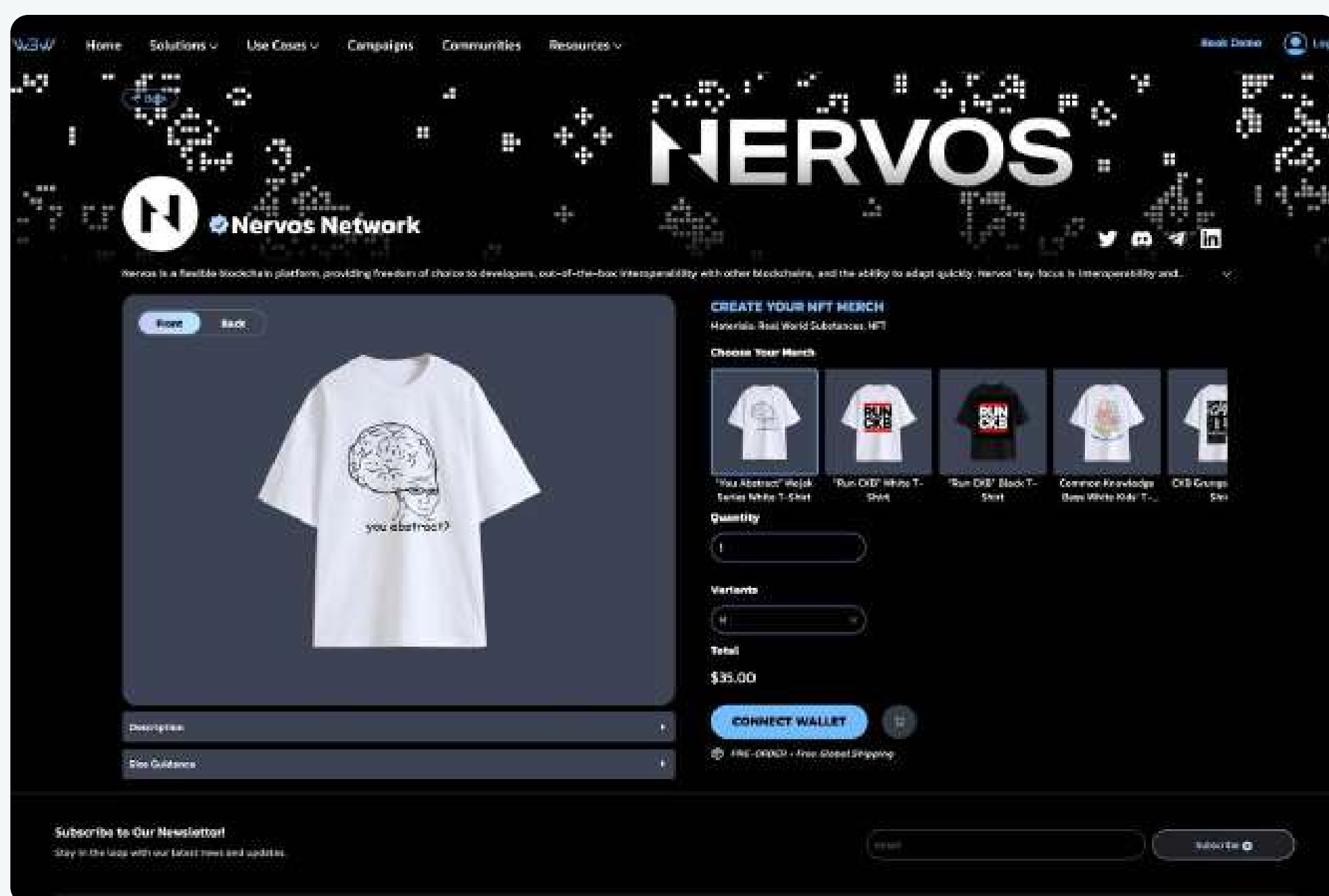
2023 Events

World Digital Mining Summit 2023 - CKB: Here to Stay

Matt Quinn represented Nervos Foundation at Bitmain's WDMS 2023, discussing the flexibility, unique architecture, and quantum resistance of CKB, underscoring its potential and long-term vision in the blockchain industry. Watch it here!

"Do you Mine?" Halving Party Edition At Consensus 2023

A Nervos staple event, "Do You Mine?" rolled out some real talk on mining, weighing the pro's and con's of Proof-of-Work versus Proof-of-Stake and exploring blockchain's potential in decentralizing domain names with the Handshake community. Check out the replay!
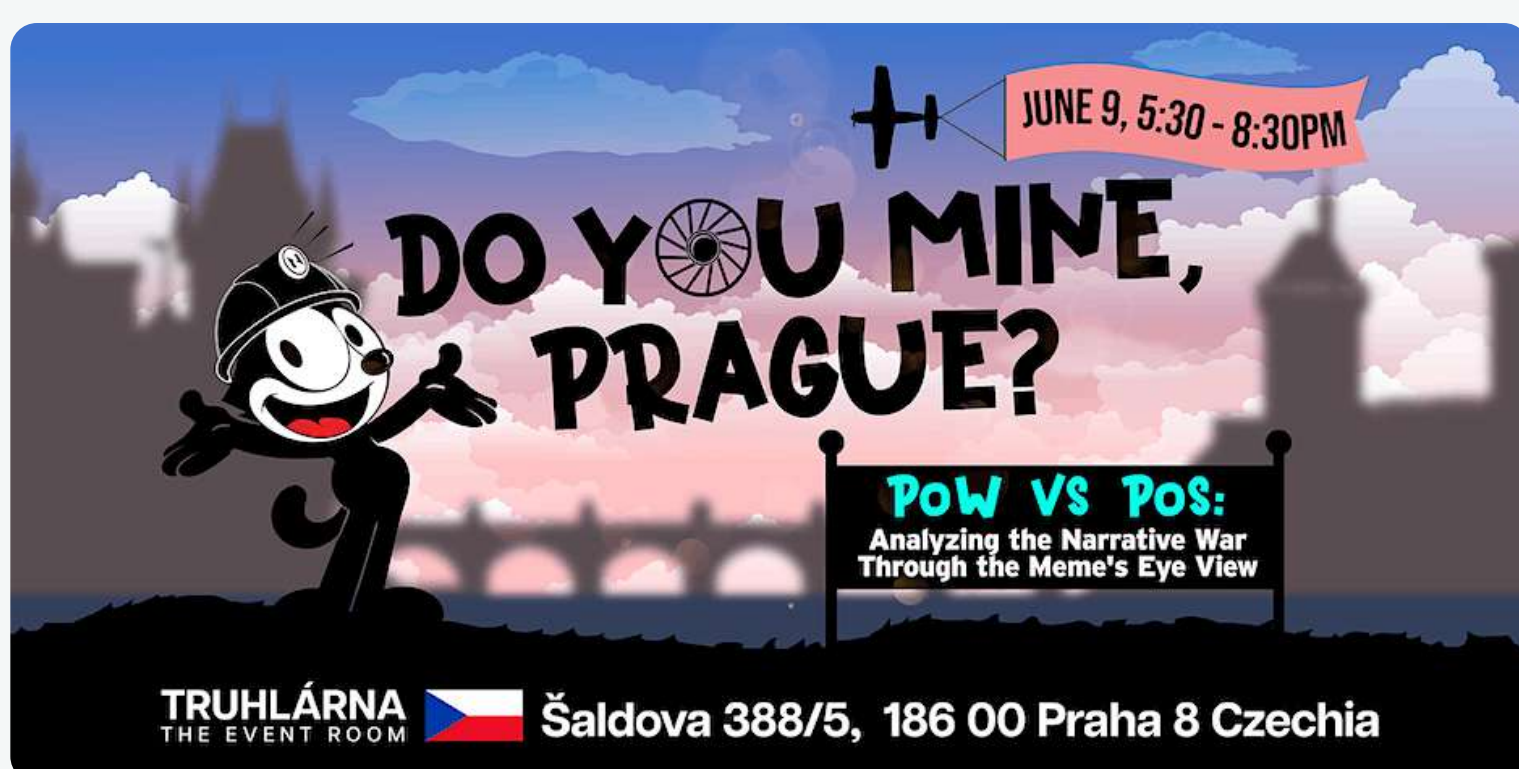

"Do You Mine?" Prague Meetup

We took our "Do You Mine?: series to Prague, where mining enthusiasts and Proof-of-Work fans gathered during blockchain week for "PoW vs. PoS, Analyzing the Narrative War Through the Meme's Eye View".

MIT Bitcoin Hackathon

This year, we sponsored a prize at the MIT Bitcoin Hackathon, check out this hackathon workshop video and the winning projects: CKBSafe and Veins.
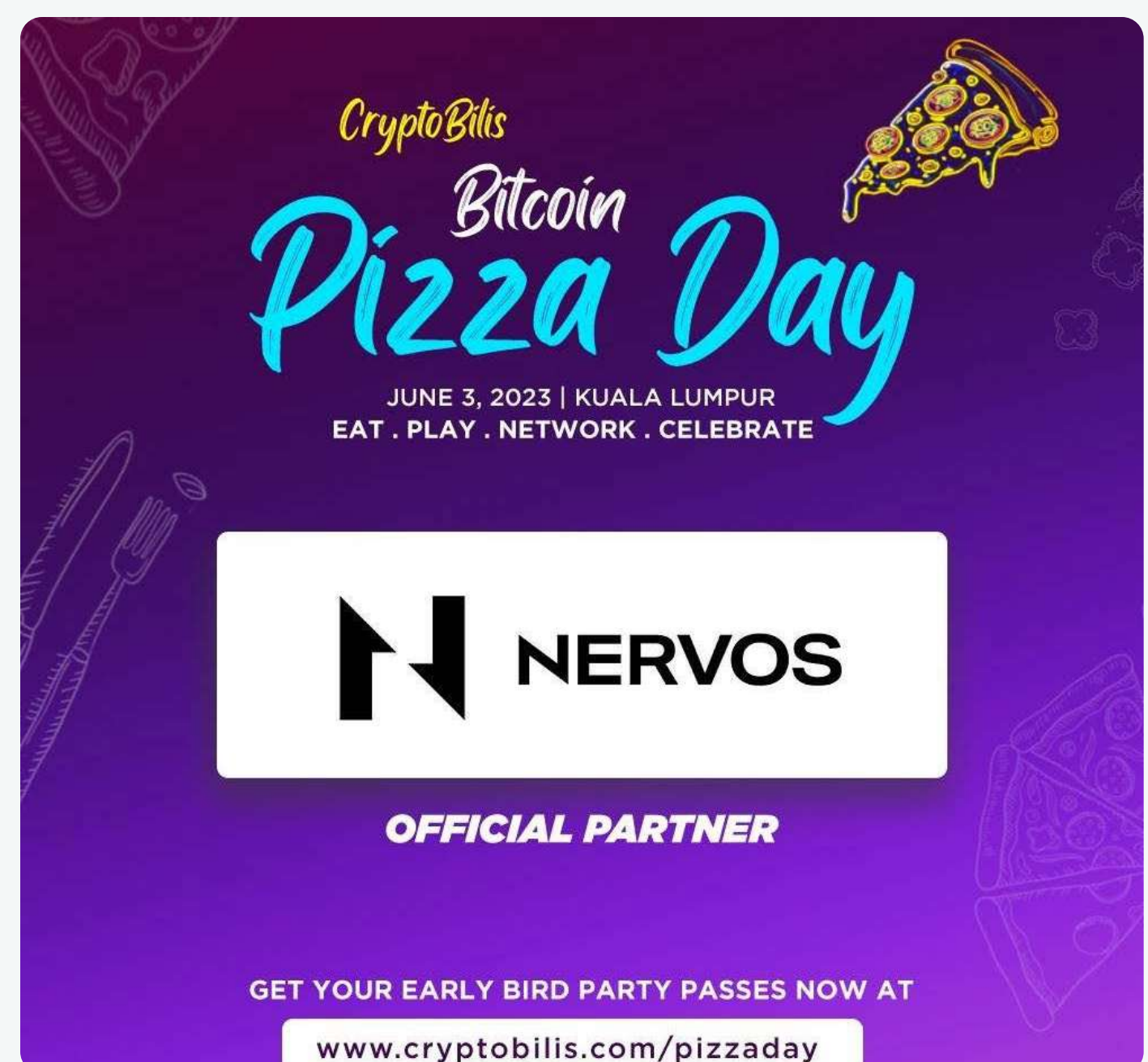
Bitcoin Pizza Day in Kuala Lumpur, Malaysia

The Bitcoin Pizza Conference in KL was a fun way to celebrate and expand our presence in Southeast Asia and introduce more folks to the wonders of CKB and the growing Nervos community!

NERVOS

Events

Web3 Mass Adoption Hack Night

Hosted along side SojuDao, JoyID, Biconomy, Catalyze Research, and Magnet, this hack night was all about getting devs up close with JoyID's easy to use Passkey wallet.

BUIDL Happy Hour

Marking our first major foray into Vietnam, we hosted this BUIDL Happy Hour, which served as the perfect stage to introduce the in's and out's of CKB to builders and enthusiasts in the region.

**We're Halving a Party, CKB's 1st Halving**

The Nervos Network turned 4 this year and the community gathered on YouTube and Discord for CKB's 1st halving. We had over 1.2K unique listeners throughout the stream!

The Ultimate Risk: RISC-V

In November we hosted 'The Ultimate Risk: RISC-V alongside builders from the Cosmos, Polkadot, Rooch, and LayerZero communities.

This event showcased the breadth of innovative blockchain development utilizing open-source RISC-V architecture. Check out the replay here!
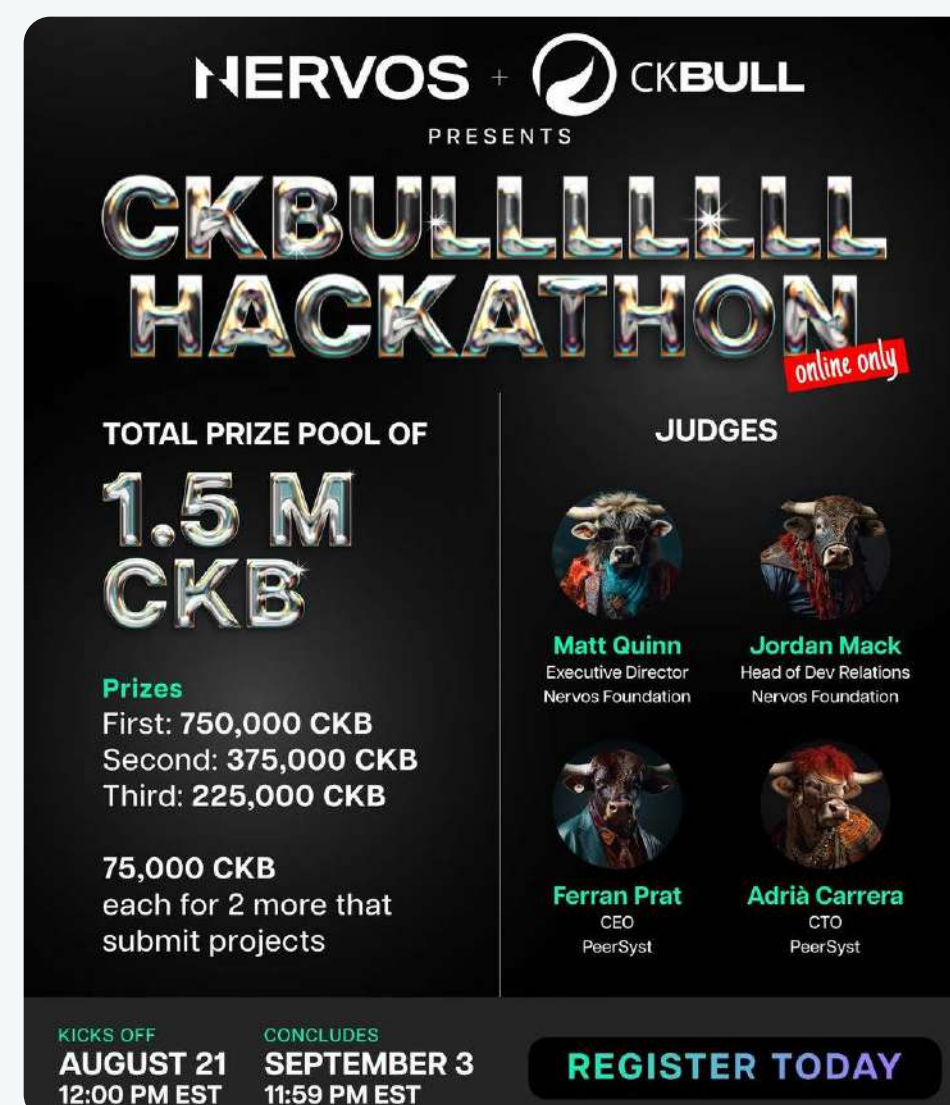
CKBullllllll Hackathon

This hackathon was done in-collaboration with CKBull wallet team to utilize the CKBull Signer API, which streamlines transaction creation and application connection to CKB.
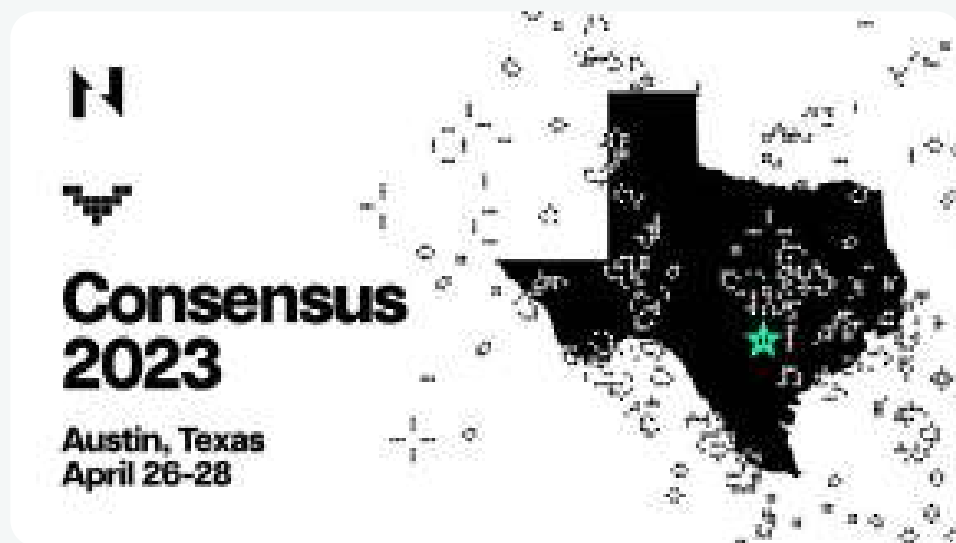
Check out the submissions!
1st) CKBearn 2nd) Event Drop 3rd)
Nervos Donations

Pitch Night Miami

At Pitch Night Miami, we joined the city's vibrant startup scene, showcasing the future of web3 technology and offering a platform for entrepreneurs and blockchain enthusiasts to connect and inspire each other.

Events

Consensus 2023 with d.id and Joy.id

We teamed up with d.id and JoyID at Consensus 2023, all together over 2,000 attendees signed up for d.id and JoyID accounts!

Stanford University - Lightning Talks

Stanford is known for their annual academic blockchain conference. This year, Matt Quinn gave a lightning talk about the power of RISC-V and what it can do for blockchains. The talk is about 3 minutes long, check out the replay!


Builders Night - Bangkok Edition

In September, we collaborated with MetaMask to host a builders' night in Bangkok, with an in-depth conversation about developments in account abstraction and it means for blockchain users and developers.

How to Build a Web3 Community Securely, Singapore

In Singapore, we brought together key players from the Nervos ecosystem including d.id and JoyID for an engaging evening, focused on the latest trends in decentralized identity and web3 communities!.
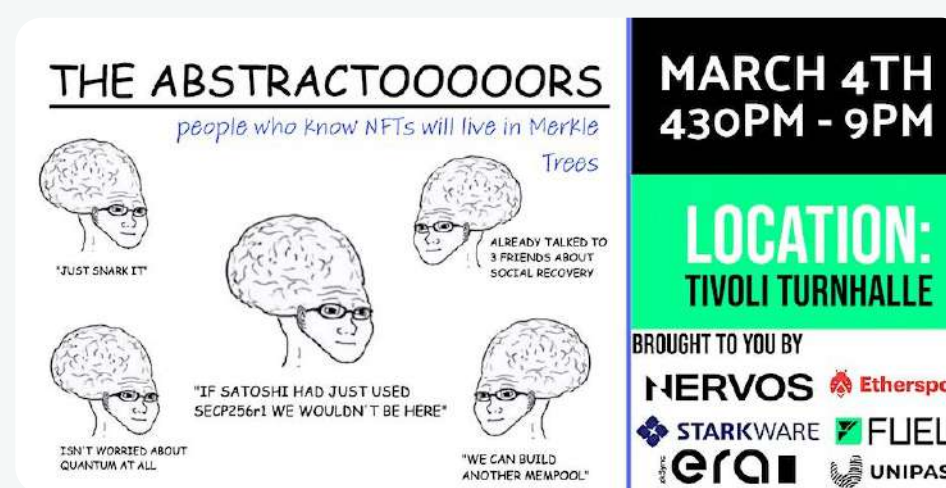
In the Name of Account Abstraction

A side event to ETH Denver 2023, we hosted an event alongside friends from Fuel, Starkware, ZKEra, Unipass and Etherspot, to discuss everything about account abstraction! Check out the replay here!

Bitcoin Energy Summit 2023

As the lead sponsor for the Bitcoin Energy Summit 2023, it was an honor for our own Matt Quinn to grace the stage as the opening keynote speaker at this inaugural summit, which brought together professionals from the power generation industry and crypto mining industries.

Nervos & Friends: Powering Web3 Mass Adoption

Nervos Foundation, JoyID, and .bit spearheaded conversations at HK Blockchain Week, focusing on bridging Web2 and Web3 and exploring decentralized technology opportunities!

Memefest

For the love of the memes! The HaCKBee meme creation event brought together our community through the universal language of memes.

Bitcoin2023 Miners' Happy Hour

Alongside partners ASIC Jungle and Lumerin, we hosted an amazing and engaging happy hour for miners in Miami during Bitcoin2023!

NERVOS

Godwoken/Axon

As the core team focused its effort on improving CKB's developer experience and application potential, there has also been a shift away from projects with the goal of EVM-compatibility, a change that has resulted in a year-over-year headcount reduction of 25%.

While massive amounts of effort have gone into these initiatives, over time it has become clear that the products that will carry this ecosystem will come from leveraging CKB's unique properties and priorities have shifted accordingly. At the end of 2023, Axon protocol development was brought to a close.

We still hold the belief in the power of Axon PoS sidechains, with security assurances and capabilities derived from CKB. The Nervos core team continues to offer support to teams with ambitions of running Axon chains and we are excited to see Khalani and other teams in the ecosystem carry Axon forward.

Learn more about Axon development in 2023 in the Axon Dev Logs, linked at the end of this report and check out the docs.

Godwoken

Godwoken, an optimistic rollup scaling solution on CKB, has seen its mainnet surpass one million blocks.

Following the dissolution of the Godwoken organization in May, the network is currently in maintenance mode with ongoing user experience improvements, including withdrawal finality adjustments (down to 7 days, same as competitors like Arbitrum).

Thirdweb support has been added, giving developers a solid, up-to-date EVM tool for building contracts.

Axon

Axon is exploring a different design approach than Godwoken by leveraging CKB as a Proof-of-Stake layer to achieve better-than-Layer 1-PoS security. In 2023, it has undergone extensive integration and testing, resulting in several iterative versions.

Furthermore, a minimal viable product (MVP) of Forcerelay/Axon has been running for months to demonstrate the interoperability capabilities. In this MVP, the SUDT Transfer Module supports token transfer between CKB and Axon.

This is a significant technical achievement because CKB is a UTXO-based chain while Axon is an EVM-compatible chain, meaning they have heterogeneous accounting and programming models.

NERVOS

Research

CKB-VM LLVM AOT engine

Experimented with a new LLVM AOT engine for CKB-VM and produced a much faster CKB-VM-compatible engine by compiling a full CKB on-chain script via LLVM directly to native code.

While the AOT engine is a valuable supplement to our arsenal, we don't plan to use it on the Layer 1. In the future, we might leverage these findings on Layer 2 or other parts of the Nervos ecosystem. More information can be found in this article.

CKB Open Transaction (Work In Progress)

In the first half of this year, we delved into and studied a new open transaction scheme. This not only integrated many ideas from previous schemes but also conducted some new proof of concepts.

We summarized the design and problems of the scheme in August and published a report. However, we are not satisfied with the results obtained from this attempt, one fundamental reason being its complexity, as well as stubborn security issues that arose from it, along with concerns about potential safety risks.

The lesson we learned from past attempts is that an open transaction scheme that is designed to meet every scenario requirement will inevitably be very complex. We should abandon the idea of finding perfect answers directly and implement the open transaction scheme in multiple stages instead.

The goal for the first stage is to determine an appropriate granularity for open transactions, clarify a few key scenarios, and design a viable plan based on more suitable granularity and key scenarios while ensuring compatibility with other parts of the transaction co-building process.

The design for the first phase of open transactions is still underway.

CKB zkVM

Initiated a proof of concept project for a zkVM built on CKB using the Halo2 framework. This prototype validates the execution of arbitrary Brainfuck programs within CKB-VM, demonstrating the framework's adaptability and potential in enhancing privacy and security in on-chain scripts.

CKB Application Standards (WIP)

As more and more applications appear on CKB, the demand for CKB application architecture standards has become increasingly urgent. By designing and following common application architecture standards, CKB applications can seamlessly interface with each other and various wallets, achieving interoperability and composability to form a complete application ecosystem.

We also want to make sure decentralized applications running on CKB are able to deliver their functions and services in perpetuity once deployed. CKB already provides a good, perpetually-available foundation, thanks to the permissionless Proof-of-Work consensus and the sustainable economic model.

We hope CKB application standards can fully leverage these properties and make sure CKB applications inherit this perpetual availability.

Through CKB Application Standards, we hope to build a p2p-based, local-first application ecosystem. Its foundation lies in self-service thinking, which maintains functionality even under extreme conditions (albeit with poorer performance) and provides permanent service for users.

Built atop this are additional supplementary protocols and tools that can improve daily usability (e.g., better performance). Such a network can not only provide permanent service, but also offer a good user experience in most cases, and most importantly, all functionality will still be accessible under extreme conditions.

Research

Continued

The CKB Application Standards include the following features:

- **Script Message**: A developer-friendly standard message format and interface definition for on-chain script invocation. With script message, a type/lock script is structured similarly to a Solidity contract, in which multiple actions (functions) can be defined to constitute the interface of the script.

  Once a developer gets a script's "action definitions", they'll be able to construct script messages invoking those actions, and then use tools to generate transactions from script messages. In this way, developers only need to deal with actions and messages and are freed from transaction-building details.

- **Transaction Cobuild Protocol**: An off-chain transaction collaborative building protocol between roles like CKB applications, open transaction processors, and wallets.

- **Message Signing**: A user-friendly message display and signing protocol where users can see what actions they are taking and confirm them on a wallet's user interface.

- **Basic Transaction Co-build**: The basic transaction co-build protocol enables things like transaction fee negotiation and adjustment.

- **Open Transaction Co-build**: A partially signed transaction format and co-build protocol that enables more complex and powerful off-chain computation and collaboration.

Stay tuned for documentation detailing these evolving standards.

CKB Combine Lock

We explored the composability of lock scripts through the Combine lock project, developing tools to address unnoticed development obstacles, including a unit testing method based on CKB-debugger and better logger support. This experiment serves as a foundation for designing CKB Application Standards and improving the overall CKB toolchain.

CKB P2P Network Protocol Redesign

We undertook a comprehensive review and redesign of the CKB P2P network protocol, Tentacle, to accommodate future use cases and enhance functionalities such as node discovery, NAT connectivity, TOR/i2p and WebRTC compatibility, and peer routing.

## Payment Channel Network (PCN) on CKB

We surveyed the PCN literature and established a general architecture for PCN on CKB, aiming for significant advancements in the upcoming year to enhance transaction efficiency and scalability.

CKB Rust Toolchain Customization

This year we revisited the Rust toolchain used to build CKB on-chain scripts.

Originally, we thought a customized Rust toolchain could push the boundary of generated code for CKB-VM, including support for std, but unfortunately it has become clear that the level of work required with this path is infeasible.

Fortunately, we have found that many of the desired script optimizations can be done by tweaking build-time flags. Accordingly, we decided to sunset this customized toolchain.

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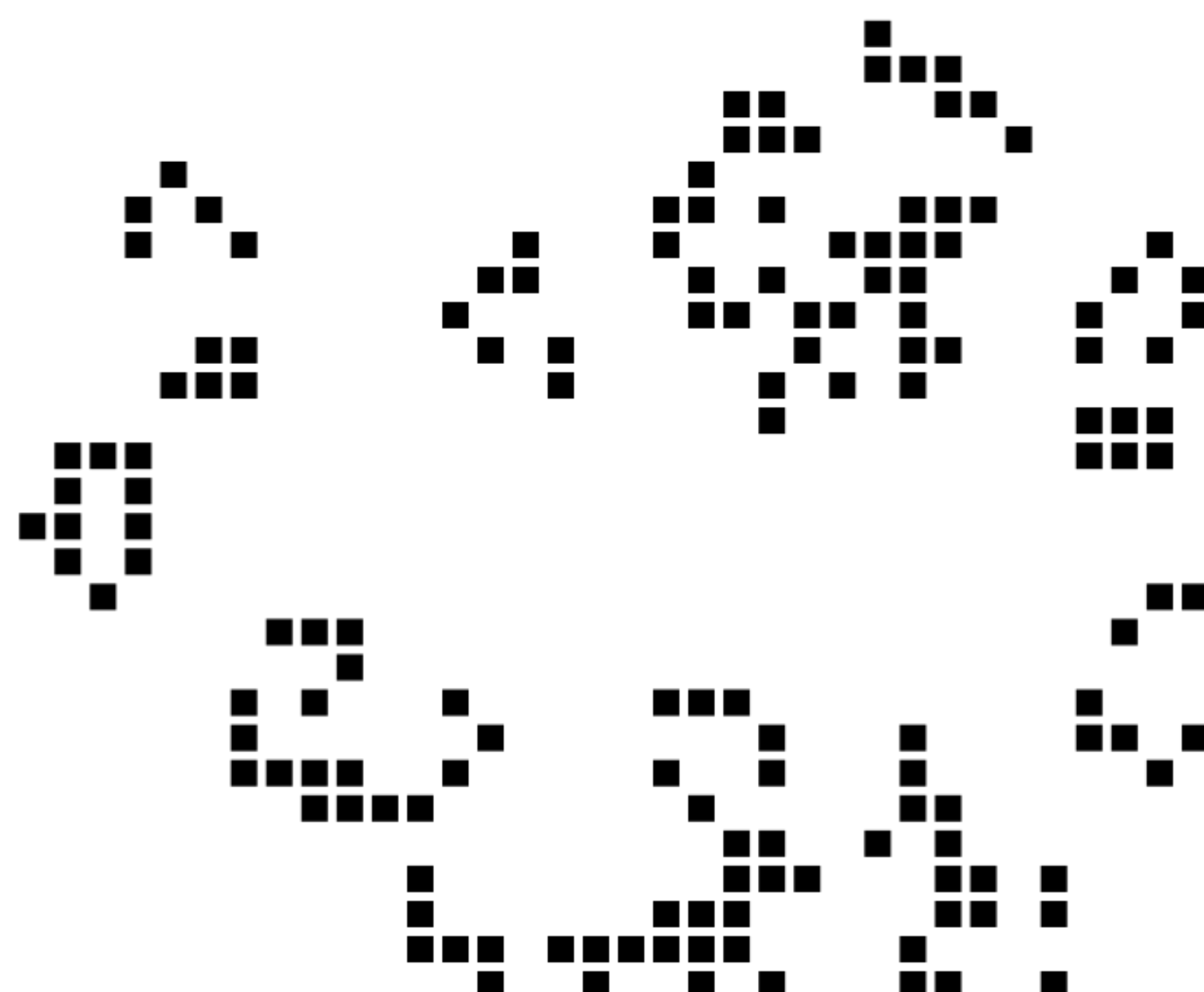
Academic Publications and Research

Publications

"When is Slower Block Propagation More Profitable for Large Miners?"

This study, published by Zhichun Lu and Ren Zhang, and presented at ESORICS'23, explores the surprising finding that slower block propagation could be advantageous for larger miners. It delves into the reasons why Bitcoin miners may not prioritize block acceleration techniques, highlighting the subtlety and fundamental nature of this issue compared to well-known attacks like selfish mining. The paper also discusses methods for detecting and countering this phenomenon.

"Polynomial IOPs for Memory Consistency Checks in Zero-Knowledge Virtual Machines"

Published in Asiacrypt'23, this paper, written by Yuncong Zhang, Shi-Feng Sun, Ren Zhang, and Dawu Gu, evaluates existing memory consistency check protocols in the Zero-Knowledge Virtual Machine (ZKVM) industry and introduces an improved protocol that enhances efficiency and memory address space utilization.

"Security-Performance Tradeoff in DAG-based Proof-of-Work Blockchain Protocols"

Featured in NDSS'24, this research by Shichen Wu, Puwen Wei, Ren Zhang and Bowen Jiang, addresses the trade-offs between security and performance in directed acyclic graph (DAG) based Proof-of-Work blockchain protocols, contrasting them with their chain-based predecessors.

Working Papers

- **NC-Max's Elastic Difficulty Adjustment Mechanism**: Introduces a new design for difficulty adjustment that effectively counters selfish mining strategies in NC-Max.

- **UTXO Position Paper**: Establishes a formal framework to analyze the differences between UTXO and Account models in blockchain technology.

- **Cell Model**: Discusses the advanced cell model design and its underlying rationale, having undergone multiple revisions.

Community Services

- **Ren Zhang** and **Yunwen Liu**: Active contributions as program committee members for notable cryptographic and blockchain conferences.

- **Blockchain Research Panorama Project**: A comprehensive summary of key computer science publications, delivered through a series of lectures. This initiative saw participation from multiple Cryptape experts, substantial online engagement, and a wide reach across platforms like YouTube and Bilibili (Mandarin).

NERVOS

Infrastructure Updates

MagiCKBase Report

Updates from the MagiCKBase team, supporting important network infrastructure such as the Neuron Wallet, CKB Explorer, GWScan and Nervos Talk forum.

- **Neuron Updates**: Released seven (7) new versions of the Neuron wallet featuring modern redesigns, enhanced user experience, and light client support. These upgrades align Neuron with current standards and user needs.
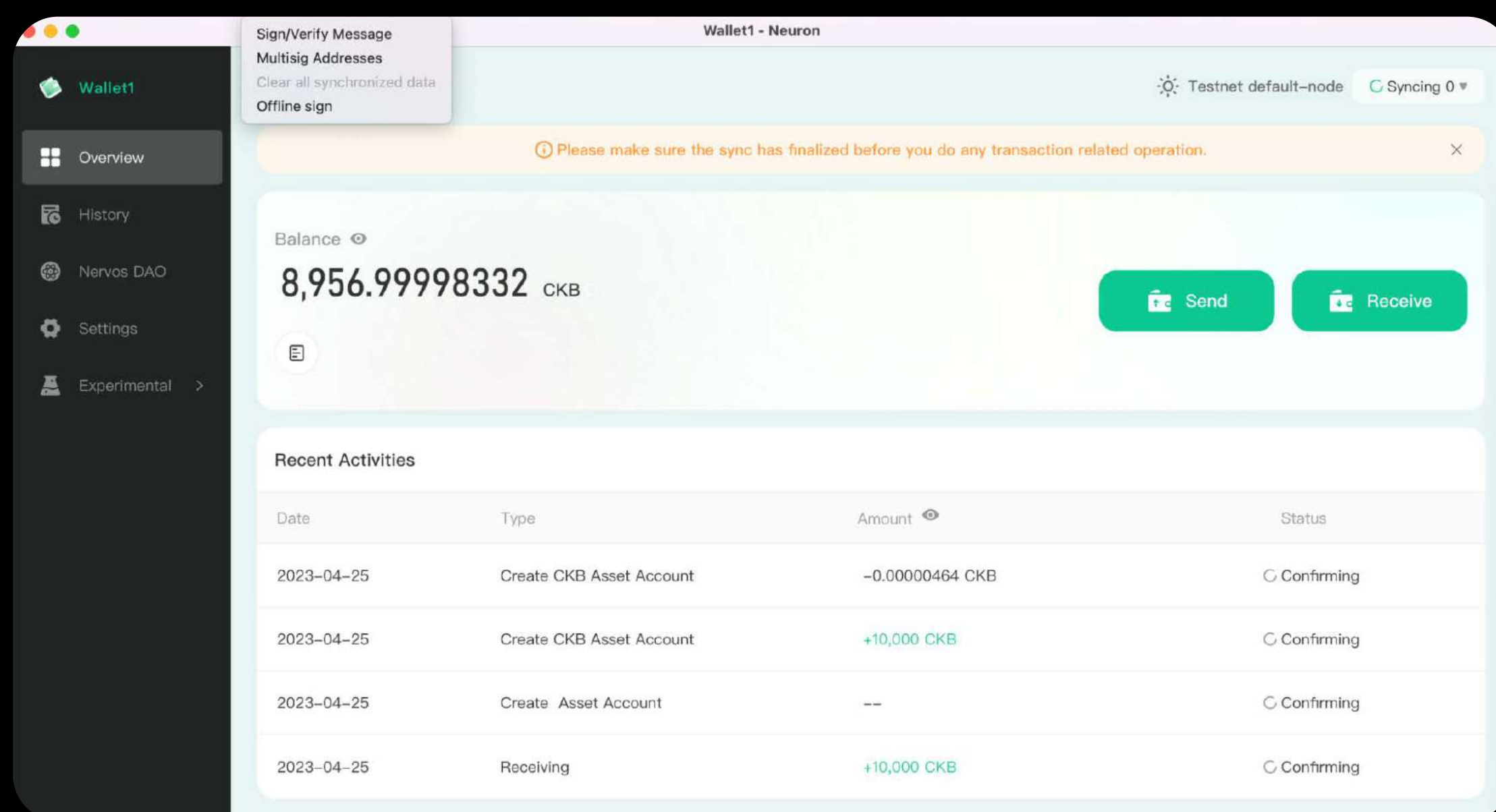
- **Technological Advancements**: Notable enhancements include support for Spore protocol, performance optimizations, and upgrade strategies to ensure security and feature updates.

- **CKB Explorer Development**: Improved data presentation, added new functionalities for professional users, and introduced lite views for basic information queries.

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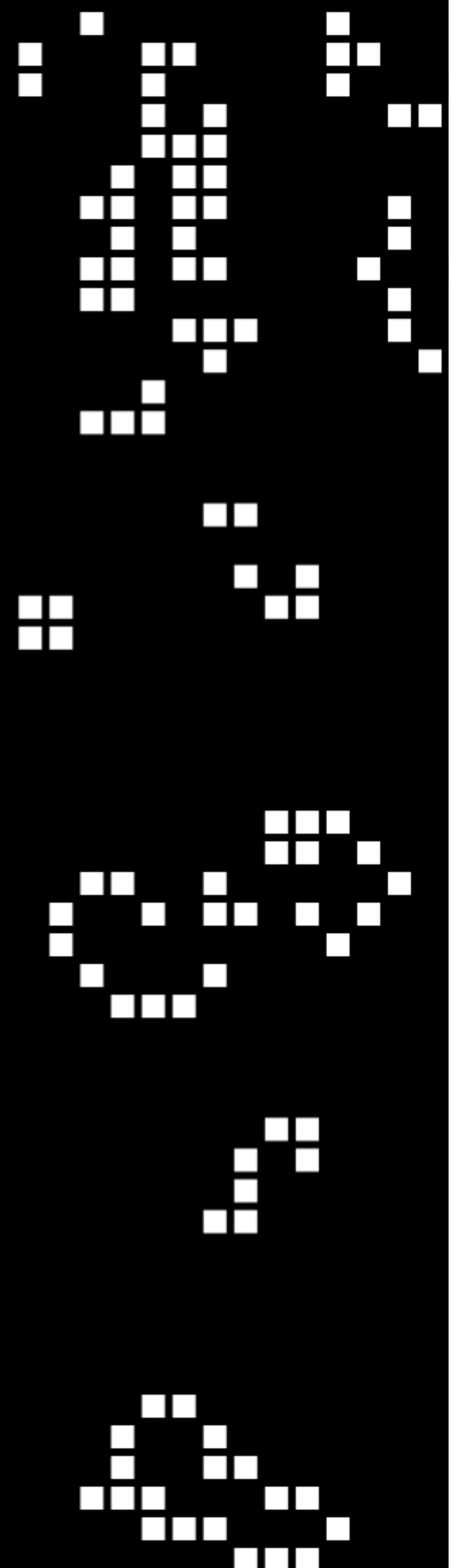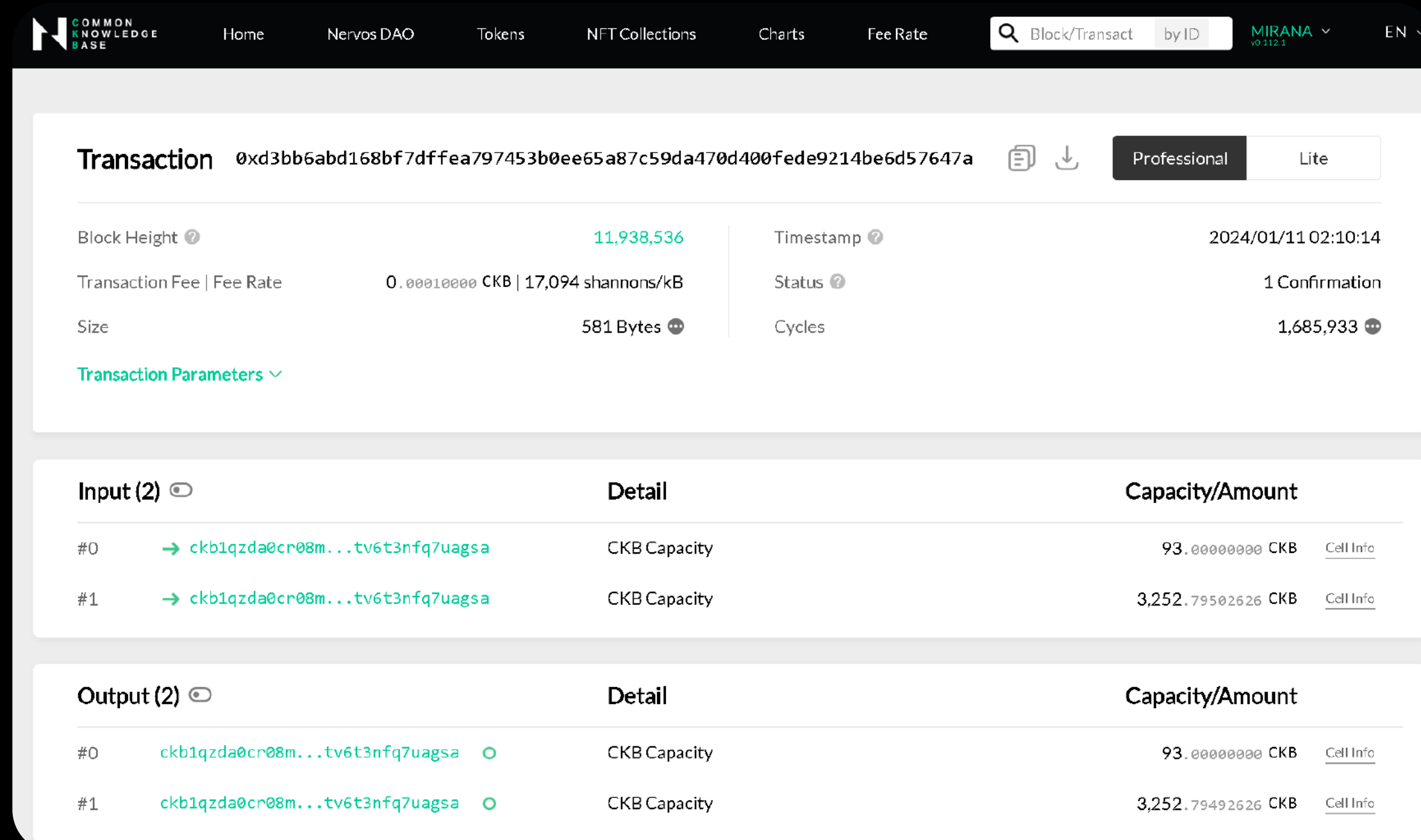
Infrastructure Updates

MagiCKBase Report

- **Internal Project Promotions**: Active development and promotion of the Kuai DApp as a best practice example within the CKB ecosystem.

- **Lumos** and **Godwoken Explorer**: Ongoing updates and enhancements to meet user needs, with the Godwoken Explorer integrating solutions from the Ethereum ecosystem for an improved user experience.

- **Public Services and Nervos Talk**: Implementation of health checks and automatic repairs for stability, along with new features like user-language-based translation in Nervos Talk.

NERVOS

Content

In the depths of a bear market, which saw a 75% drawdown in the price of BTC, and many alts, including CKB, seeing even deeper drawdowns, we seized on an opportunity to expand the public's understanding of CKB, under relatively quiet, almost sobering market conditions.

This year, we launched a "Common Knowledge Base" on nervos.org, an educational resource covering a wealth of blockchain topics and CKB-specific articles.

In the spirit of open source development, this knowledge base is managed on Github, and anyone can contribute articles through pull request. We've been impressed with the outcomes of this project & are proud to see the contributions from outside the foundation, in the passionate advocates that have joined this journey. Articles have also been translated in Chinese & Spanish!

In this report, we've divided the knowledge base into three sections:
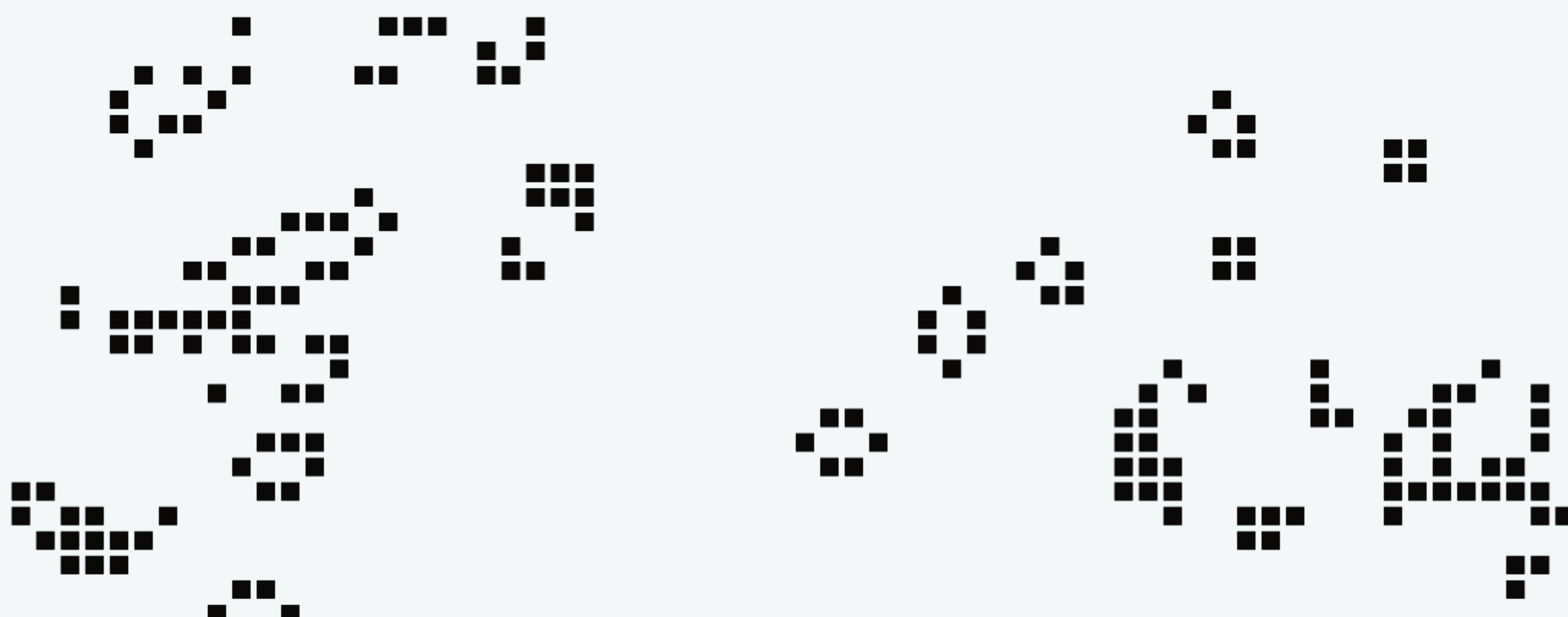
Long-form articles

In these in-depth articles, our team took great care and diligence to express the fundamental ideas behind CKB, and the principles that firmly ground our organization and the network.

Knowledge Base articles

These articles have been created to facilitate understanding of fundamental blockchain concepts. Building on the shoulders of giants means newcomers to the project may require some foundational understanding to "get" the reasoning and concepts of the network. For those looking to deepen their understanding of these concepts, and in turn CKB and the Nervos Network, these articles have proven to be an invaluable resource.

Contributed guides and tutorials

We may be biased, but it doesn't change the fact: the Nervos community is unlike any other. The knowledge density contained in our ranks is incomparable to any project we're aware of, and as you may have guessed, these contributed articles are top notch.

NERVOS

Long Form Articles

中文 Español **Available in Chinese & Spanish**

Common Knowledge Base: Understanding Our Ethos

An essay on time preference and building future-proof blockchains. The remarkable speed of change in the blockchain industry has increasingly been steering the space toward high time preference thinking.


Nervos: An In-Depth Overview of a Blockchain Network Built for Modularity

This article seeks to be the be-all and end-all resource for the underlying architecture and value proposition of the Nervos network.


Common Knowledge Base (CKB): A Blockchain Developer's Dream

Nervos' Layer 1 blockchain, Common Knowledge Base, allows developers to bring their own cryptography and build decentralized applications with superior UX and financial primitives that aren't possible on any other chain.
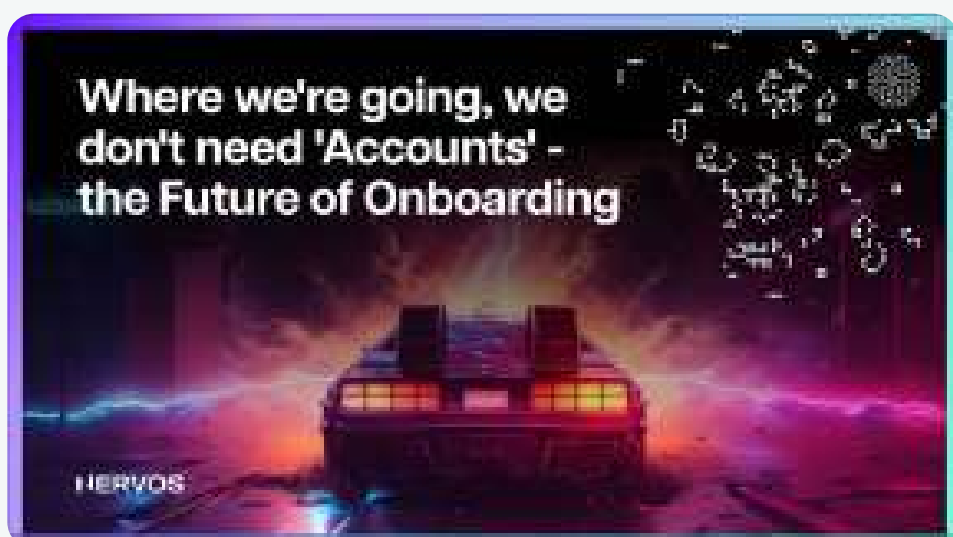
Where we're going, we don't need Accounts: The Future of Onboarding

Account abstraction is a key milestone that blockchains are striving to achieve in order to bring their user experience on par with traditional Internet applications and onboard the next billion users. CKB is uniquely positioned to welcome them.
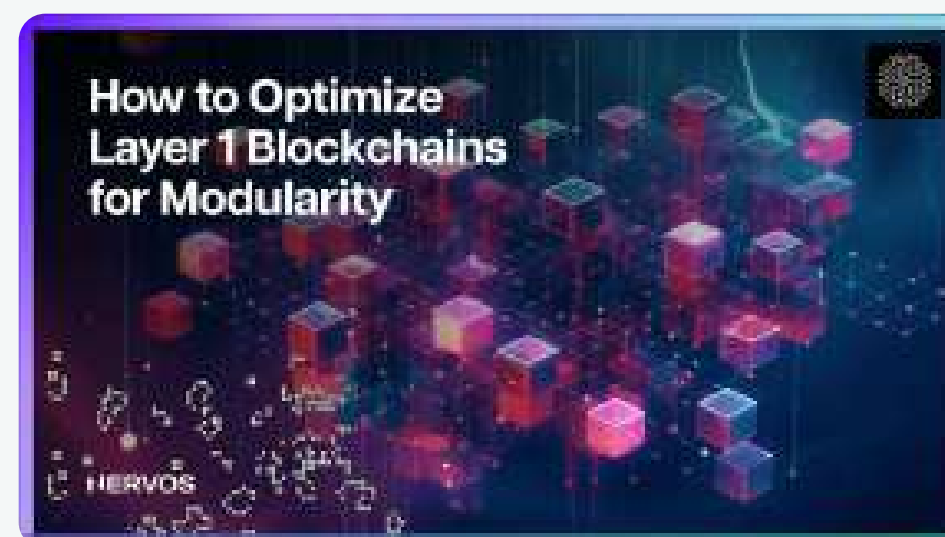
How to Optimize Layer 1 Blockchains for Modularity

Modularity in blockchains has been discussed at length. In a layered architecture, what are the ideal qualities of a Layer 1 blockchain?

Modular vs. Monolithic Blockchains: A Comprehensive Comparison

Delving into the key differences between modular and monolithic blockchain architectures and their impact on scalability, security, and decentralization.

Bitcoin vs. CKB: Two Approaches to Achieving Sustainable Security

Bitcoin's security model design has served as both an inspiration and a reference point for subsequent cryptocurrencies. Therefore, its long-term success or failure is undeniably relevant for the entire industry.

Blockchain Trilemma: The Ultimate Guide

The Blockchain Trilemma is a theory, proposed by Ethereum founder Vitalik Buterin, stating that blockchain networks can't be secure, decentralized, and scalable all at the same time.

The Ultimate Guide to Blockchain Light Clients

Light Clients offer a trust-minimized way for users to easily and conveniently access the blockchain, without any reliance on third parties.

NERVOS

中文 Español Available in Chinese & Spanish

Knowledge Base Articles

What is Block Time in Blockchain?

What is Slashing in Proof-of-Stake (PoS)?

Bitcoin Script: A Comprehensive Guide

What is Secp256r1?

What is a Blockchain Gas Fee?

What is Transaction Confirmation in Blockchain?

Understanding the Mempool in Cryptocurrency: A Comprehensive Guide

Understanding Sybil Attacks and Consensus Mechanisms in Blockchain

What is State Bloat in Blockchains?

What's the difference between blockchain computation and verification?

What do "State" and "State Change" Mean in Blockchain?

What is RISC-V? A Revolution in Processor Architecture

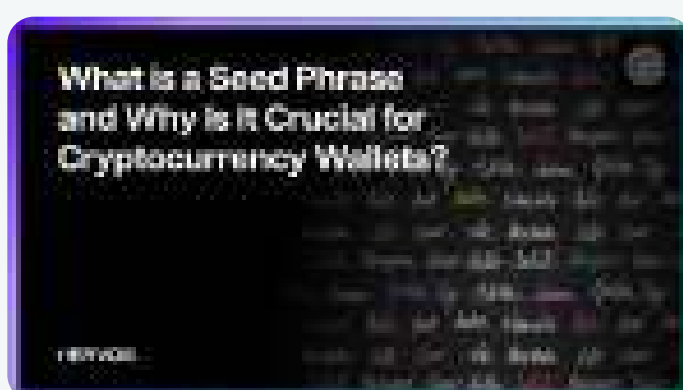**What is the Difference Between a Miner and a Full Node?**

What is a Hard Fork and a Soft Fork in Cryptocurrencies?

Crypto Mining Hardware: Exploring CPU's, GPU's, and ASIC's

Understanding Cryptocurrency Mining Pools: Advantages and Drawbacks

What is a Seed Phrase and Why Is It Crucial for Cryptocurrency Wallets?

What is Cryptocurrency Mining Difficulty and How Is It Adjusted?

What is a Multi-Signature (Multisig) Wallet in Cryptocurrency?

What are Blockchain/Cross-Chain Bridges?

NERVOS

Knowledge Base Articles

What is a Cold Wallet and Why is It Important for Cryptocurrency Security?

A Primer on BFT Consensus Mechanisms in Blockchain

What is a Light Client in Blockchain Technology?

What is a Non-Custodial Crypto Wallet?

A Deep Dive into Decentralized Storage Systems

SHA256: The Most Used Hash Function in Cryptocurrencies

What is Keccak256? Exploring the Cryptographic Hash Function and Its Use in Cryptocurrencies
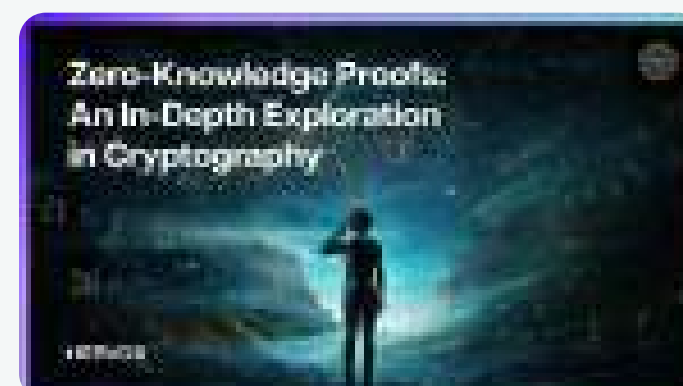
Understanding ECDSA: The Backbone of Digital Signature Security

Secp256k1: A Key Algorithm in Cryptocurrencies

Decentralized Identifiers (DIDs): Creating User-Friendly, Secure, and Interoperable Blockchain Identities

Zero-Knowledge Proofs: An In-Depth Exploration in Cryptography
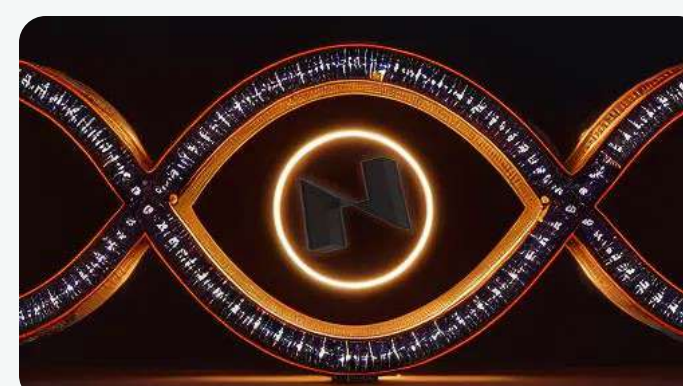
What is Blockchain Interoperability?

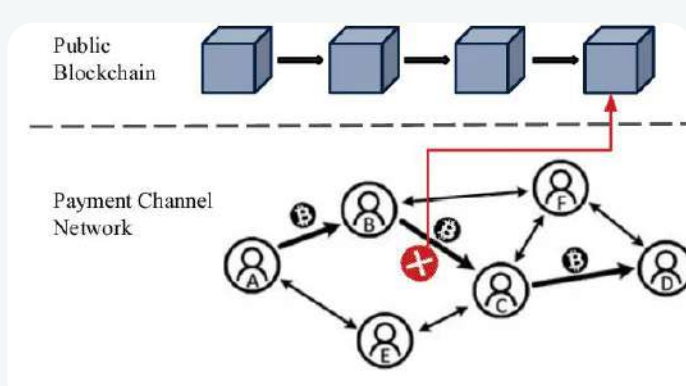**Proof-of-Work vs. Proof-of-Stake: Unraveling the Key Differences**

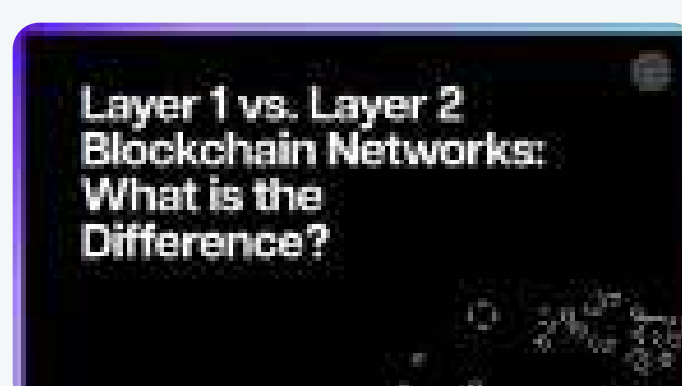**Sidechains: Unlocking the Potential of Blockchain Scalability and Interoperability**

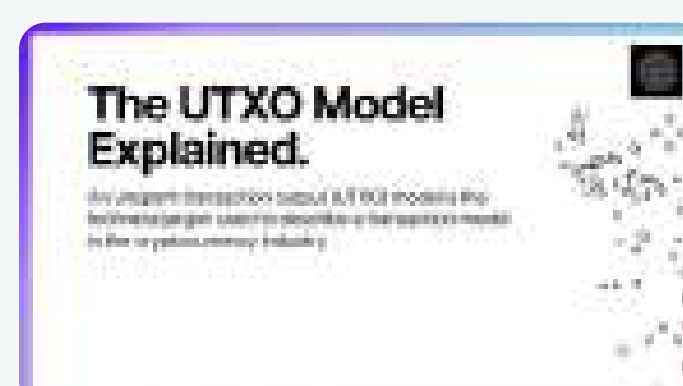**Quantum Resistance in Blockchains: Preparing for a Post-Quantum Computing World**

ASIC-Resistance, is it possible?

What are Payment Channels?

Layer 1 vs. Layer 2 Blockchain Networks: What is the Difference?

The UTXO Model Explained

UTXO vs. Account-Based Blockchains - Benefits and Drawbacks

NERVOS

中文 Español Available in Chinese & Spanish

Knowledge Base Articles

What Are Optimistic Rollups? Everything You Need to Know

What is a 51% Attack in Cryptocurrency?

What Is a Hash Function?

What Is Nakamoto Consensus?

What Is the UTXO Alliance?

Why Is Proof-of-Work Required in Bitcoin?

ZK-Rollups vs. Optimistic Rollups: What's The Difference?

Contributed Articles

Surprisingly, Secondary Issuance is not Inflationary

A Deep Dive Into the Tokenomics of Nervos Network

Understanding the Nervos CKB Issuance Model

Pi400 Ubuntu Node Setup Guide

Nervos DAO — Withdrawal Process Explained

NERVOS

Hashing it Out
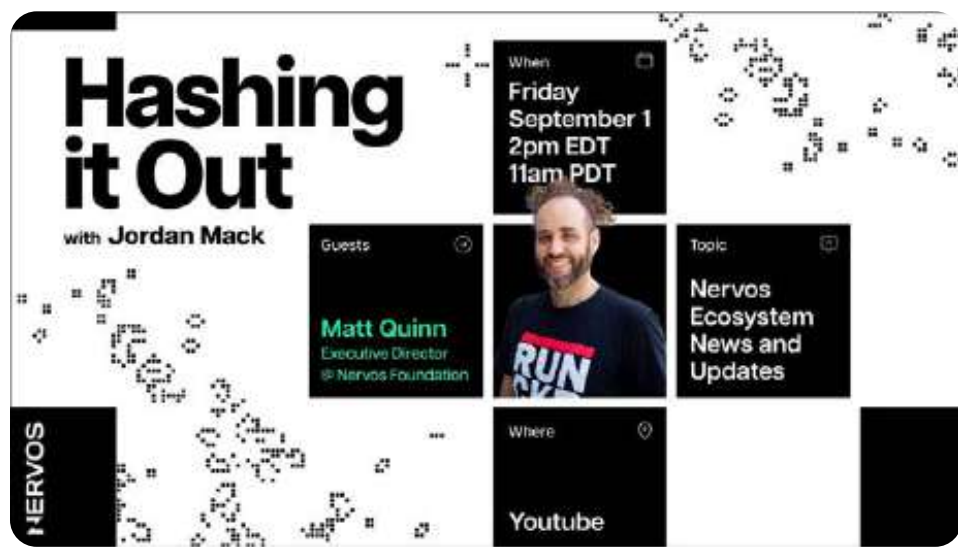
September: Nervos Ecosystem News and Updates

July: Interoperability on Nervos, past and future
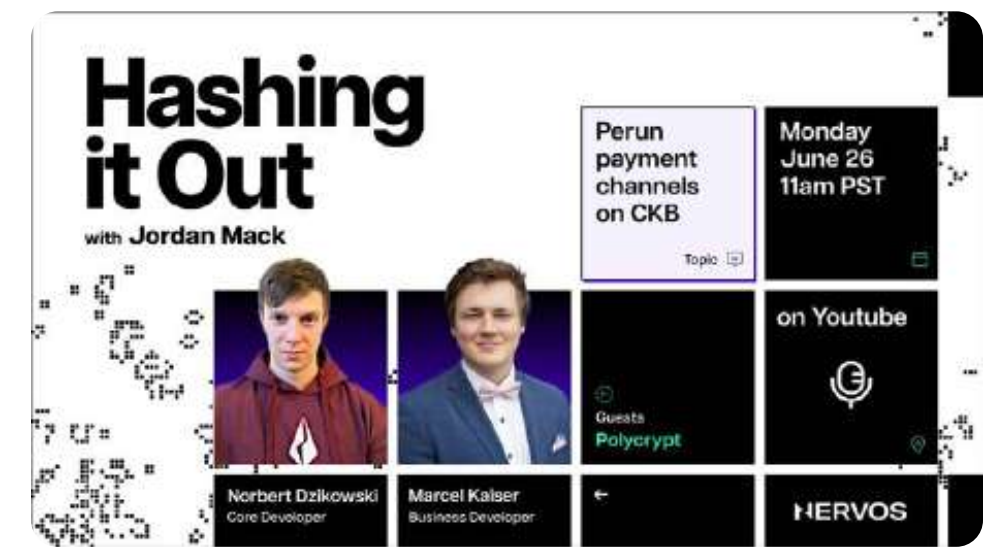
June: Polycrypt: Payment Channels and CKB

May: Industry News

April: Account Abstraction
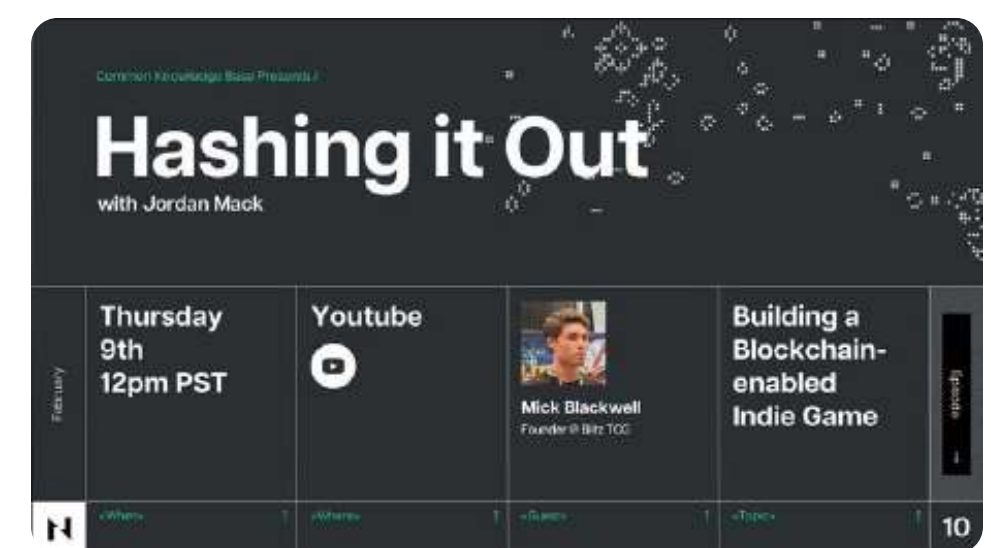
February: Building a blockchain enabled game

January: 2022 Recap
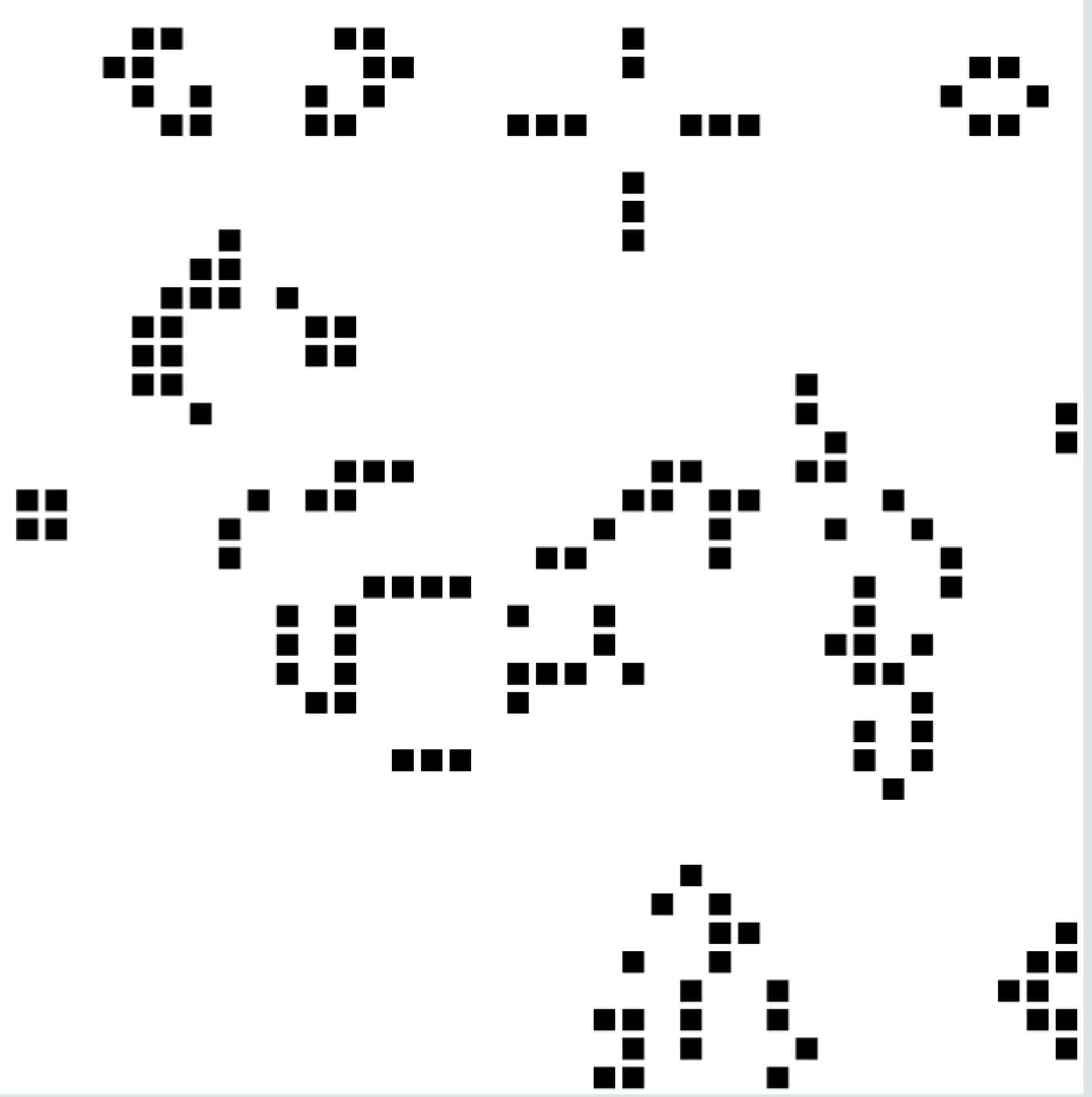
NERVOS

Reddit AMA's
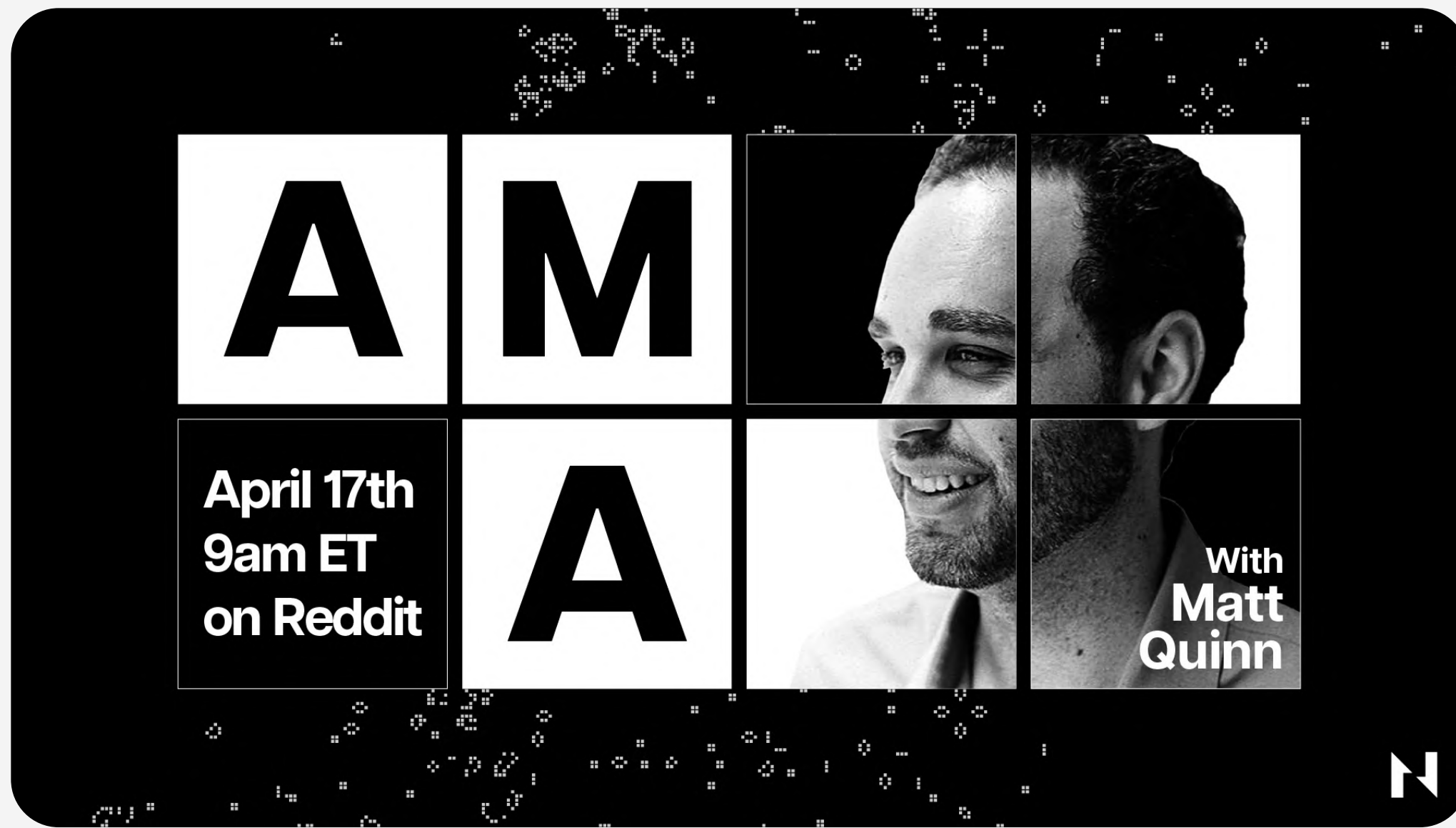
Matt Quinn, Executive Director, Nervos Foundation

Cipher Wang, Founder, JoyID

Ren Zhang, Inventor of NC-Max

Kevin Wang, Co-Founder, Nervos Network & Khalani

Jordan Mack, Head of Dev Relations, Nervos Foundation

Jan Xie, Chief Architect, Nervos Network

Cipher Wang, Founder, JoyID

r/cryptocurrency: Jordan Mack & Matt Quinn
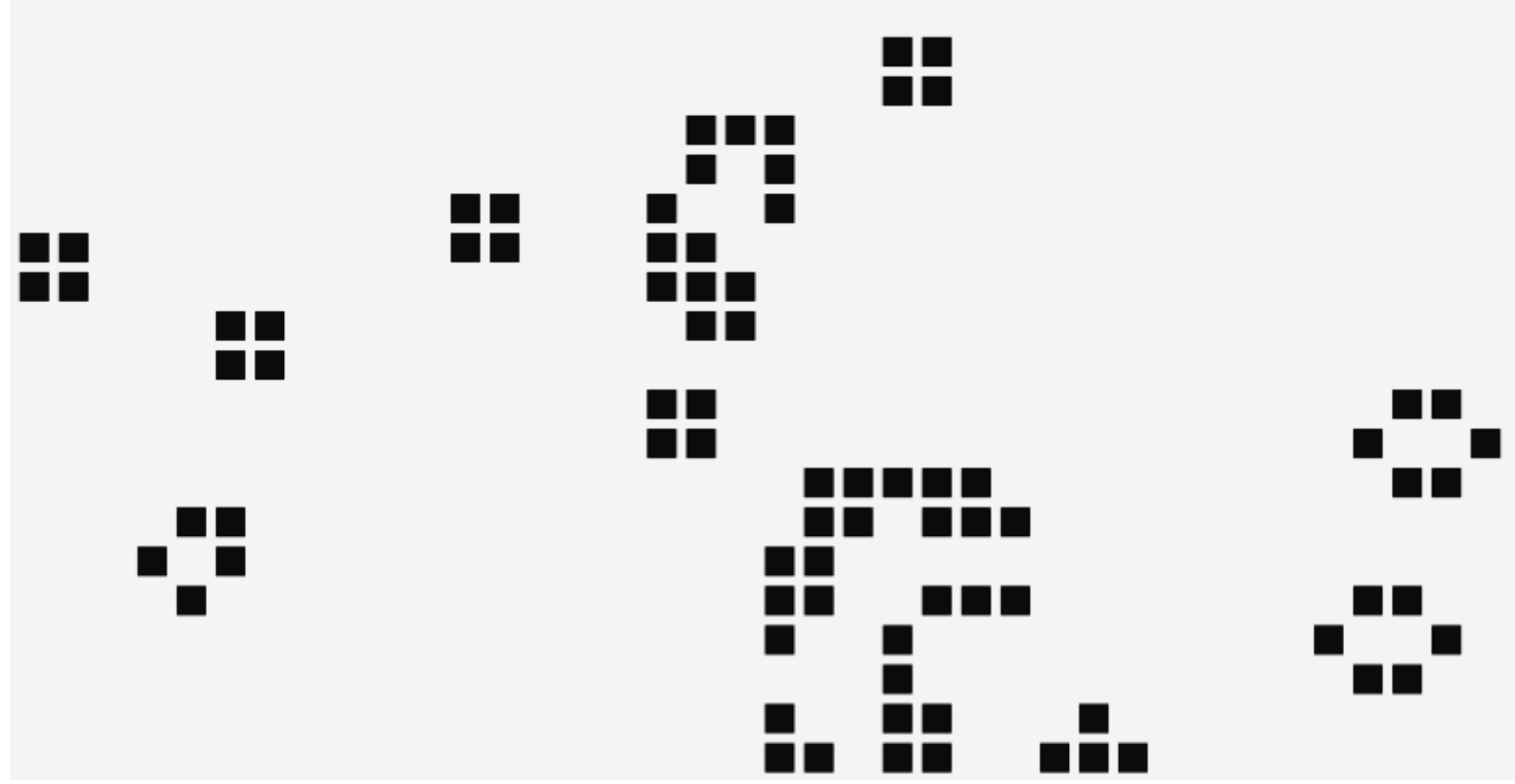
NERVOS

Newsletters

March 2023

April 2023

May 2023

June 2023

July 2023

August 2023

September 2023

October 2023

November 2023
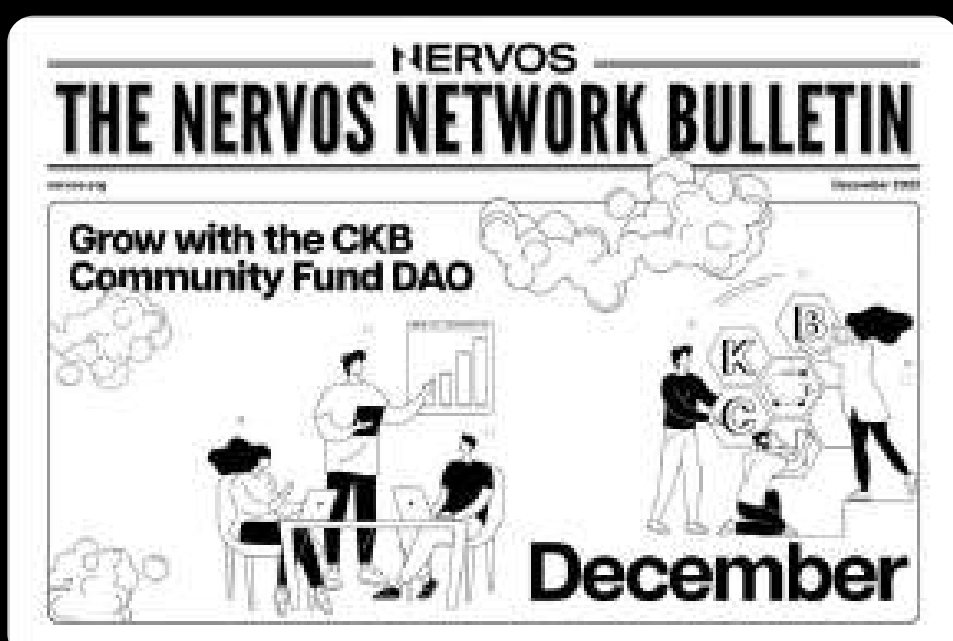
December 2023
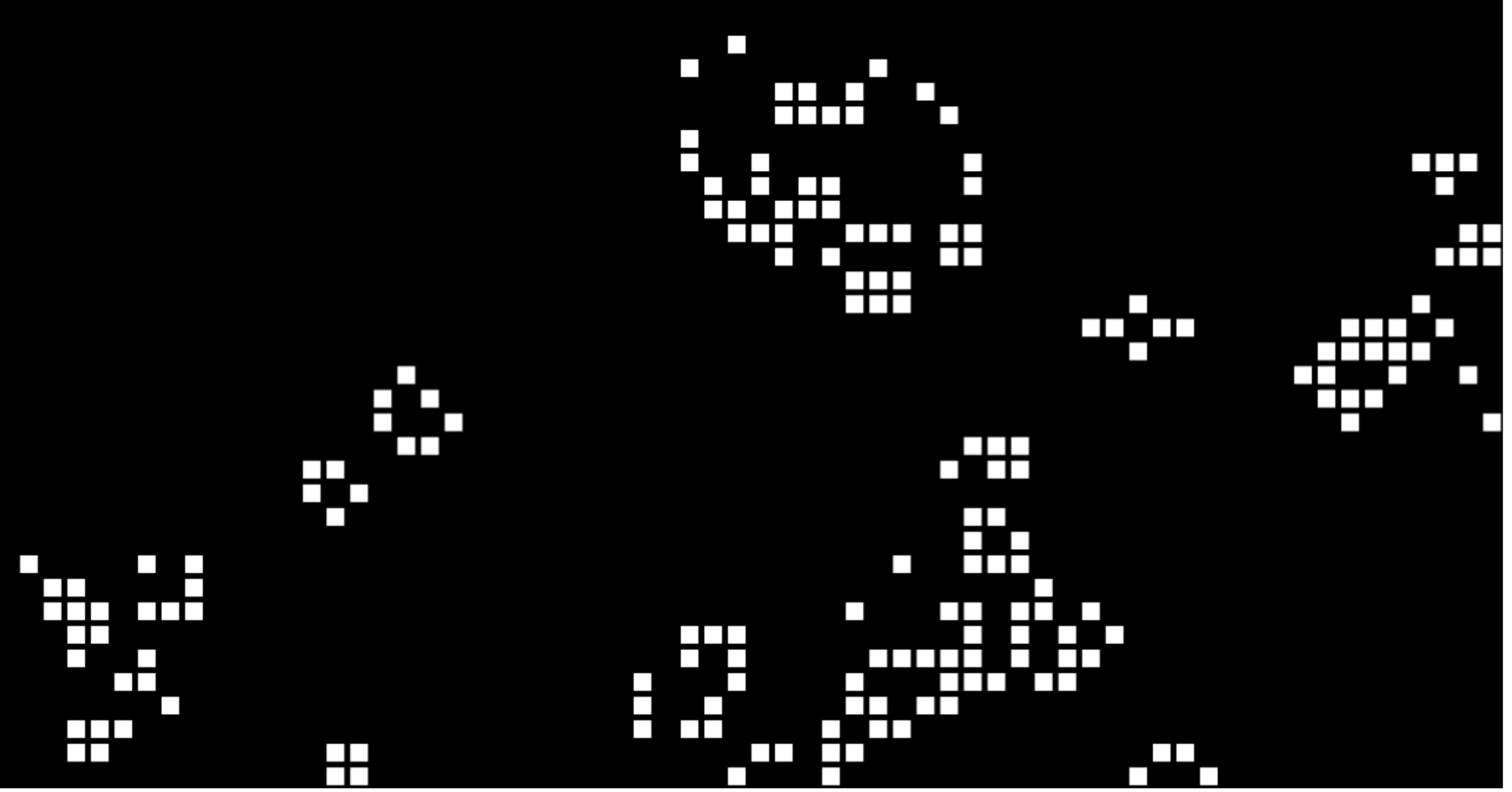
NERVOS

Social Metrics

Overview

In 2023, the Nervos Foundation focused on amplifying the community's understanding of blockchains and CKB, and in turn attracted a wider crypto audience.

The revamped nervos.org, filled with insightful content, enhanced search rankings, leading to an improved online presence for the project.

Social media efforts, including Twitter campaigns and informative LinkedIn posts, successfully drew in more crypto enthusiasts and reinforced our expertise.

LinkedIn

Our LinkedIn posts resonated profoundly with the professional community, leading to a substantial year-over-year (YOY) follower increase of 68.36%.

	LinkedIn	YOY Growth
2021	2,189	
2022	3,230	47.56%
2023	5,438	68.36%

Youtube

Our YouTube channel's subscriber count rose by 50.52%, a testament to our compelling video content, including the 'Hashing it Out' series and various events, which effectively educated and captivated our visually-oriented audience.

	Subscribers	YOY Growth
2018	63	
2019	262	315.87%
2020	317	20.99%
2021	1,059	234.07%
2022	4,121	289.14%
2023	6,203	50.52%

NERVOS

Social Metrics

Reddit

Reddit's membership growth of 2.68% illustrates a dedicated space for rich dialogue and robust engagement, with community-led discussions reinforcing a consistent interest in the evolving Nervos ecosystem.

	Members	YOY Growth
2021	10,578	
2022	18,042	70.56%
2023	18,526	2.68%

Twitter

Twitter growth was near-static on the year, however it remains a crucial channel for real-time updates and community interactions.

	Followers	YOY Growth
2020	15,841	
2021	54,922	246.71%
2022	115,700	110.66%
2023	115,728	0.02%

Telegram

Despite a slight decline, Telegram continues to be an essential real-time communication tool that facilitates immediate and direct engagement with the Nervos community.

	Members	YOY Growth
2021	19,424	
2022	17,213	-11.38%
2023	14,868	-13.62%

NERVOS

Social Metrics

Nervos DAO Ⓝ

The Nervos DAO has seen a robust increase in depositors, boasting 25.25% growth in 2023, signaling sustained trust and participation in the network. Unique addresses on the network have surged to over 2.9 million, equaling a 269.02% leap year over year, reflecting the growing confidence and activity within the Nervos ecosystem.

	Depositors	YOY Growth
2019	986	
2020	7,500	660.65%
2021	28,830	284.40%
2022	46,970	62.92%
2023	58,830	25.25%

Unique Addresses Created Ⓝ

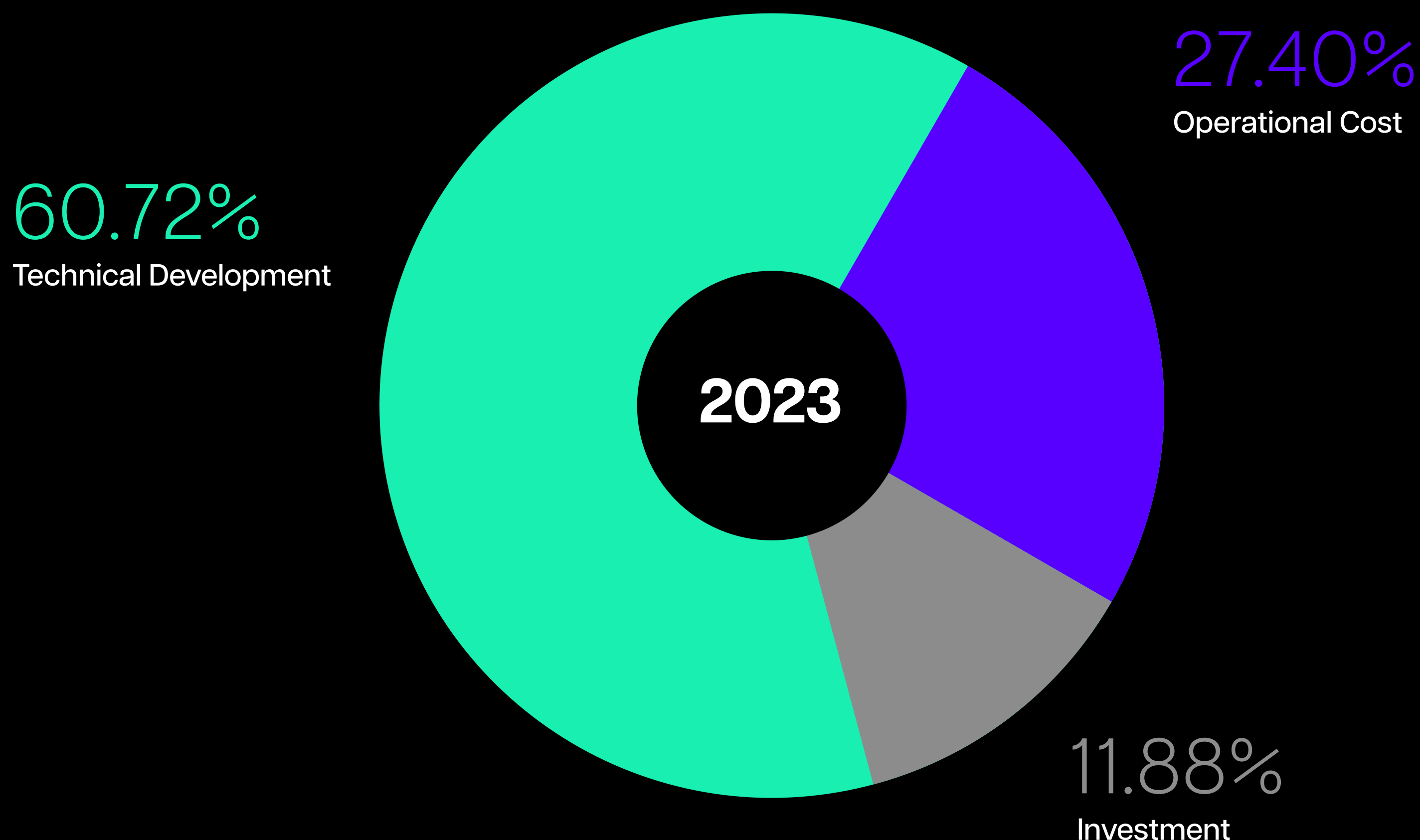|	Unique Addresses	YOY Growth
2019	15,274	
2020	55,832	265.54%
2021	407,373	629.64%
2022	800,369	96.47%
2023	2,953,542	269.02%

Hash Rate Ⓝ

NERVOS

Budget Report

Nervos Foundation consists of dedicated teams of blockchain enthusiasts who share the vision of paving the path to better financial systems and navigating toward the Internet of tomorrow.

Each team contributes to the ecosystem in its focused domain. For example, Cryptape focused on research and development of CKB, MagiCKBase focused on the CKB Explorer, Neuron Wallet and other network infrastructure, and Nervina Labs recently shipped JoyID. The foundation supports these teams' funding and operational needs.

The total spending in 2023 was $9.77 million, with 60.72% of the spending on technical development, including funding for CKB infrastructure, research, developer tools, as well as security audits, grants, bounties, and hackathons. The 27.40% in operational cost covers developer relations, marketing, legal and other operational costs. The remaining 11.88% was allocated to investment.

The Foundation's mission is to raise awareness and increase CKB's adoption among sophisticated developers and tech-centric blockchain enthusiasts worldwide. In 2024 and beyond, the foundation will continue to identify opportunities to grow the ecosystem, with a focus on enhancing the infrastructure, improving the developer experience and supporting teams and events to onboard developers.

As the ecosystem matures, the foundation plans to gradually donate CKB to the CKB Community Fund DAO, putting the power in the hands of CKB holders.

27.40%
Operational Cost

60.72%
Technical Development

2023

11.88%
Investment

NERVOS

Dev Logs

Core Development

CKB Dev Log 2024-01-10

CKB Dev Log 2023-12-27

CKB Dev Log 2023-12-13

CKB Dev Log 2023-11-29

CKB Dev Log 2023-11-15

CKB Dev Log 2023-11-01

CKB Dev Log 2023-10-18

CKB Dev Log 2023-10-04

CKB Dev Log 2023-09-20

CKB Dev Log 2023-09-06

CKB Dev Log 2023-08-23

CKB Dev Log 2023-08-09

CKB Dev Log 2023-07-26

CKB Dev Log 2023-07-12

CKB Dev Log 2023-06-28

CKB Dev Log 2023-06-14

CKB Dev Log 2023-05-31

CKB Dev Log 2023-05-17

CKB Dev Log 2023-05-03

CKB Dev Log 2023-04-19

Dev Logs

Core Development

CKB Dev Log 2023-04-05

CKB Dev Log 2023-03-22

CKB Dev Log 2023-03-08

CKB Dev Log 2023-02-22

CKB Dev Log 2023-02-08

CKB Dev Log 2023-01-25

CKB Dev Log 2023-01-11

CKB Dev Log 2022-12-28

Axon

Axon Development Updates 12/07/2023

Axon Development Updates 11/22/2023

Axon Development Updates 10/25/2023

Axon Development Updates 10/13/2023

Axon Development Updates 09/06/2023

Axon Development Updates 07/26/2023

Axon Development Updates 07/12/2023

Axon Development Updates 06/28/2023

Axon Development Updates 06/14/2023

Axon Development Updates 05/31/2023

Axon Development Updates 05/17/2023

Axon Development Updates 04/28/2023

NERVOS

Dev Logs

Axon

Axon Development Updates 04/05/2023

Axon Development Updates 03/22/2023

Axon Development Updates 03/08/2023

Axon Development Updates 02/24/2023

Axon Development Updates 02/08/2023
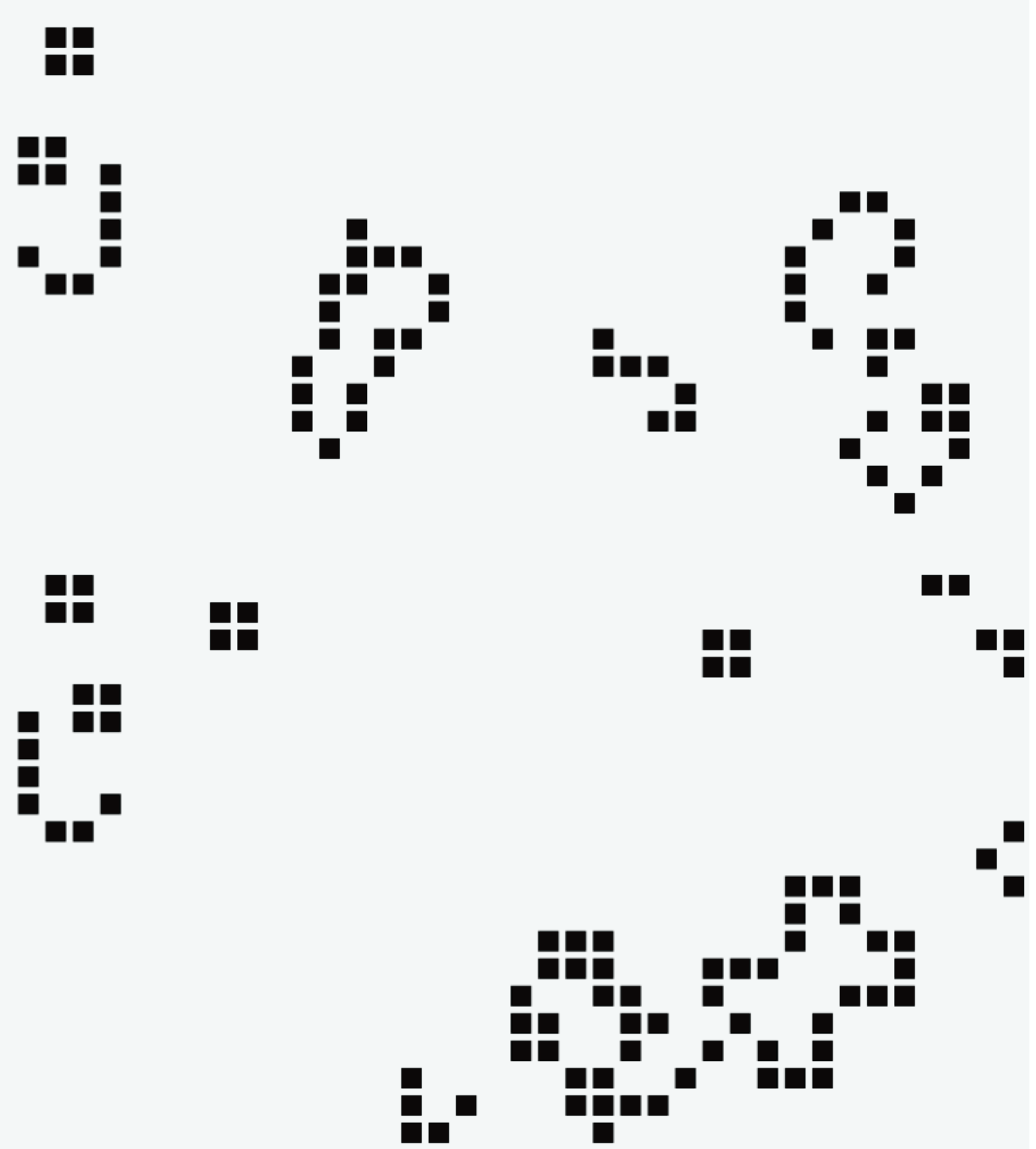

Axon Development Updates 01/18/2023

Axon Development Updates 01/04/2023

Axon Development Updates 12/21/2022

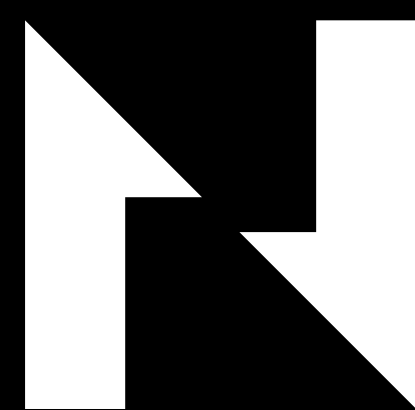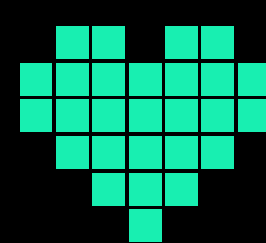**Axon Development Updates 12/11/2022**

You've made it to credits!

The Nervos Network and CKB ecosystem are a product of hundreds of passionate contributors around the world, from diverse regions, backgrounds and skill sets.

At the Nervos Foundation, we strive to support all of you in manifesting your destiny through our journey together.

We've been working at this for some time, but in many ways we're only getting started.

Your passion and enthusiasm make the impossible a reality, let's keep building.

To 2024 and beyond 🧑‍🚀

NERVOS