FOLDER PROTOCOL

Scaling the Network of Distributed Storage

White Paper v.1.5

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Table of Contents

1. Abstract

It is not an exaggeration to say that today's world wide web services hold the same level of efficiency to publish content on the web without having to rely on a specific company or service provider. Ever since the giant IT corporations such as google and Facebook started to dominate the services of users' data, there has been a constant issue raised regarding users' privacy protection and data collection. As a result, users in the world began to question whether they should trust the transparency of these service providers, thus creating the wave of others to release their product by improving the efficiency, data protection, and user-friendliness. This 'wave' has acknowledged the Distributed Ledger Technology (DLT), popularly known as Blockchains, as the core building block of Web 3.0. A Blockchain is an immutable and append-only ledger that stores the network state. Distributed consensus between all the network nodes is required in order to extend the blockchain and store the critical network data among the network nodes.

Therefore, it could be prohibitively expensive to store any other kinds of data into the blockchain. For multiple use cases, it may be more efficient to store other non-critical data in a secure fashion close to the security level of the blockchain.

The InterPlanetary File System (IPFS) is a peer-to-peer distributed file system that seeks to connect all computing devices with the same system of files. In some ways, IPFS is similar to the Web, but IPFS could be seen as a single BitTorrent swarm, exchanging objects within one Git repository. In other words, IPFS provides a high throughput content-addressed block storage model, with content-addressed hyperlinks. This forms a generalized Merkle DAG, a data structure upon which one can build versioned file systems, blockchains, and even a Permanent Web. IPFS combines a distributed hash table, an incentivized block exchange, and self- certifying abstraction of all file information.

Folder Protocol is a decentralized IPFS network that ultimately works as a layer-2. Folder Protocol's second layer solution to the decentralized storage to bring enterprise level scalability will be implemented in stages. Folder Protocol will be focusing on developing and releasing a comprehensive solution that can bring enterprise scalability to the different decentralized storage protocols in the market.

2. Background

Most of the current IPFS networks ensure that data is safely stored. However, the processes of storing (sealing), verifying (proving) and unsealing (for retrieval) are computationally expensive and can take time. This is specially relevant for the retrieval of data, which should happen as fast as possible.

Folder Protocol was founded to improve the currently limited knowledge, research and development in the decentralized storage infrastructure(sector). The first stage of the Folder Protocol is designed to specifically address the scalability and latency issues of current IPFS and filecoin networks. From a scalability perspective, the core issues affecting the scalability are how Distributed Hash Table(DHT) works and how DHT algorithm looks up the content and peers. Since the resources are the core with the IPFS network, the speed of node connection to store / retrieve requested data is the most significant factor. However, in order to increase the speed of the node connectivity in the current IPFS network, more powerful resources are in demand. Servers, thus, would perform better for data retrieval and node discovery in a highly connected network instead of the IPFS base layer.

Most significant issue with IPFS and Filecoin network at current stages are following :

1. What if web servers shut down?
2. What if the network to the web server gets lost?
3. What if there are too many clients requesting a web server?
4. What if the web server loses files?
5. What if the size of a file requested to a web server is too large?
6. 90% of Filecoin's nodes are located in China

At Folder Protocol, we are developing potential solutions that directly solve these scalability issues on decentralized storage such as IPFS networks. The first of such solutions is based on a highly connected Virtualized Gateway Subnodes Network using dedicated IPFS Network Gateways.

Folder Protocol's Virtualized Gateway Networks come with a built-in data availability protocol to make sure the data is stored on at least 67% of virtualized subnodes in the Gateway Network. Once a virtualized subnode creates a block proposal it will communicate it to other subnodes in the Gateway Network using the data availability protocol. The data availability Protocol guarantees that the message is transferred to the supermajority of the subnodes in the Gateway Network.

3. Folder Protocol Technology

3.1. Virtualized Gateway Subnodes Network

When Bob requests data on the IPFS network, the IPFS protocol finds the nodes that have the data. The network doesn't care if it is finding the nodes that are decentralized or centralized. With IPFS, resources become important. The more connections a node has with other nodes, the faster it will be able to find nodes with the data and have its own data be discovered. However these extra inter-node connectivity demands more powerful resources. Servers, thus, perform better for data retrieval and node discovery in a highly connected network instead of the IPFS base layer.

Folder Network's IPFS solution for decentralized storage is operated by a group of Virtualized Gateways of Subnodes of IPFS Network. These subnodes are selected from the subset of nodes in the FOL network and are executed on all of the subnode's computational/storage resources. These Virtualized Subnodes form a network of IPFS Gateways running dedicated IPFS Network. Since the nodes in these Gateways are highly connected, up to 100x-1000X, achieving enterprise level scalability and performance for data storage and retrieval are instantly achieved.

Bob, a data heavy user or a business who is building a web3 application can avoid DHT lookups by joining Folder Network and using the Virtualized IPFS Gateways Network to both save and retrieve large amounts of the data instantaneously, achieving the speed and performance similar to Amazon or Google Cloud storage provides.

Alice, who wants to bring her storage services to Folder Network, can request to join as a virtualized Subnode in a Gateway Network and get compensated for services offered. When Alive joins as a node in the folder Network, the Folder Protocol makes Alice node a highly connected node in the Virtualized Gateway Network offering 100-1000X speed and performance for content discovery.

Bob can specify his/her desired network and storage connection configuration and submit the payment for the duration that they would like to access the network resources to run the network. The nodes in the Virtualized Gateway meeting the specified computational and storage requirements in the Bob's configuration will be assigned to participate in the Virtualized Gateway Subnodes Network. With such highly connected dedicated IPFS Gateway Networks, the data creation, access and retrieval will become instantaneous and will be comparable to the performance of Amazon and Google Cloud solutions.

In the initial phase, all the computational and storage resources in the Virtualized Gateway Subnodes Network will be treated equal. But as the Folder Network evolves, we will need specific Virtualized Gateway Networks specializing in the storage and computational needs in a

specific domain. For example, we can have separate Virtualized Gateway Networks for (1) a network with scientific data commons to facilitate decentralized Artificial Intelligence and Deep Learning systems, (2) a decentralized network of exchanges that have their order books of all financial assets (3) a decentralized autonomous organization (DAO) that shares all of its data through Folder Network.

3.2. Verifying Storage with Zero-knowledge Identification Protocols and Verifiable Delay Functions

For verifying storage, Folder Protocol will be using a more secure and efficient methodology of "commit-then execute" message execution rather than a traditional challenge-response signature scheme.

In zero-knowledge identification protocols, neither party trusts each other. With this approach, exactly nothing about the secret is revealed to the Verifier except that it is Valid. The core idea to achieve this comes from Interactive Proof Systems. Here is a common approach to such protocols:

$$\textit{commit step} \left\{ Prover \overset{statement}{\rightarrow} Verifier \right.$$

$$\textit{round } i \begin{cases} Prover \overset{challenge}{\leftarrow} Verifier \\ Prover \overset{proof}{\rightarrow} Verifier \end{cases}$$

Folder Protocol uses VDFs to find trustless and efficient solutions to measure the passage of time using the commit-then execute approach based on the Verifiable Delay Functions. The exact setup details of such VDF scheme will be discussed in the future revisions of the white-paper.

3.3. Inter-Gateway Networking Sharing and Switching Between Networks

A big advantage of Folder Network of Virtualized Gateways of IPFS Network is the ability to switch between networks if a node decides to make its data available across other Gateway Networks. The node will request a change to Folder Protocol Node Monitoring Service and the Folder Protocol will process the request and make the inter-gateway connection without losing any node's data. The node preserves all the data and its configuration and makes its data available in a different Virtualized Gateway Network.

3.4. Folder Protocol Manager

Folder Protocol Manager exists on the mainnet and serves as the entry-point to the Folder ecosystem. It will manage the orchestration of all entities within the Folder Network including the Virtualized Gateway Networks creation/destruction, Node creation/destruction, economic incentives related to storage creation/retrieval, bounties, etc.

3.5. Node Creation/Destruction

To be identified as a node in Folder Network, the node must execute Folder Protocol Backend Service(Daemon) and the Folder Protocol Manager will verify the network hardware and software requirements for the node. There are different types of nodes as described above. When the node passes the verification, the Folder Protocol Manager passes the request to the network and adds to the network as a node based on the configuration request. After it is added as a node, the data availability protocol will assign a large number of inter-connected peers to it making the new node highly connected for enterprise scale performance. The Folder protocol Manager continuously monitors the performance of the node at each epoch for continuity of the node operation within the dedicated IPFS Gateway Network.

When a node submits a request to exit the Virtualized Gateway Network, the Folder Manager evaluates the request and the node has to wait a pre-assigned time period before the node can be destructed from the Gateway Network. During this time, the data and connectivity of the nodes gets readjusted within the Gateway Network.

3.6. Virtualized Gateway Network Creation/Destruction

As explained above, when a user requests Virtualized Gateway Network, the user provides their network and storage configuration and submit the payment to the Folder Manager. In the beginning, these requests will be evaluated uniformly across the resources of subnodes. But in the future versions of the Folder Protocol, the user will be able to specify granular configuration parameters for the number of virtualized subnodes, their network & storage bandwidth, number of signers, and the size of the virtualized subnodes in the dedicated IPFS Gateway Network.

3.7 Virtualized Subnode Shuffling

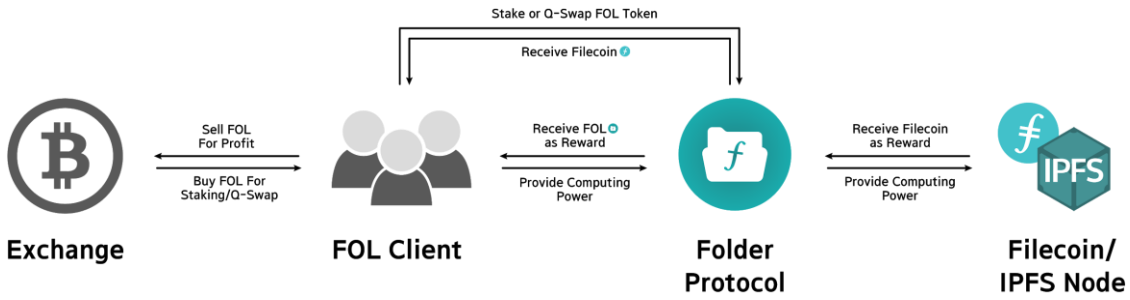
For additional security, the users will be able to enable periodic shuffling of the virtualized subnodes to avoid any collusion. The Folder Protocol Manager will process such virtualized subnode shuffling and the shuffling time period.

4. Folder Protocol Token (FOL)

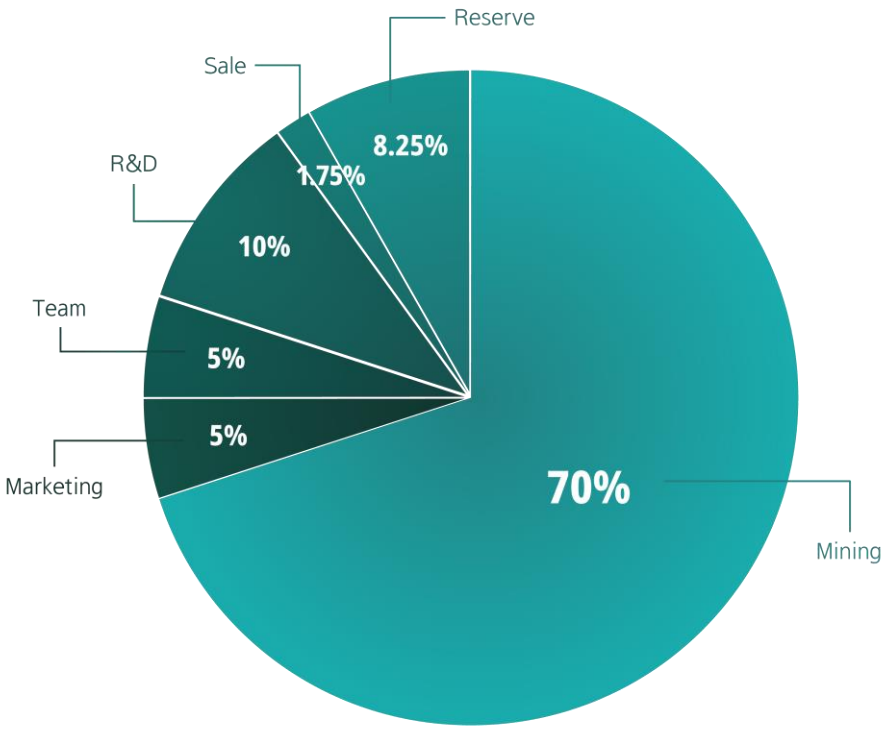
4.1. Token Economics

There are three main actors of Folder Protocol's token economy that interacts with one another:

- **Miner/Client** provides computing power to Folder Protocol, ultimately contributing to the Filecoin network and receiving FOL as a reward.
- **Folder Protocol** functions as an intermediary layer to facilitate the exchange of computing power and FOL token between FOL client and IPFS/Filecoin nodes accumulating Filecoin.
- **IPFS/Filecoin Nodes** are owned by Folder Protocol. This group of nodes provides computing power as a part of the Filecoin network to engage in mining activity.



4.2. Token Allocation

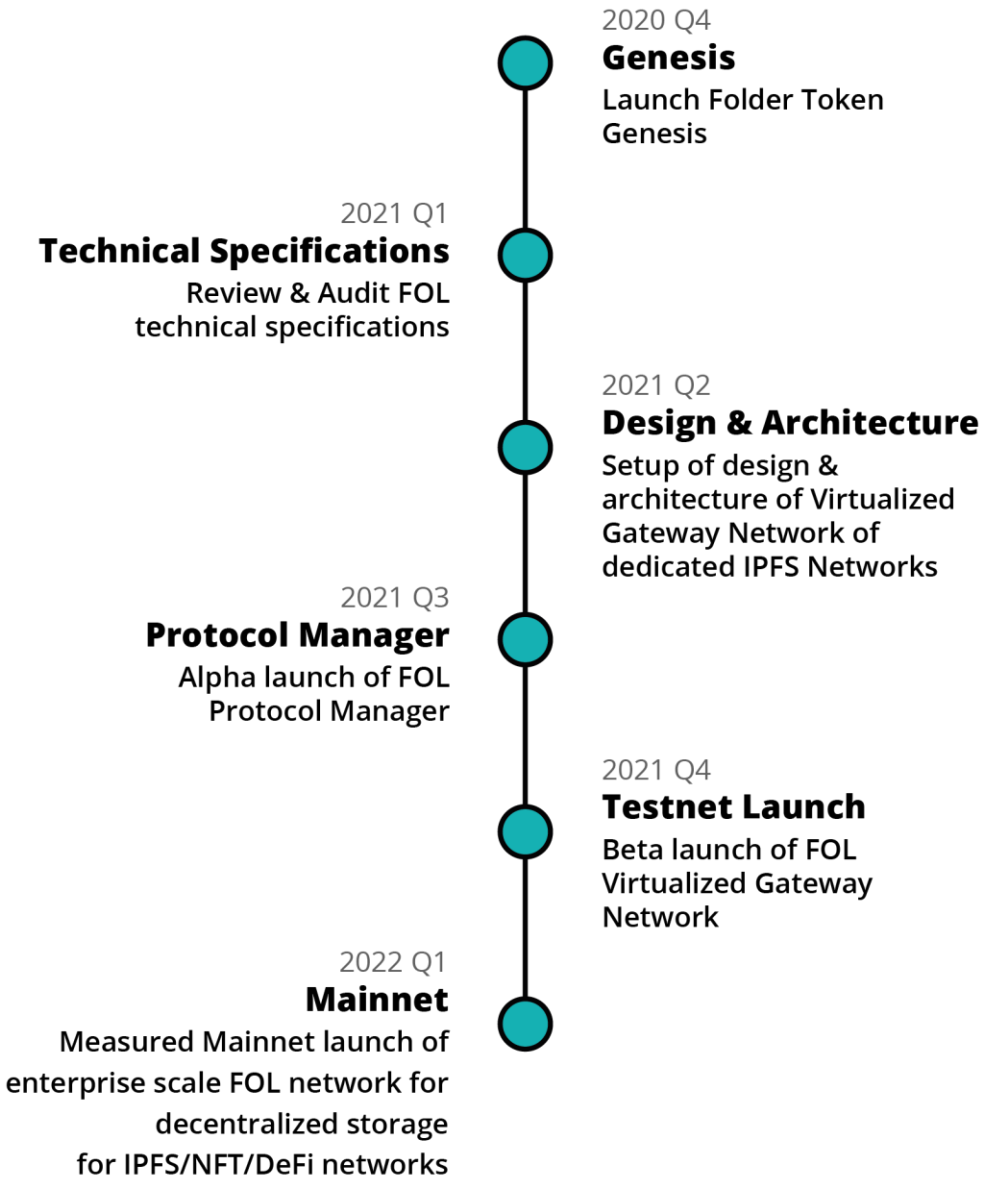


Folder Protocol (FOL)

(Total Supply 200,000,000)

		Ratio	Quantity(FOL)	Lock-Up	Vesting Plan/m
Total Supply		100%	200,000,000	-	-
Mining		70%	140,000,000	-	-
Sales (1.75%)	**IUO**	0.25%	500,000	-	-
	IEO	1.5%	3,000,000	-	-
R&D		10%	20,000,000	-	24
Team		5%	10,000,000	12	24
Marketing		5%	10,000,000	-	24
Reserve		8.25%	16,500,000	-	-

5. Roadmap


2020 Q4
Genesis
Launch Folder Token Genesis
2021 Q1
Technical Specifications
Review & Audit FOL technical specifications
2021 Q2
Design & Architecture
Setup of design & architecture of Virtualized Gateway Network of dedicated IPFS Networks
2021 Q3
Protocol Manager
Alpha launch of FOL Protocol Manager
2021 Q4
Testnet Launch
Beta launch of FOL Virtualized Gateway Network
2022 Q1
Mainnet
Measured Mainnet launch of enterprise scale FOL network for decentralized storage for IPFS/NFT/DeFi networks

Disclaimer

The following disclaimer concerns "FOLDER Protocol"

This document is for informational purposes only and the contents of this document are for information purposes only and do not constitute any investment advice, solicitation or solicitation of the sale of stocks or securities in Folder Protocol (FOL) token and its related companies. Such invitations must be made in the form of a confidential memorandum, subject to relevant securities laws and other laws. The contents of this document may not be construed as compelled to participate in the exchange. Nothing in this White Paper may be considered as participation in the exchange, including the requirement to obtain a copy of this White Paper or to share this White Paper with others.

Participating in the exchange means that the participants have reached the age criteria and possess complete civil capacities. The contract with FOL token is true and valid. All participants signed the contract voluntarily and had a clear and necessary understanding of the FOL token before signing a contract. The FOL token team will continue to make reasonable attempts to ensure that the information in this White Paper is true and accurate. During the development process, the platform may be updated, including but not limited to platform mechanisms, tokens and their mechanisms, token distribution. Portions of the document may be adjusted in the new White Paper as the project progresses, and the team will release the update by posting a notice or a new White Paper on the site.

Please be sure to get the latest White Papers, and make timely adjustments to your decisions based on the updates. It is expressly disclaimed that the participants will not be liable for any loss resulting from (i) reliance on the contents of this document, (ii) inaccuracies of the information in this document, and (iii) any action resulting from this document. The team will spare no efforts to achieve the goals mentioned in the document, but due to the existence of force majeure, the team cannot make a full promise. FOL token is an important tool for generating performance on the platform and is not an investment product. Owning a FOL token does not mean giving its owner ownership, control, or decision-making rights to the Folder Protocol.

FOL token as a digitally encrypted currency does not fall into the following categories: (a) currencies of any kind; (b) securities; (c) shares of legal entities; (d) stocks, bonds, notes, warrants, certificates or other Instruments that grant any rights. Depending on the market rules and the application of post-arrival demand, the value of the FOL token may not have any value.

The team will not make any commitment to its value-added and will not be responsible for the consequences caused by the increase or decrease in value. To the fullest extent permitted by applicable law, for the damages and risks including, but not limited to, direct or indirect damages, loss of business profit, loss of business information, or any other economic damages arising out of the interest in connection with a particular purpose. Folder Protocol team and FOL token should comply with any regulations for healthy development conducive to the exchange of industries and the development of self-regulation industry self-declaration.

Participants and their Delegates will fully accept and abide by such inspections. At the same time, all information disclosed by participants to accomplish such inspections must be complete and accurate. The FOL token clearly communicated possible risks to the participants. Once the participants participate in the exchange, they acknowledge and accept the terms and conditions in the Rules, accept the potential risks of this platform and bear the consequences.

Please be assured that all information written on this version of Folder Protocol's whitepaper including the project itself, timeline, and/or roadmap is subject to change or delay at any time without notice.