CHERRY

Decentralized file storage, smarter.

Layer one blockchain infrastructure bridging smart contracts to decentralized file systems.

LightPaper v3.0 November 15th 2021

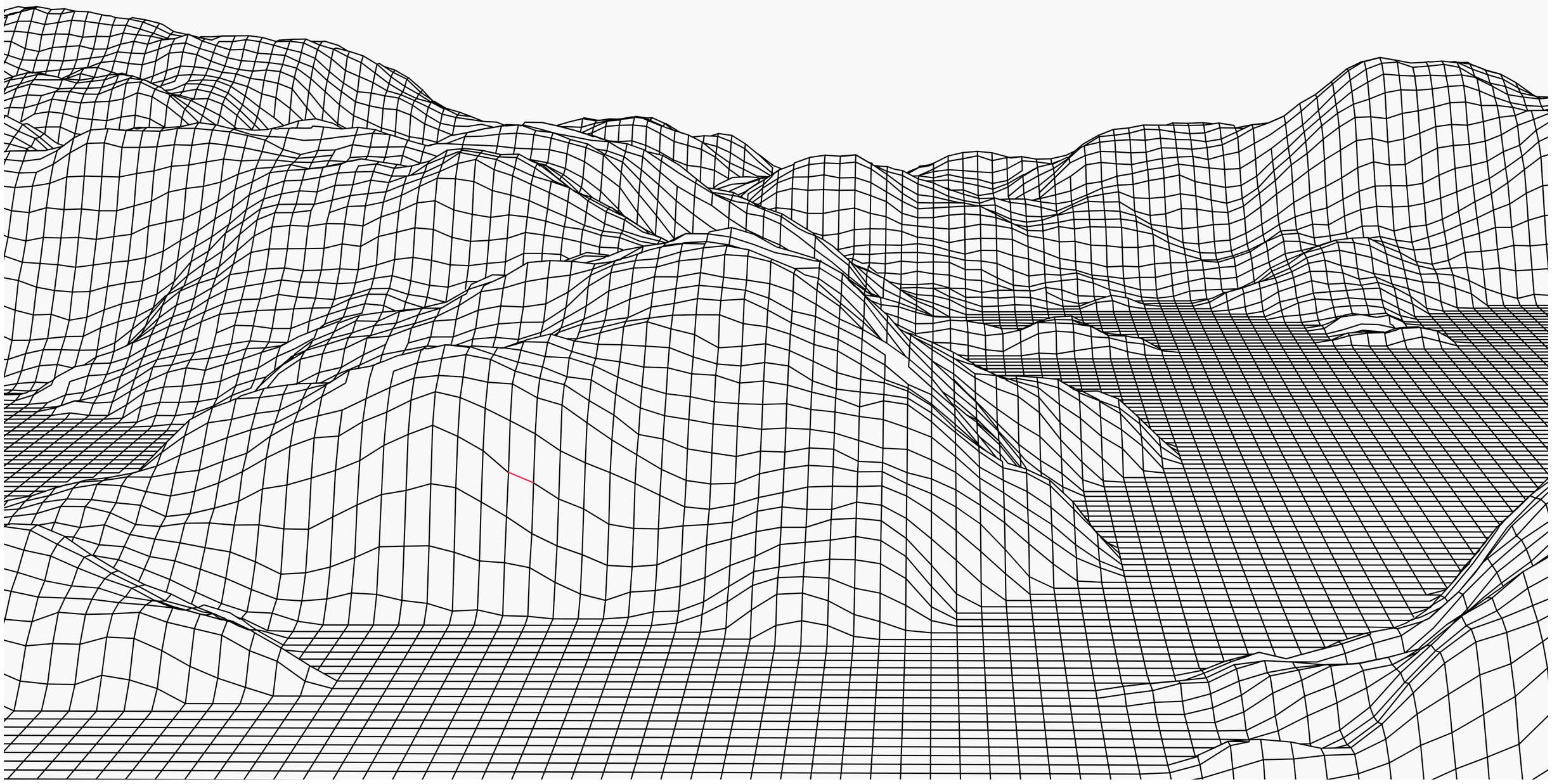

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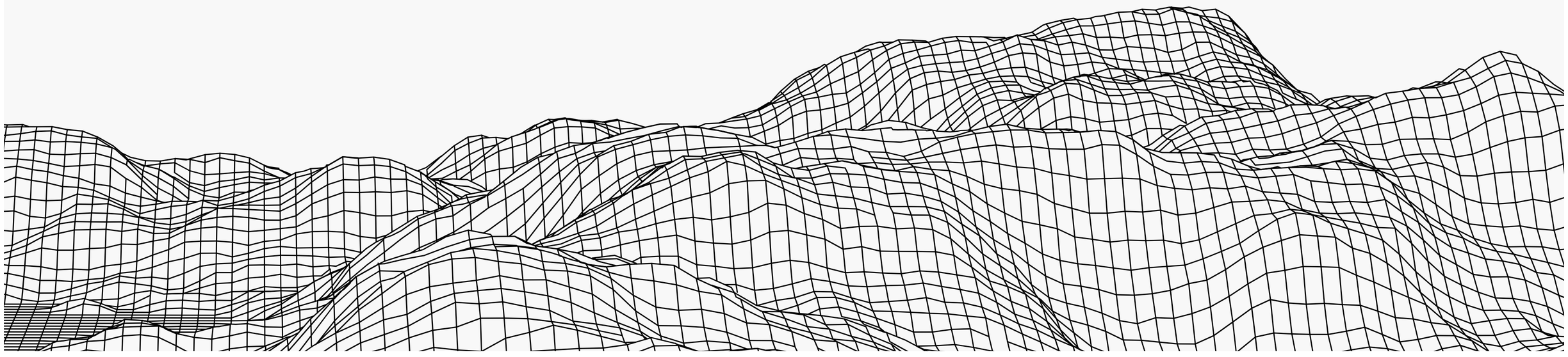
Table of Contents

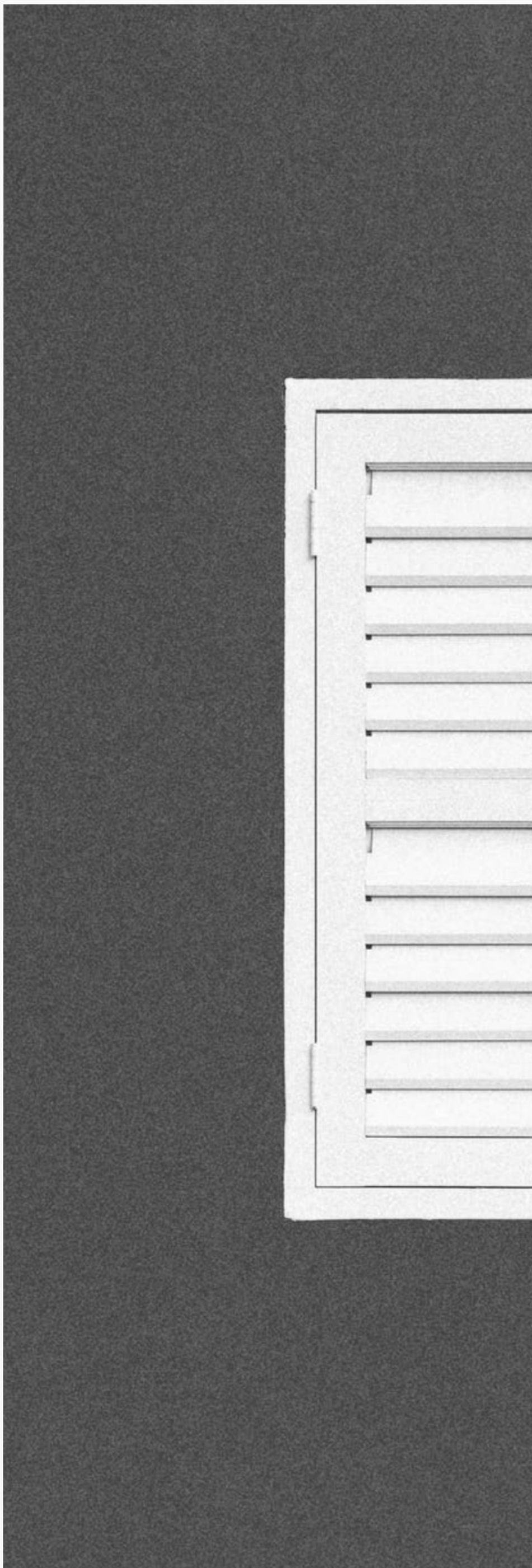


3. Executive Summary

Cherry seeks to build a permissionless toolkit for the management of decentralized data storage systems. To achieve this goal, Cherry adopts existing technologies including a decentralized file system and a smart contract state machine, which it combines and extends on a purpose-built platform, the Cherry Network.

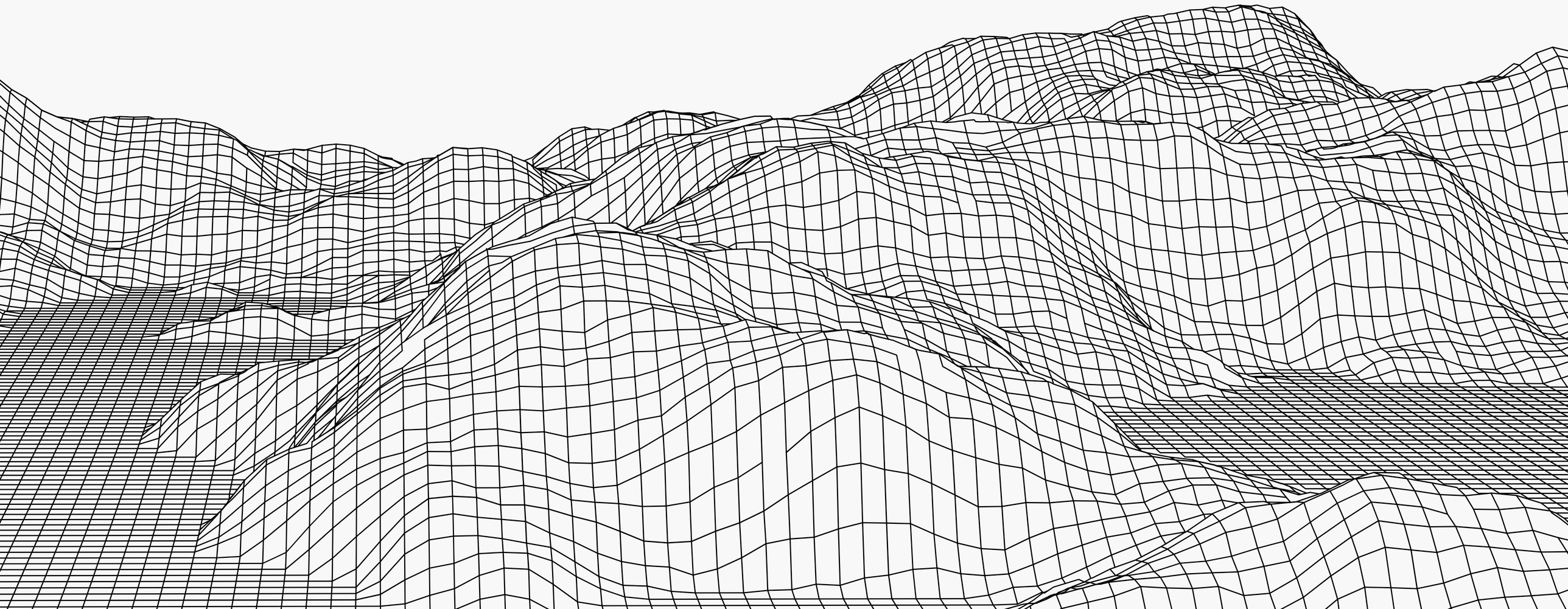
Its main advancement is the introduction of a mechanism to index the files stored within the storage partitions of nodes, and present this up-to-date account of what data is held - and how to optimally retrieve it - to the state machine runtime.

Smart contracts running on the Cherry Virtual Machine (CVM) are thus able to interact with the decentralized file system synchronously, perform read/write operations, and manifest constructions such as ownership and access rules.



The communication between the CVM and the decentralized file storage system is parametrized, and mediated by network peers abiding by the same on-chain consensus-driven restraints as the blockchain runtime. Such architecture guarantees the trustless execution of file I/O, and provides a transparent record of node integrity.

The Cherry Token is introduced as the unit of account on which on-chain resource economies may form. Its fundamental role is to mediate the consumption of network resources among users, and reward node operators for their contribution to the network.



4. Overview

Cherry is focused on solving a narrow, yet important missing link in today's web3 landscape: decentralized file administration. Cherry achieves this goal with an innovative solution tailored and adapted to meet the challenges of tomorrow.

We observed that the present-day toolkit available for the construction and deployment of file-consuming decentralized applications lacked the versatility and the architectural specificity to achieve widespread adoption, and often broke blockchain's decentralized, trustless promise. Cherry is a purpose-built blockchain specializing in addressing the hurdles encountered by web3 developers and their users when attempting to perform file read/write operations in a decentralized setting.

Cherry combines cutting-edge cryptographic paradigms and advanced peer-to-peer networking and file distribution protocols to produce a novel base-layer infrastructure for the decentralized internet. Its functionality may be shared within the interoperable network that bridges across the most popular public blockchains like Polkadot and Ethereum.

With a rich plug-and-play application programming interface and a feature-full software development kit, Cherry accelerates the adoption of decentralized application designs. From experienced layer two developers trying to improve their applications and gain an edge on their competition to enterprise users seeking to earn their place in the distributed internet revolution, Cherry Chain is at once innovative and production-ready.

Built with ease of use in mind, Cherry Chain abstracts the complexities of blockchain processes and hypermedia workflows into user-friendly interfaces. As a result, developers benefit from blazing-fast and intuitive development processes, allowing them to focus on their product rather than platform integration. Ultimately, end-users can rely on the stability of the base layer for more functions guaranteeing fewer bugs and more predictable costs.

5. Fundamentals

The Cherry development team leveraged many existing paradigms in the creation of Cherry Chain. These were then extended with the Project's vision in mind. Here are the most notable design principles we implemented establishing Cherry Chain as a unique, innovative platform for the next generation of decentralized applications:

Data Retention and Indexing

Files of any type may be stored in the offline data storage module within Cherry Chain nodes. Each network participant maintains a hash table indexing all data stored across its peer network. The data's existence and location are thus transparently known and usable in on-chain runtime at all times. Its content, however, is subdivided and distributed in chunks that may be fetched and composed into readable information according to user-defined access rules. The Inter-Planetary File System underpins the data storage processes.

Scale-Proof Architecture

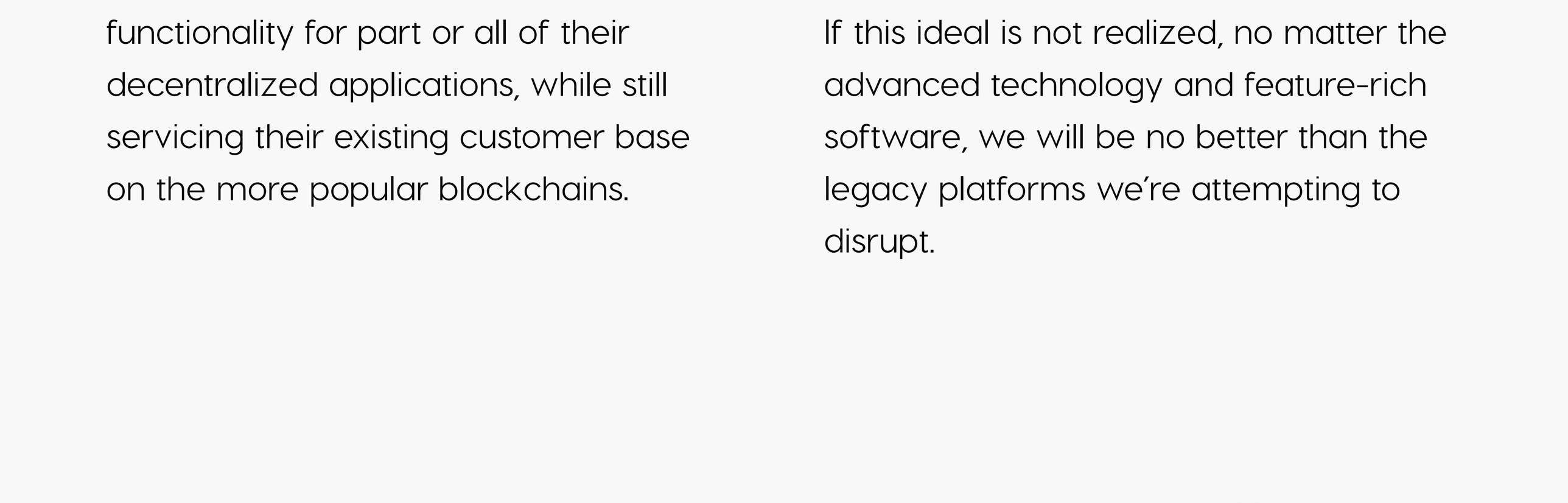
Horizontal scale is ensured by expanding both the number of nodes and the performance of the hardware on which the Cherry nodes run. No exotic solutions are required due to the separation of roles and hierarchical organization imposed by the network's consensus rules. Cherry's authentic innovation can be identified with the introduction of zero-knowledge "Rollups" as a native layer-two scaling solution. While computation and storage are handled off-chain, on-chain smart contracts are updated with state transition zero-knowledge proofs organized in trustless Rollups, each with no theoretical upper bound resource consumption limit.

Network Interoperability

Open networks are not exclusive by design, but few support interoperability bridges to form an interconnected platform of rich functionalities spread over several purpose-built infrastructures. The Cherry team is building highly opinionated software, which it doesn't believe should be exclusively used by active participants of the Cherry Chain. Developers from the leading open blockchain platforms will be able to integrate the Cherry functionality for part or all of their decentralized applications, while still servicing their existing customer base on the more popular blockchains.

Decentralization

From Cherry Chain application execution runtime to the organizational and governance structure of the Cherry Community, decentralization is a core driving principle of the Cherry Project. Trustless participation in a vast distributed resource economy, such as the Cherry Chain, requires decentralization at every step. No one party should have an overwhelming say over any aspect, technical or philosophical, within the Cherry Project. If this ideal is not realized, no matter the advanced technology and feature-rich software, we will be no better than the legacy platforms we're attempting to disrupt.



6. Substrate

Substrate is an open-source modular blockchain framework that allows developers to construct and deploy custom chains.

It comes with p2p networking, consensus algorithms, and cryptographic libraries out-of-the-box. Despite being “completely generic,” it includes standards and conventions, such as those in the Substrate runtime module library “FRAME,” regarding the underlying data structures that power the state transition function. When building with FRAME, the Substrate runtime is composed of several smaller components called pallets. A pallet contains a set of types, storage items, and functions that define a set of features and functionality. Additional features can be introduced in the runtime as pallets, upgradeable modules, which operators may develop to extend their nodes base features.

Cherry Chain has done just that, deploying most of its innovations as pallets. These include a discovery network based on a Kademlia distributed hash table (DHT) index of the network participants and their declared role in the consensus, functionality, as well as the data storage and distribution protocol.

Nominated Proof of Stake is the consensus algorithm of choice to run Cherry Chain. For its purposes, nodes are split between nominators and validators who are entrusted with block production and the finality gadget for a finite period of time. Other node roles exist within Cherry Chain, such as the Indexers: this type of node maintains an up-to-date state of the chain as well as the data distribution DHT of the state of its peers in GraphQL consumable form. Storage can be optionally enabled in each Cherry node, allowing the peer to reserve a file system partition for the hosting of IPFS chunks.

The Substrate runtime is compiled into a native executable and a WebAssembly (Wasm) binary. Nodes operate the native version, but chain logic and smart contracts are also replicated as Wasm in the shared blockchain.

The network must therefore include the correct state of the Wasm runtime in its consensus process. For this reason, the Wasm runtime representation is considered canonical. The runtime consistency across syncing nodes can thus be verified. If the native version isn't consistent, the runtime executor may be upgraded, updated network-wide, and when peers are required to execute code, they will be able to compare their executor version with the latest on the network.
The major runtime modifications Cherry proposed are a fully zk-Rollups compliant virtual execution machine for its second layer, as well as a partial implementation of an IPFS distributed data storage mechanism, both of which will be covered in the following sections.

7. Interoperability

The future of blockchain is an interconnected web of collaborative yet independent and autonomously governed blockchains, each focusing on disparate features, from which all may benefit.

Interoperability is critical for the mass adoption of decentralized applications. Users need to be able to interact and collaborate across different platforms, leveraging the various features and characteristics of each. Interoperability between blockchains enables better experiences for both users and developers through more straightforward smart contract execution, better information sharing, more partnership opportunities, and implementation of cross-chain solutions. From the beginning, developers working on Cherry Network focused on creating a scalable and interoperable platform. Our team understood how essential interoperability is for the blockchain industry as a whole and for the long-term success of the Cherry Chain. We needed to create a platform that developers could easily integrate with their projects if they choose to do so. By allowing developers to easily extend their blockchain applications to take advantage of the unique features of the Cherry Chain, we are helping move the entire blockchain industry towards mass adoption.

An additional, more practical benefit that these design features produce is a fast onramp for decentralized applications to start using Cherry Chain with no further modification. A high level of compatibility allows for a transitory period in which developers may get acquainted with Cherry's characteristics and gradually adapt their apps to leverage them while still operating their old code as usual. Cherry focuses on developer experience and incremental change, both essential for an emerging layer one network. Networks need users to thrive, and Cherry Chain's EVM compatibility and broad interoperability properties allow anyone to start using Cherry and contribute to the future of creative expression.

A cornerstone of blockchain interoperability is the blockchain bridge. Bridges are ways for two technologically diverse and economically sovereign chains to communicate with one another. The native Cherry Chain bridges are all trustless by design. The Cherry Bridges connect our network and other blockchain platforms with Turing-complete smart contract languages such as Tezos, NEO, Ethereum, Tron, Avalanche, Binance Smart Chain, Polkadot, and many others.

8. Scaling, zk-SNARKS & zk-Rollups

The recent uptick in decentralized applications users produced periods of total network paralysis in Ethereum and other popular blockchains. As a result, transaction fees skyrocketed, and time or cost-sensitive dApps like decentralized exchanges became unusable. All this evidenced the importance of scale readiness among emerging blockchain networks.

There exist many scaling solutions for open blockchains, some of which have been more successful than others. Some worth mentioning are sharding, whereby the base layer is partitioned to spread out the computational and storage workload across the peer-to-peer network so that no one node is responsible for processing the entire network's transactional load. Instead, each node only maintains information related to its partition or shard; more recently, we've seen the emergence of multi/side-chain architectures like the proposed Plasma protocol in Ethereum or Polkadot's parachains.

This methodology involves propping up separate blockchains with more or less overlapping attributes with the main chain to ensure compatibility. These side-chains are used to distribute some of the workload according to a given rationale (optimizations, geolocation, hardware specifications, etc).

None of the alternatives mentioned above meet the scalability and security requirements for a network at scale. The main goal of scalability is to increase transaction speed (finality) and transaction throughput (transactions per second) without sacrificing decentralization or security. We believe the Cherry Project has identified the ideal protocol that is infinitely replicable, and which wholly derives its security from cryptography and that of the Cherry Chain. It involves executing computational operations off-chain but then posting the resulting transaction data on layer-1. Cherry implements the zero-knowledge version of these "Rollups."

Following this paradigm, the “operators” bundle transfers off-chain and generate a cryptographic proof, a succinct non-interactive argument of knowledge (SNARK) proof. This is known as a validity proof and is posted on layer 1. The zk-Rollup smart contract maintains the state of all activity on layer 2, and this state can only be updated with a validity proof.

This architecture provides the following guarantees:

- The Rollup validator can never corrupt the state or steal funds (unlike side-chains).
- Users can always retrieve their tokens from the Rollup even if the validator stops cooperating because the data is available (unlike Plasma).
- Thanks to validity proofs, neither users nor any other trusted party needs to be online to monitor Rollup blocks to prevent fraud (unlike payment channels or Optimistic Rollups).

9. Data Storage and Indexing

Cherry collapses the computational and data layer into one powerful network. Developers and node operators can now attest, and safely store data within their own node off chain storage module. The data may then be distributed in a decentralized data storage system powered by IPFS, according to owner-set access rules.

Storage services of Cherry Chain are mainly adapted to such technologies as the Inter-Planetary file system and distributed hash table, enabling basic data integrity, content addressing, tamper resistance, and deduplication. Kademlia neighborhood-driven routing model ensures data is retrieved with the minimal amount of steps from the nodes which hold it. This technique enables messages to be routed between any two nodes, even if they do not maintain a direct connection. Data is retained as chunks, which canonically are the smallest unit of the data stored and distributed within the network, and always are 4kb in size. Chunks are individually encrypted to ensure that only their owner can access them. Smart contracts may be nominated owners of data, and thus complex access rules may emerge. The presence of identifiable owners also facilitates the emergence of varying runtime-based economic models to best allocate scarce storage resources among users.

Cherry Chain deploys IPFS among its network peers. While the data itself is persistent in a small subset of nodes that elect to preserve that data, a shared state of file path location and routing is shared within the Kademlia's DHT index, as mentioned in section 7. In IPFS jargon, these nodes provide a pinning service that Cherry Network will later enhance with a smart contract-based economic model.

For the time being, each network participant who requires data to be stored within the Cherry storage module (e.g., for later consumption within NFTs or other decentralized applications) will either need to operate their own node (which can be the same as the zkRollup validator) or will have to trust a fellow ecosystem participant to store data on their behalf. The Cherry DAO has committed to guaranteeing pinning capacity for its users in view of later monetization.

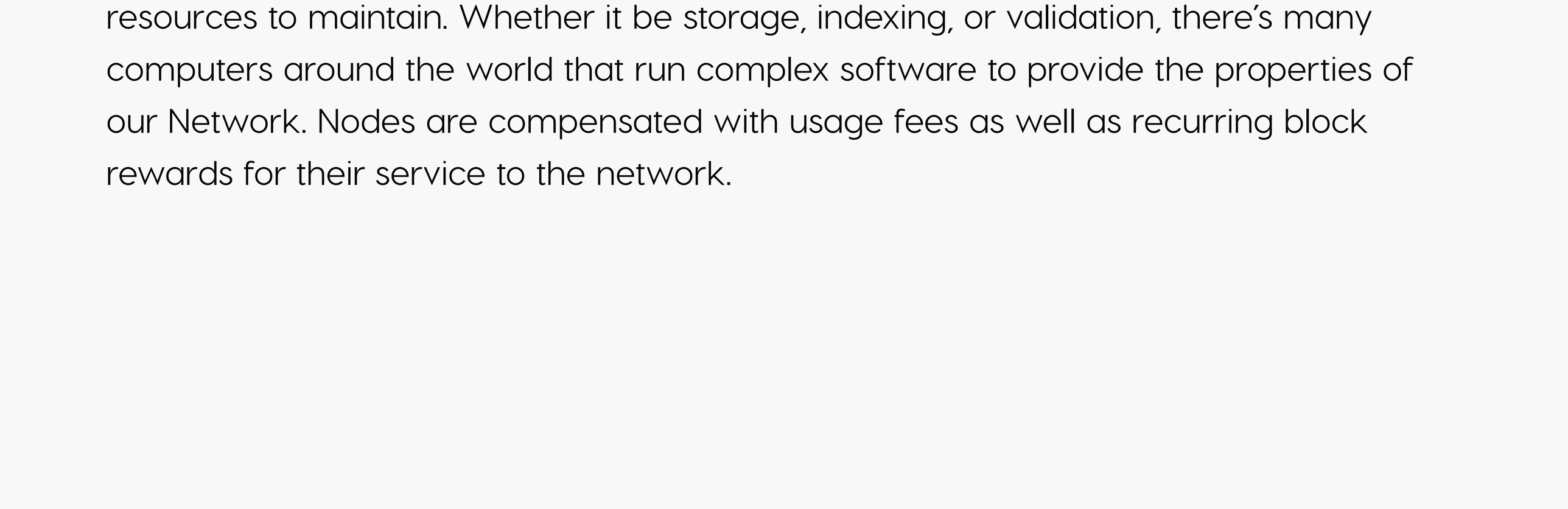
10. Cherry Token

Cherry Token (CHER) is the Ecosystem's native token designed to empower sustainable economics within the Cherry platform and foster a mutually beneficial relationship between node operators, developers, investors, and users.

CHER is used as a "standard" currency within the Cherry platform. It is the base unit of account for every smart contract within the Cherry Ecosystem as all network fees are denominated in Cherry Tokens. Users exchange CHER for network resources, and developers spend them to launch and operate their dApps.

Node Economy

The Cherry Chain offers powerful features which cost expensive computational resources to maintain. Whether it be storage, indexing, or validation, there's many computers around the world that run complex software to provide the properties of our Network. Nodes are compensated with usage fees as well as recurring block rewards for their service to the network.



Validation

Selected by a process called “Nomination,” this subset of nodes is entrusted with the submission block proposals and their inclusion in the shared ledger. To ensure their good faith Validator nodes set a “stake” of CHER tokens which could be reclaimed or “slashed” in case the node was caught acting maliciously.
If the Validator nodes faithfully execute their functions following the rules of the protocol, they will be compensated with a block reward issued every block they successfully submit to the chain.

Other users can “nominate” Validators by staking their CHER toward the election of their preferred nodes as validators. Canonically, in exchange for this support, Validators commit a portion or all of their earnings proportionally to those users who nominated them as Validators.

Storage

In addition to performing blockchain networking functions, nodes may provide partitions of their hard drive disk for consumption within the IPFS layer of the Cherry Network. They may either place their own files and refuse new additions, with the objective of making certain files accessible to the CVM state machine, or more complex storage economics may ensue.

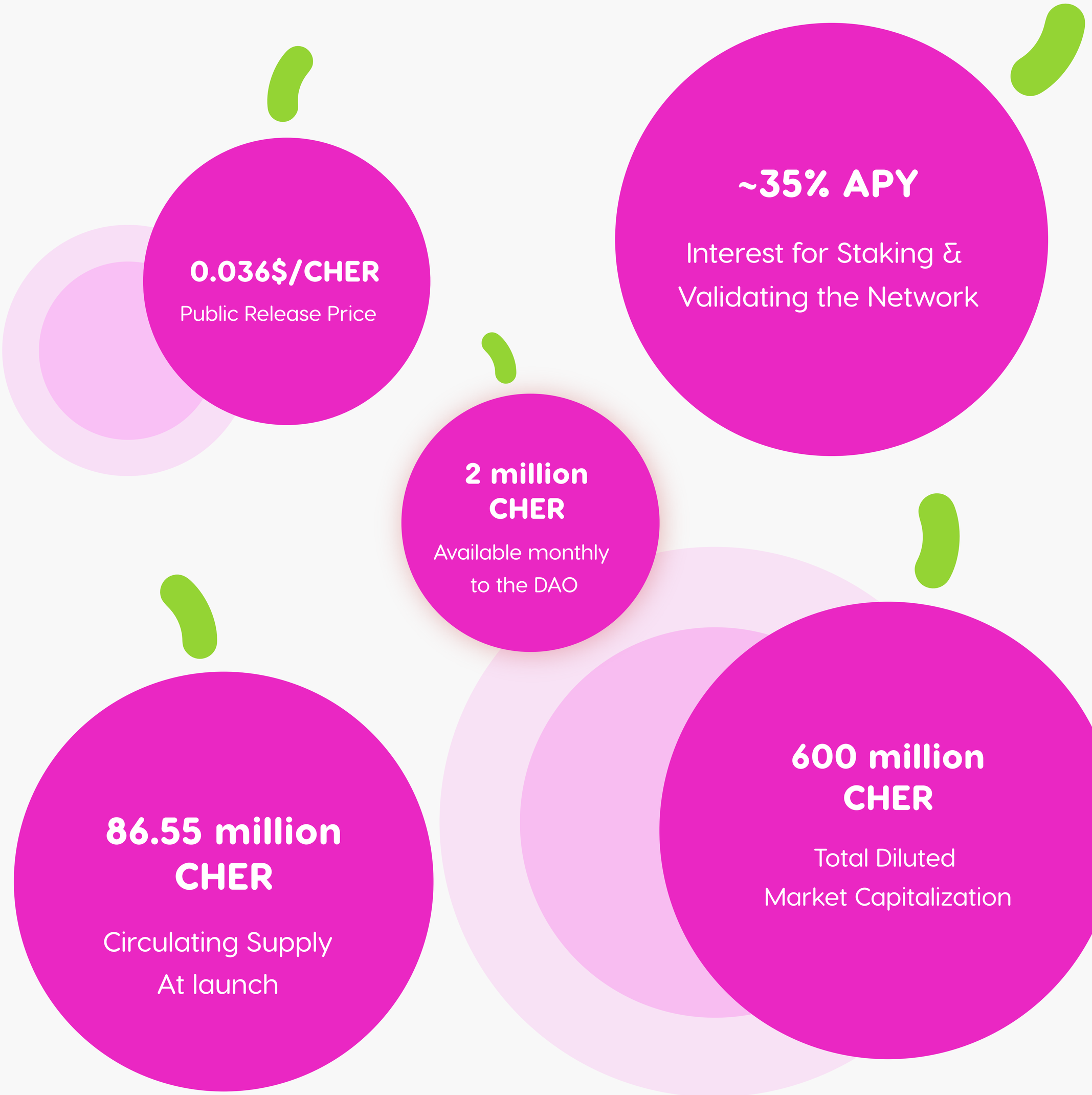
Those who have empty space on their machines may choose to either replicate the data already stored on Cherry’s IPFS layer, or rent it out to users who may want to include new files to Cherry’s decentralized storage environment. For both of these services, as well as more abstract relationships with specific smart contracts, Nodes which provide storage to Cherry’s IPFS instance get compensated in CHER.

Indexing

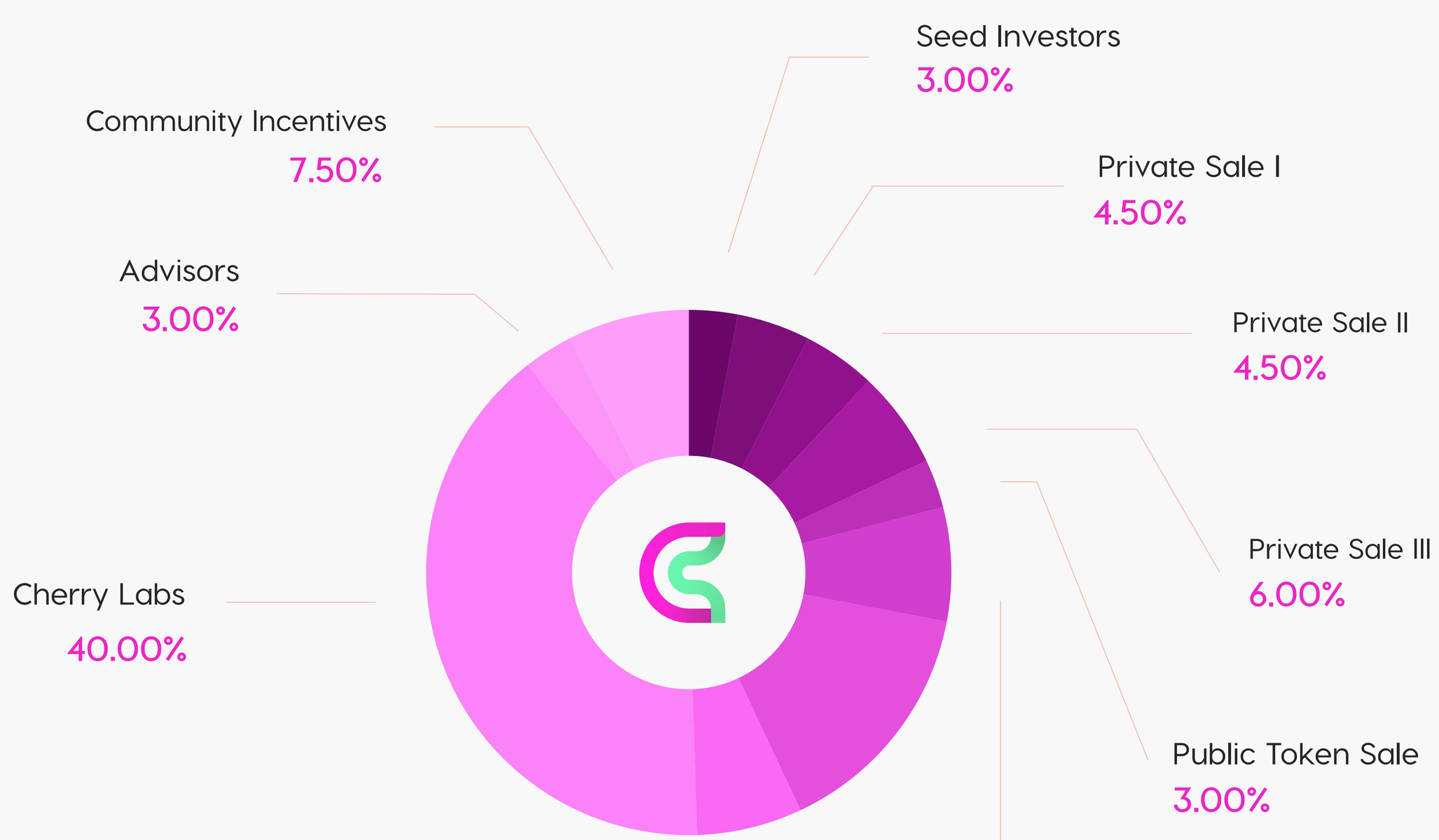
The base function of all nodes in the Cherry Network is to maintain a constant state of the blockchain database, as well as of the connected peers. In addition to this simple function, Cherry nodes also keep a table of all the data stored within the IPFS layer of Cherry Network. They do this by constantly surveying the data as divided and spread in chunks across the Storage Nodes.
This record allows each node to check whether files exist, whether they match a certain identifier (or whether they for example have changed). Indexers are also able to suggest the most efficient route with which files may be retrieved. Indexers too enjoy a small reward in CHER from their primary function that is to replicate and thus secure the Cherry Network. New economic incentives may also be added with the interactions of specific trusted indexer nodes with on-chain smart contracts.

11. Cherrynomics

The Cherry Token ($CHER) shall be the native token of the Cherry Chain platform. Its primary function is as a currency to mediate the use of scarce network resources among users. More details about the Cherry Token may be found on https://cherry.network/economics



Distribution



Token Sale

Name	Allocation (CHER)	Discount	CHER PRICE	Raise	Bonus
Seed	18,000,000.00	33.00%	$0.0240	$432,000.00	Governance Token
Private Sale I	27,000,000.00	33.00%	$0.0240	$648,000.00	
Private Sale II	27,000,000.00	25.00%	$0.0270	$729,000.00	
Private Sale III	36,000,000.00	15.00%	$0.0306	$1,101,600.00	
Public Sale	18,000,000.00	0.00%	$0.0360	$648,000.00	
Total	**126,000,000.00**			$3,558,600.00	

Seed Token Sale:

18,000,000.00 CHER

Private **Sale I**

27,000,000.00 CHER

Private **Sale II**

27,000,000.00 CHER

Private **Sale III**

36,000,000.00 CHER

Public Sale

18,000,000.00 CHER

Total: 126,000,000 CHER

Tokens that will be distributed to the public through sale events such as launchpad listings, initial decentralized exchange offerings, and private token sale. 21% of the CHER supply.

Vesting Schedule

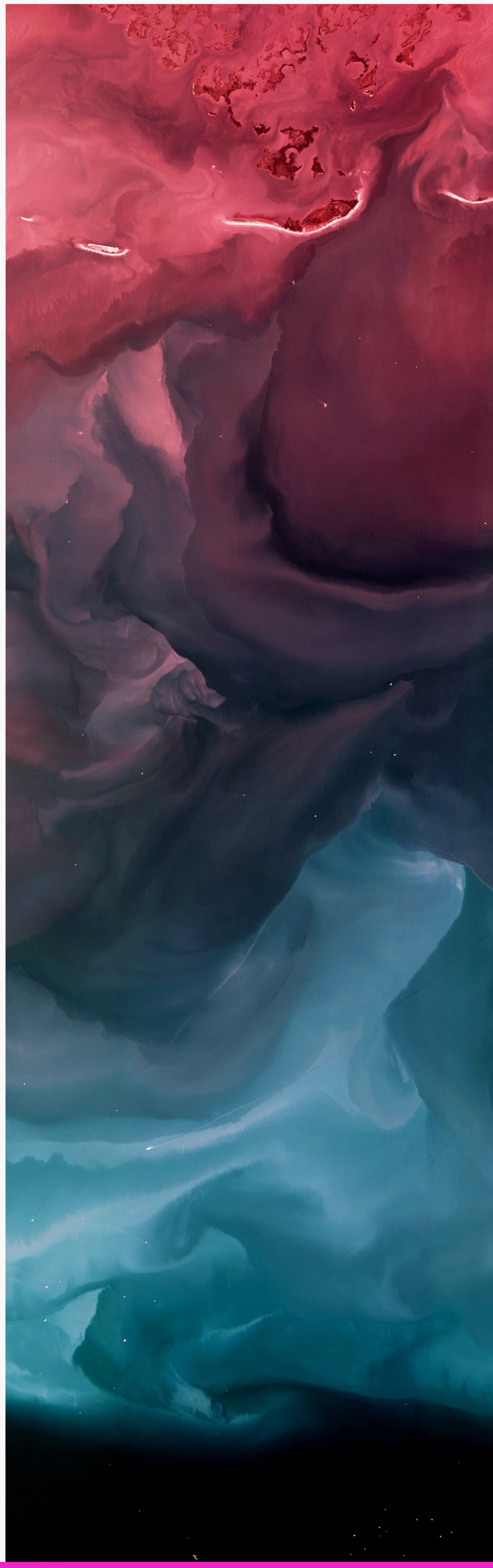
Cherry Tokens either sold or granted to Strategic Partners, Early Investors, the Founders, Advisors and the Team will follow a vesting schedule which will continue to be distributed in 2026 and beyond. The graph shows the number and breakdown of the CHER tokens that will become accessible on a monthly basis.

Name	Allocation (CHER)	Distribution	Vesting
Seed Investors 3.00%	18,000,000	TGE+6-TGE+15	**10% on TGE, 6 month cliff,** linear release for **9 months** (15 months total)
Private Sale I 4.50%	27,000,000	TGE+5-TGE+14	**10% on TGE, 5 month cliff,** linear release for **9 months** (14 months total)
Private Sale II 4.50%	27,000,000	TGE+3-TGE+12	**15% on TGE, 3 month cliff,** linear release for **9 months** (12 months total)
Private Sale III 6.00%	36,000,000	TGE-TGE+9	Linear release for **9 months**
Public Token Sale 3.00%	18,000,000	TGE	No lockup
Liquidity Pools 7.00%	42,000,000	TGE-TGE+6	No lockup
Strategic Partnerships 15.00%	90,000,000	TGE-TGE+18	**33% on TGE**, linear release for **18 months**
Founders & Team 6.50%	39,000,000	TGE+6-TGE+30	**6 month cliff,** linear release for **24 months** (30 months total)
Cherry Labs 40.00%	240,000,000	TGE-TGE+60	Linear over **60 months**
Advisors 3.00%	18,000,000	TGE+4-TGE+16	**4 month cliff,** linear release for **12 months** (16 months total)
Community Incentives 7.50%	45,000,000	TGE-TGE+6	**66% on TGE**, linear release for **4 months**

12. Inflation & The Treasury

The Cherry infrastructure is based on the contributions of many decentralized peers each acting individually and together in the provision of computational resources to the Cherry Network. The more nodes there are, the safer and more efficient the Cherry Network becomes. Consequently, to enlist new machines as either Validators, Storage providers, or Indexers, the Cherry Network issues block rewards distributed among these node entities. A detailed account of the CHER reward emission schedule can be found in our documentation.

A portion of the blocks is held and disbursed monthly to proposals the Cherry DAO elected to fund within the on chain governance process. Refer to our documentation to find the specific primer and further details about how the decentralized governance takes place in Cherry.



13. Roadmap

Q1 — We Design

- Technology stack identified
- Development team formed
- Core Architecture Designed

Q2 — We Build

- [x] Advisory board formed
- [x] Custom distributed ledger technology research
- [x] zk-Rollups custom implementation

Q3 — We Launch

- → Fundraise
- → Cherry Chain Canary Testnet Launch
- → Support early adopters

Q4 — We Perfect

- → Cherry Governance & Labs Launch
- → Creators outreach and incentive program
- → Security Audit

∞ — We Win

- → Community Based Governance
- → Cross Chain interoperability
- → Cherry SDK Released

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