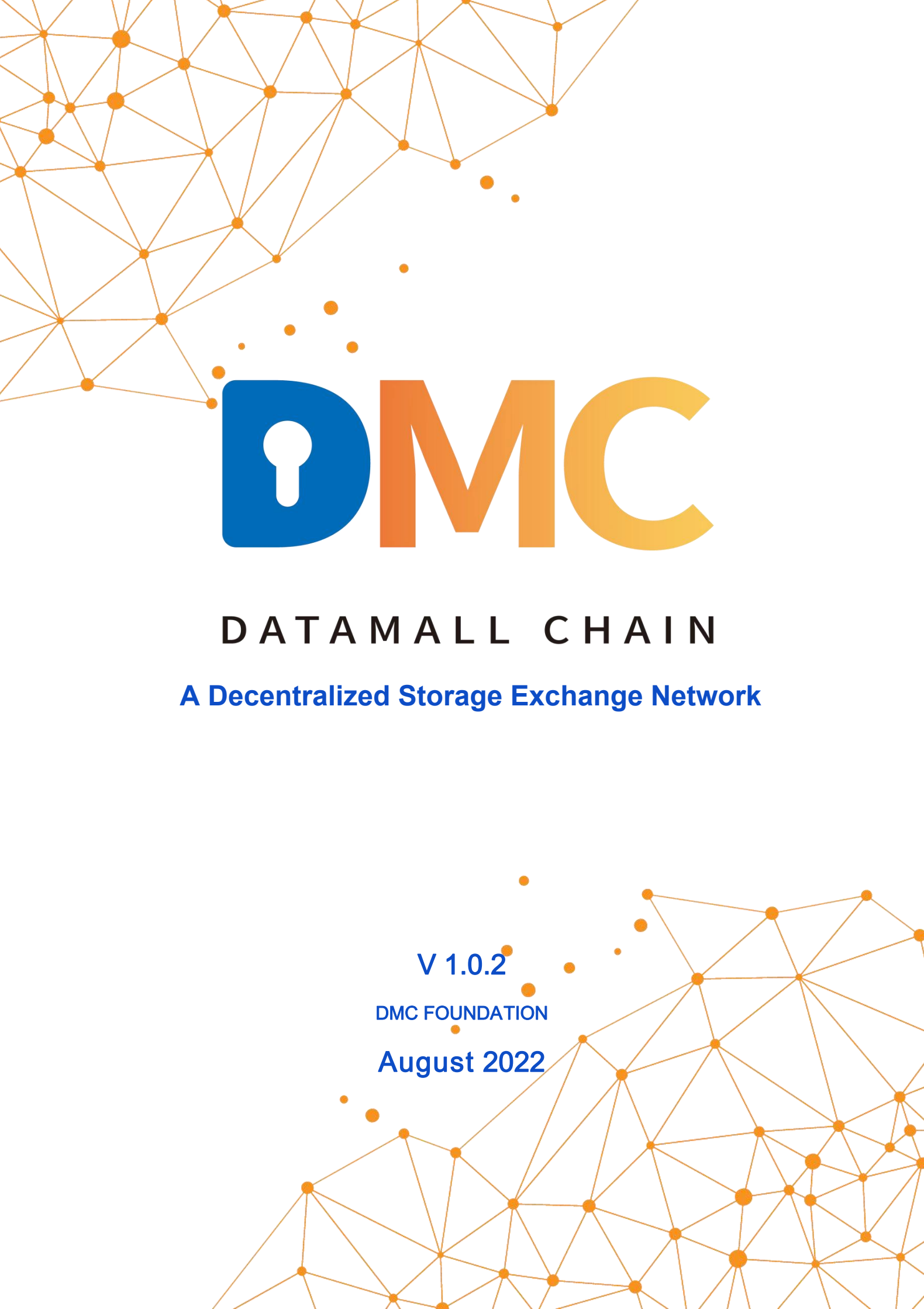


DMC

DATAMALL CHAIN

A Decentralized Storage Exchange Network

V 1.0.2

DMC FOUNDATION

August 2022

CONTENTS

SUMMARY

We propose an implementation of a decentralized market place for storage service, by accommodating the existing decentralized storage infrastructure like IPFS, Filecoin, StorJ, ARweave etc., will help to complete the storage foundation of web3.0 metaverse, in which consumers will be able to safely store their data while maintaining complete data ownership. The implementation consists of minting of the PST token; listing of open bids to match storage requests; forming and executing of the storage contract based on the proof of delivery of storage service, and notably, the introduction of the governance token DMC (Datamall coin), as the medium and value courier of storage service transactions. The DMC token will effectively incentivize the decentralized storage transaction market, improve governance efficiency, and promote the rapid development of the web3.0 storage ecosystem as well.

1.Background

With the global adoption of big data and artificial intelligence technology, the explosive growing number of IoT devices in every corner, as well as the recent introduction of METAVERSE, data has become the keystone of the digital world. IDC estimates that the global data size was 33ZB (equivalent of 36 billion mobile hard drives with a capacity of 1TB each) in 2018, and reached 41ZB and 50ZB respectively in 2019 and 2020. Data storage generally follows Moore' s Law, i.e., global data is doubling every other year, thus the global data volume is estimated to reach 163ZB by 2025, around when, 460EB (1EB=1024*1024TB) of data will be generated daily, which is equivalent to 200 million DVDs.

According to the latest statistics released by IDC, data generation of the United States accounts for about 21% of global data, China accounts for about 23%, the EMEA (Europe, Middle East, Africa) and APJ (Asia Pacific and Japan) account for 30% and 18% respectively, while the rest of the world contributes to the remaining 8%.

2.Problems and Challenges

Internet has undergone rapid development for the past two decades, which accounts for the most important reason of consistent data explosion. Although Internet, born with the purpose to promote openness and equality, and originally designed as a distributed communication network, has obviously lost its purpose along its path. The sad reality is that it is now monopolized and exploited by major conglomerates. This essentially makes our Internet world very much centralized and full of censorship. The Internet today is playing an indispensable role in accelerating information dissemination and distance shortening between humans, yet it is gradually showing the shortcomings of a centralized architecture, upon which nowadays most of digital activities rely. On one hand, web content is insecure,

easily deleted or lost, as web pages have ambiguous life cycle set forth by the website owners. On the other hand, the need for huge volume data storage and rapid speed of data generation put pressure on the centralized data storage architecture, which has an Achilles heel in SPOF (single point of failure). Data center disaster, database ill performance or malicious attacks may cause irrecoverable data loss while the content creator has no control over his/her own data.

To overcome the increasingly severe consolidation and exploitation of controlling power in the web world, the emerging decentralized storage technology was introduced to provide a more reliable and secure solution for any person/organization with storage need. Blockchain storage platforms such as Sia, Storj, Filecoin, and Swarm have developed rapidly in this regards. They take advantage of the underlying block chain technology to ensure high availability and security of the data stored on them.

However, there is still a missing piece to the puzzle: a market place to match the open orders and open bids for storage need, and to reward both sides of each transaction after completion. This market place has to be able to scale rapidly when the demand spikes. Moreover, which is equally important, all of these should be done in a DECENTRALIZED manner.

Data consistently flows in the foundation of our digital world today, whose livelihood completely depends on the flow. We believe that only when data being stored keeps its ownership and has its value recognized in a transaction, data can be incentivized to flow limitless and bring more livelihood into the METAVERSE.

3.Vision

Decentralized storage technology has broken the traditional centralized model and created an open data storage environment, but various decentralized storage systems today are still isolated from each other. The DMC system proposed in this white paper is committed to creating a global decentralized storage market, breaking the barriers between various service platforms, building bridges across data security requirements and decentralized storage services, and helping the users store data safely and quickly by acquiring affordable and reliable storage services, thus eventually building a free, safe, and efficient data storage infrastructure for the Web3.0 METAVERSE.

As Doug Adams says, "*We are stuck with technology when what we really want is just stuff that works*", we would not try to stockpile this white paper with jargons and formulas, but a working solution that fixes today's problems in the storage field.

4.Our Solution

4.1 Economic Model

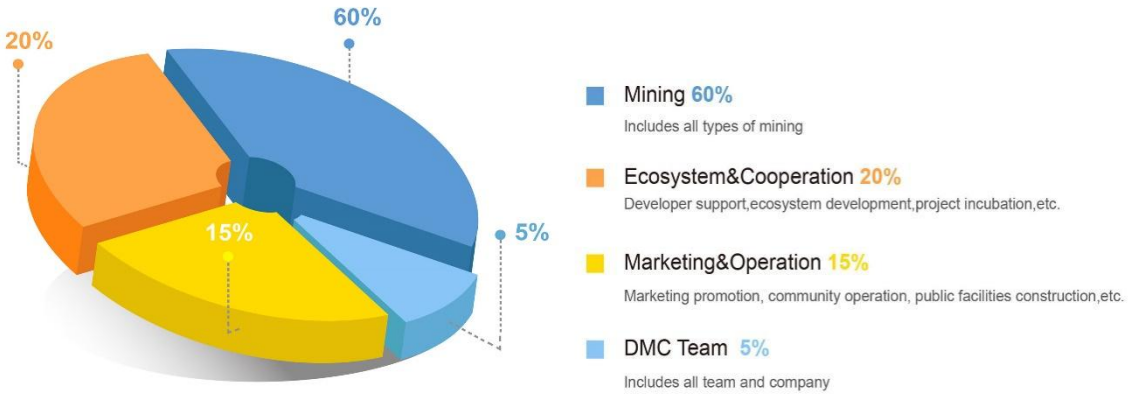
4.1.1 DMC Token

As the token is designed for global decentralized storage market, DMC (Datamall coin) represents the actual data storage service capability, and the invisible hand to match up supply and demand for storage needs. With DMC, you can purchase storage services; and vice versa, if you have spare storage space, you can make it available to earn DMC; or you may do both. The decentralized storage market built by this project provides users with a safe and efficient storage service that is not controlled or exploited by any single entity.

4.1.2. Token Distribution

A total amount of 1 billion DMC tokens will be minted, with 4 decimal places.

DMC tokens are divided into four parts based on various factors such as incentives for miners, token holders and foundations.



By the final stage of the token release, we expect the miners hold 60% of total tokens, ecosystem and cooperation account for 20%, marketing and operation account for 15%, DMC Team holds the remaining 5%.

The DMC foundation does not pre-allocate any token for itself, yet in order to provide support to the developers and community members in the DMC ecosystem, a predefined percentage of the tokens mined will be allocated to the DMC foundation, which runs as a DAO. From the first stage, the allocations of miners in the total output of the stage has been increasing, and the allocations of the foundation has been decreasing and released linearly. You can see the exact numbers at each stage to the miner and the foundation in Table 1.

Stage/Role	1	2	3	4	5	6	7	8	9	10	11	Estimated number of tokens	Percentage of total tokens
User & Miner	30%	40%	50%	55%	60%	70%	75%	80%	90%	95%	95%	597,988,104	60%
Foundation(developers,community members,ecosystem participants)	70%	60%	50%	45%	40%	30%	25%	20%	10%	5%	5%	402,011,896	40%

Table 1

4.1.3.Release Schedule

By collecting,summarizing and organizing the data of total number of token released,we can get Table 2.

Take 6 months as a stage, from the first stage of releasing 36,000 DMC per hour and the hourly release amount continues to decrease with the time period, until the Stage11 DMC is fully released.

TOKEN RELEASE SPEED					
Stage	Estimated Time	Stage Release Number	Total Number of Token Released	Proportion of Stage Release	Total Released
1	01.2022-06.2022	155520000.00	155520000.00	15.55%	15.55%
2	07.2022-12.2022	142560000.00	298080000.00	14.26%	29.81%
3	01.2023-06.2023	125280000.00	423360000.00	12.53%	42.34%
4	07.2023-12.2023	93960000.00	517320000.00	9.40%	51.73%
5	01.2024-06.2024	70470000.00	587790000.00	7.05%	58.78%
6	07.2024-12.2024	52852500.00	640642500.00	5.29%	64.06%
7	01.2025-06.2026	118918125.00	759560625.00	11.89%	75.96%
8	07.2026-12.2027	89188593.75	848749218.75	8.92%	84.87%
9	01.2028-06.2029	66891445.31	915640664.06	6.69%	91.56%
10	07.2029-12.2030	50168583.98	965809248.05	5.02%	96.58%
11	01.2031-06.2032	34190751.95	1000000000.00	3.42%	100.00%

Table 2

When we depict the above token release schedule into graph, we get Figure 1. The token release speed slows down as the decentralized storage market matures. We expect the

market run with less and less incentives and eventually governed completely by DAO.

Figure 1

4.2 Transaction Model and Principle

The transaction model has three main components in PST Maker Contract, Trading Contract and Storage Delivery Contract. The basic structure of the model is shown in Figure 2.

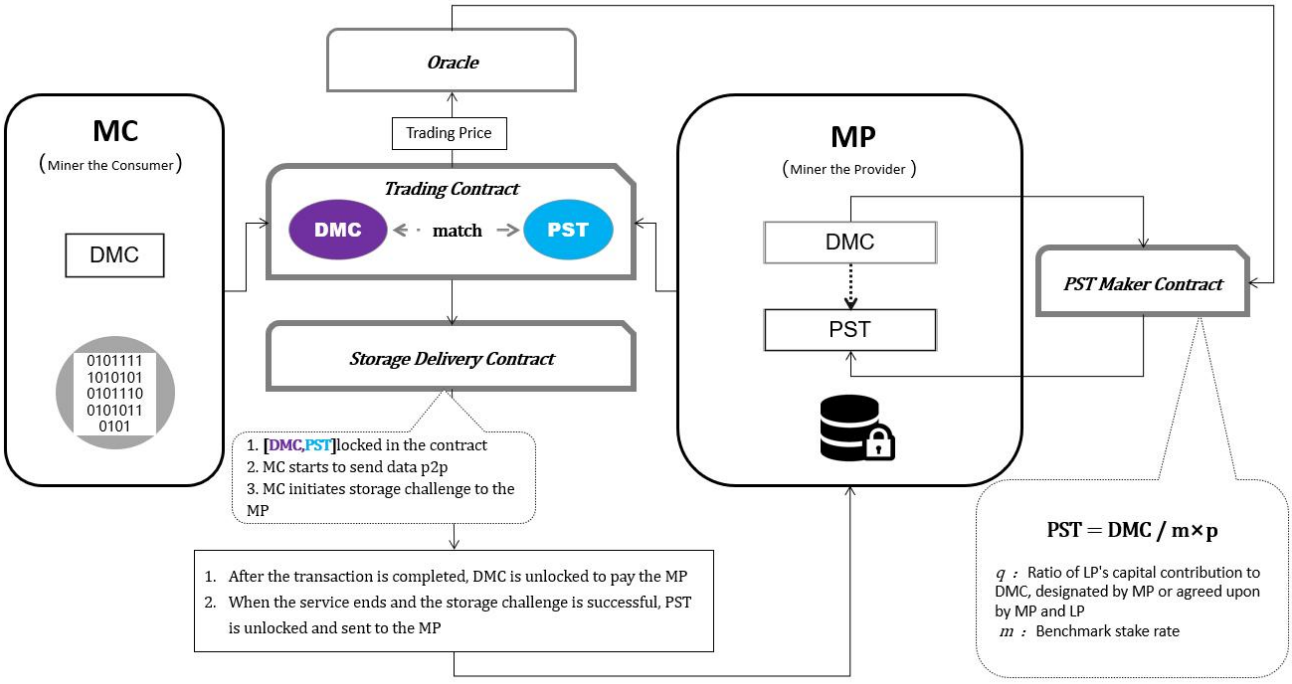


Figure 2

4.2.1 PST Maker Contract

Proof of Service Token （PST）

1 PST represents a standard unit of storage service, that is, 1 PST corresponds to 7 days of storage service of a defined data capacity. MP (Miner the Provider) needs to stake DMC through the PST Maker Contract to mint PSTs. For example, if we set $1PST = F(1G, 7Days)$, then 1PST is equivalent to the storage service capacity of 1G for 7 days.

The purpose of PST Maker Contract is to allow the MPs to stake DMCs to get PSTs. Specifically, it means that the MP and the limited partner — LP (the DMC investor that mints the PST on behalf of the MP) stake the corresponding amount of DMC according to the benchmark stake rate m required by the system to mint the PST. Assuming that 1 PST = p DMC, the formula for the number of PST minted is calculated as follows:

$$\mathrm{PST} = \frac{DMC}{\mathrm{m}\times\mathrm{p}}$$

m ： Benchmark stake rate, the minimum stake reserve ratio that must be met for minting PST

r ： Current stake rate

n ： Liquidation stake rate, the threshold that triggers the liquidation, less than the benchmark state rake. n<m

The flow chart of minting PST is shown in Figure 3:

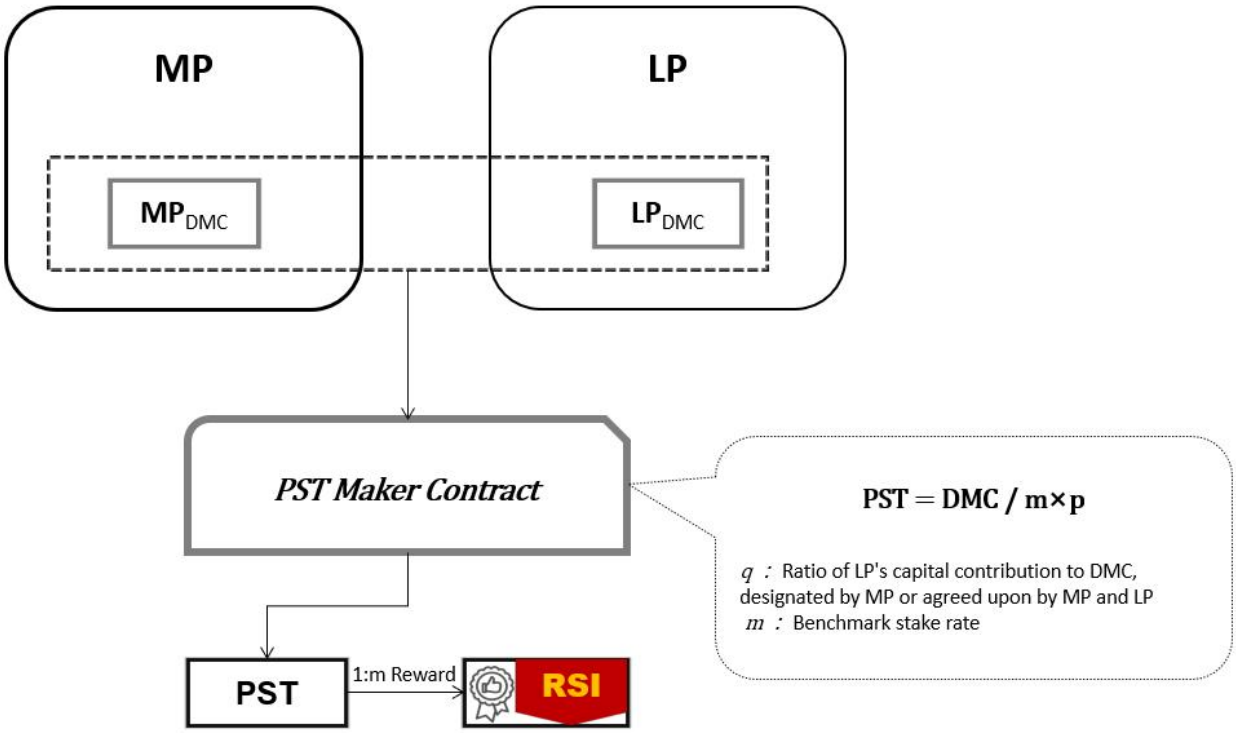


Figure 3

The function of PST Maker Contract is explained as follows:

(1) Increasing reserves

MPs or LPs can increase reserves at any time. And the maximum percentage of reserves that LPs may contribute is determined by MPs.

(2) Redemption reserves

When the MP completes the redemption, if r < m, the redemption fails; when LPs redeem successfully, and $r < n$, the automatic liquidation process is started.

(3) Minting PST

MPs start minting PST. During the process after the minting, if r < m , then the minting fails.

(4) Burning PST

MPs can burn PST that is not related to any pending orders.

(5) Liquidation

If $r < n$, the system will automatically enter the compulsory liquidation process and burn the corresponding PST to ensure $r \geqq m$.

4.2.2 Trading Contract

The trading contract matches up orders and open bids and executes the transaction between data storage consumers and storage service providers. The function is achieved through the following components:

- **BidOrder**

MP (Miner the Provider) announces the storage availability according to the service capacity and the corresponding MP_{PST}, along with the price for the service wished for by the MP.

- **AskOrder**

MC (Miner the Consumer) searches for storage service offerings that satisfy their needs.

- **MatchOrder**

MC finds the storage service order that meets the need and confirms the transaction, thus the MC_{DMC} and MP_{PST} from both parties are locked together into the storage delivery contract, hence entering the delivery process.

- **Market Price Oracle**

Bid order price varies with different geo-location, SLA (service level agreement) and other factors, thus the final transaction prices also vary from each other. Therefore, the system will refer to the average transaction price in the past several days, weeks, months or years and the current listing prices in several typical regions to form a unified global benchmark price, which is served as an input to the oracle to provide directive for the PST minting contract. At the same time, since the function of PST is to prove the storage capacity, it is also used to pay for penalties when MPs breach the contracts or fail the proof of storage service. As the storage contracts are executed at different prices, penalty amounts also vary.

4.2.3 Storage Delivery Contract

- **Delivery**

The Delivery Contract is responsible for monitoring the status of data delivery and the distributing of income and rewards. MC_{DMC} and MP_{PST} are locked from the user and the miner respectively. During the delivery process, MC can initiate a storage challenge at any time. At the delivery complete time defined by the contract and if all the storage challenges successfully answered, MC_{DMC} is unlocked and paid to the MP, along with MP_{PST}.

- **Default on the contract**

If a storage challenge fails and eventually there is proof that the storage service has not been delivered, contract default is triggered, which in turn triggers punishment or arbitration.

4.2.4 Proof of Storage Copy

Proof of Storage Copy is a verification method to ensure real data storage. The data storage consumer may verify whether the storage service provider has successfully stored the data through challenges periodically. MC samples a piece of the original data for verification so challenges may be answered with relatively low overhead. The steps are as follows:

1. After MC and MP sign the contract, MC encrypts all the data to be stored and gets the data H.

2. MC sends the data H to MP (including MC's digital signature), and MP saves it as data H'.

3. MC checks on MP periodically. MC calculates the hash of a portion of the data in the data H, $A = Hash(Block(H, ID) + Random)$. ID and Random are sent to MP, and MP queries the stored encrypted data H' to calculate $A' = Hash(Block(H', ID) +$

$Random$) and answer the challenge with A'. If A' matches A, the challenge is successfully answered.

4.3 Proof of Storage Service

The decentralized storage service network uses the Proof of Storage Service (PoSS) algorithm for consensus. Top miner nodes are ranked to become super-nodes, specifically, based on the amount of PST minted by pledged DMC, a corresponding number of votes are generated, thus the nodes are ranked according to the storage delivery capability. It is the goal of the project to entice miners with ability to provide secure and reliable storage service, so the super-nodes (consensus nodes) are vital to the success of the project.

PoSS and the storage transaction model in DMC ensure fair incentives, yet also provide mechanisms to prevent malicious attacks, such as Node hijacked attack and Collusion attack.

Node hijacked attack

Since PoSS is a consensus mechanism, a super-node may carry out external attacks to destroy network services, especially if it obtains voting power. However, since the status of the super-node is qualified via DMC tokens staked, the cost of the attack is extremely high, unless the node is hijacked by hackers.

Collusion attack

Since a certain number of MPs are selected to serve as super-nodes, if more than two-thirds of the super-nodes conspire, it might cast votes to harm the interests of most MCs and other MPs, leading to potential block forks or DMC depreciation, which will hurt the conspirers in return.

4.4 Governance

4.4.1 Mint Process

In order to build a decentralized storage market that can evolve and flourish benignly, it is necessary to provide incentives for both sides of the storage transaction. We propose an incentive for real storage transaction behavior, called Real Storage Incentive (RSI).

The reward is divided into the following three parts:

- **Liquidity Reward**

PST is minted by MPs through staking DMC. In order to increase the supply and liquidity of PST, MPs and LPs work together to stake DMC to mint PST. Therefore, after the PST is successfully minted, MPs can get the RSI rewards from the system by publishing their storage service capabilities, and the rewards will be distributed to MPs and LPs according to the stake ratio of DMC tokens or the negotiated ratio q between the two parties. Meanwhile, a delayed-releasing reward model is set to avoid pending malicious orders, under which the release ratio of the reward will be based on the market order price as the benchmark price to set the incentive range of MPs' order.

- **Data Storage Reward**

After MC has finished storing the data, the system will reward MC with a certain amount of RSI after the storage challenge verifies that the data has indeed been stored successfully. The reward process is shown in Figure 4.

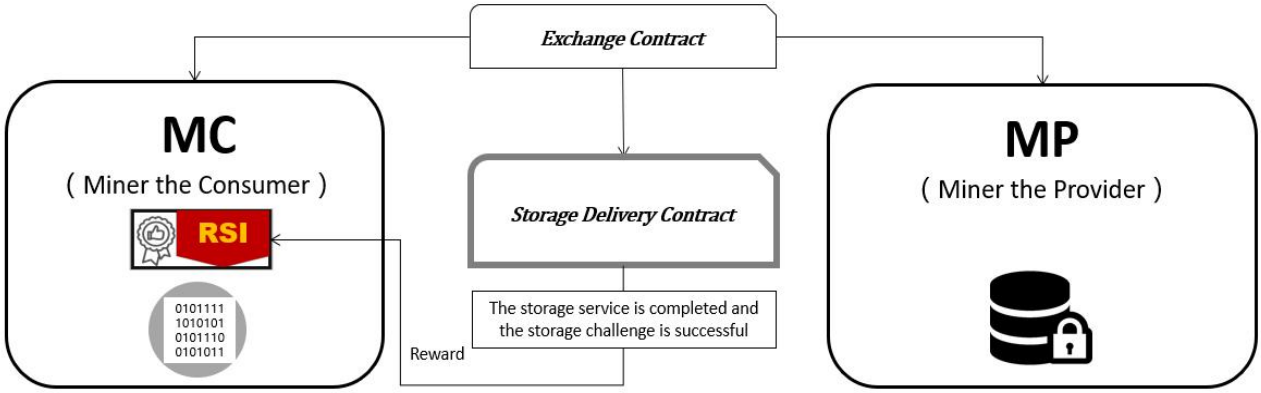


Figure 4

● Storage Service Reward

For MPs, after the storage service is successfully completed and storage challenge won, the system will reward MPs with a certain amount of RSI. The reward is distributed to the MPs and LPs according to the proportion of staked DMC or a ratio *q* negotiated by both parties. The reward process is shown in Figure 5.

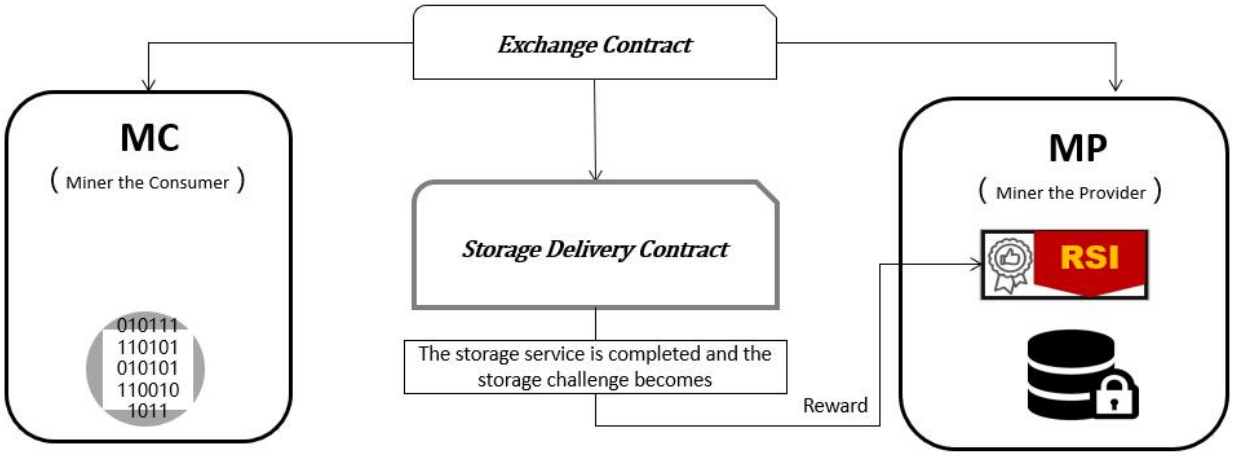


Figure 5

● RSI reward rule

After a storage service is successfully completed, MCs, MPs and LPs all get rewarded. The RSI reward ratio is set initially to $1/m:(1+1/m)$ for the demand and supply side, where m is the benchmark stake rate.

4.4.2 Penalty

The decentralized storage market serves both storage providers and storage consumers as they are equally important in the ecosystem. Balancing the supply and demand is vital to the construction and development of the ecosystem. MPs provide stable and high-quality storage services while MPs make sure that the service runs smoothly. Therefore, on the other side of the incentives, punishment is also planned.

Fake storage service capacity

If the MP's pending order does not match the actual storage capacity announced, i.e., the actual storage capacity is falsely reported, so that the MC's storage order could not be truly met, the delivery contract returns the locked DMC to MC and gives MC a certain amount of compensation for the breached contract. Simultaneously, MP's PST is unlocked and corresponding reserve DMC liquidated.

4.4.3 RSI Buyback

RSI plays an important role in the DMC platform, as it reflects the ecological value of the project. A portion for governance is allocated by DMC to buyback and burn RSI in different stages. The buyback of RSI follows the ABO (Asset Buyout) model, and the formula is as follows:

$$U = \sum_{n=1}^{365\times T} \frac{H_n}{\sqrt[365]{1+K}^{n}}$$

In the equation above, *U* is the total value of DMC issued as of date, T is the duration of DMC issuance (years), H_n is the value of the daily buyback RSI amount, and *K* is the set annualized rate of return. Since *U*, *K*, *T* are all known, H_n can be calculated accordingly.

The flow chart of the RSI burning process is shown in Figure 6. At the beginning of the project, the DMC governance allocation is used to buyback and burn RSI from MCs. With the evolving of the project, the accumulated transaction fee (DMC) of the project gradually increases. When the “balance point” is reached in Figure 6, the transaction fee (DMC) will be used instead for RSI burning.

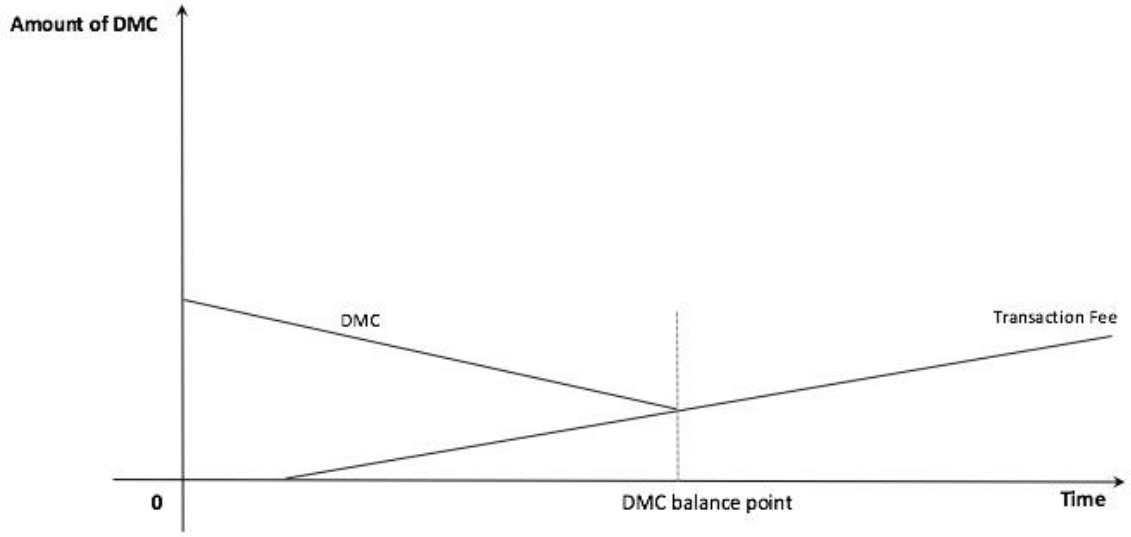


Figure 6

5. Community

5.1 Community Role

The goal of DMC is to work with storage service providers to provide affordable storage for consumers, thus DMC foundation will work with all individuals and organizations that need affordable storage, storage service providers (miner/mining pool/traditional storage vendors), traders, and developers who build on top of DMC platform as well.

Let us review the roles of members in DMC community：

- **Miner the consumer (MC) —— Data storage consumer**

MC is the consumer of storage capacity by purchasing PST on the platform and is also the versifier who initiates storage challenge during the transaction of storage service.

- **Miner the provider (MP) —— Storage Service Providers**

MP is the provider of storage capacity by selling PST on the platform to earn DMC and is also the server who accepts storage challenge during the transaction of storage service.

- **Limited Partners (LP)**

A limited partner in DMC provides financial support for MPs in order to share storage income and rewards.

- **Trader**

A trader in DMC community is someone who helps the project indirectly through value discovery and liquidity provision.

- **Developer**

The DMC foundation provides rewards and endowments to developers in participating in continuous development on the DMC project, as well as building applications which takes advantages of the decentralized data storage service provided by DMC.

5.2 Community Architecture

Partners and organizations in the ecosystem can be classified into three layers: storage application layer, storage transaction layer, and storage service layer.

5.2.1 Storage Application Layer

With a solid foundation of decentralized storage infrastructure, various applications will be sponsored by the DMC community to enrich the ecosystem. The applications include typical blockchain utilities such as DEX, DeFi, wallets, blockchain explorer and NFT, as well as internet applications and DApps built on top of decentralized storage.

5.2.2 Storage Transaction Layer

The storage transaction layer is the centerpiece of the entire ecosystem, which is implemented on top of a public chain that is optimized specifically to handle storage related transactions.

5.2.3 Storage Service Layer

All storage facilities in the decentralized storage market as well as the centralized storage field players can join in the DMC community to become a service provider. For example, the mining pools and individual miners on platforms such as Filecoin, Sia, and Storj, as well as data service vendors built on top of AWS or Azure can enter the DMC decentralized storage market.

6. Conclusion

As the Tao Te Ching says, the Tao produced one; one produced two; two produced three; three produced all things. Computing power, data storage and network bandwidth are the Three that serve as pillars for computers and internet today and beyond. DMC covers decentralized data storage in this white paper, yet it is our goal to provide decentralized platforms for all three in the future.

DMC ecology unveils the vision of “Decentralized Data Storage for Real Data”, committed to providing truly free and safe data service for everyone, dedicated to building bridges to easily access global data storage network, matching data storage demands with data storage service providers, activating global decentralized data storage markets, and finding a safe environment for each piece of data. In the future, the DMC community is committed to building a safe, compliant, and extensive data storage and transaction ecosystem, as well as playing an important supporting role in building applications such as decentralized personal Dropbox, open data exchange, digital twins and metaverse applications.

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