



# Metaverse Business Whitepaper

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**BIXEN FOUNDATION**

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## INTRODUCTION

### 1. What is Metaverse?

The term “metaverse” was coined by Neal Stephenson in his 1992 science fiction novel “Snow Crash”, as a compound word of “meta” and “universe.” In general, a metaverse means a future version of the internet where people interact socially and professionally in persistent, shared, and immersive virtual worlds.

The metaverse is a hypothetical iteration of the internet as a single, universal and immersive virtual world that is facilitated by the use of virtual reality (VR) and augmented reality (AR) headsets<sup>1</sup>. Hence, the evolution of the metaverse is closely connected to advancing virtual reality technology due to increasing demands for immersion, especially through the era of COVID.

As aforementioned, metaverse is the “virtual world” of the new internet based on Web3.0<sup>2</sup> which is the third generation of internet that will change the conventional way of using internet. The emergence of blockchain technology utilizing computer resources of network participants enables the current internet (called Web 2.0) to evolve into Web 3.0 that provides a completely personalized internet environment in which data storage, use, and ownership are given to network participants.

In the Web 3.0 environment, it is feasible to create a real “virtual world” (metaverse) where people can make a “face-to-face” interactive experience through immersive images beyond reading and writing which is the core of Web 2.0. Virtual reality technologies such as VR/AR/MR/XR make it possible for people to create their virtual identities, build their own virtual communities, and spread their own imaginations through metaverse.

The most important fact is that Web 3.0 brings to prominence “data ownership.” In the world of Web 2.0, digital assets are owned by the platform in the form of data created by the users. On the contrary, an individual in the world of Web3.0 can confirm the ownership of digital assets created by her/himself through non-fungible tokens (hereinafter, NFT) using encryption technology. This means that people can construct a complete set of economic value chains by developing virtual real estate, virtual artwork, and digital currency.

There are two major issues facing NFT; (1) ‘value’ issue, and (2) ‘data storage’ issue. Before the discussion about those two issues, it should be understood how closely NFT and distributed data storage system is interrelated with metaverse.

#### 1.1 NFT

NFT is an indispensable element in metaverse since NFT's own characteristics of a unique representation (which is irreplaceable and indivisible) ensure the ownership of a digital product. Like other products, NFT products can be traded on the NFT marketplace (on-line trading platform). Due to NFT with encryption technology, anything can be transformed into a highly marketable ‘digital product’ (NFTized<sup>3</sup>) on the NFT marketplace. NFT market has recently been booming due to its strength in digital value conversion of real items.

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<sup>1</sup> <https://en.wikipedia.org/wiki/Metaverse>

<sup>2</sup> Web 3.0 refers to a supposed third generation of internet-based services that collectively comprise what might be called ‘the intelligent web’: An intelligent web technology that allows computers to understand the contents of a web page and provide personalized information using semantic web technology. It is an intelligent, personalized web.

<sup>3</sup> <https://www.urbandictionary.com/define.php?term=NFTized> It is defined as an alternative investment method of taking a physical product and turning it into a digital asset that could be tracked using blockchain technology.

## 1.2 Distributed Data Storage System

Due to blockchain technology, a new type of data storage system known as distributed (decentralized) data storage has emerged to strengthen security of data storage by abandoning centralized cloud storage system.

Distributed data storage system can ensure data ownership since it is in most cases based on blockchain, the technology of data recording and storage in a virtual ledger simultaneously stored on the computers of all the network participants.

## 2. Key Issues with Metaverse<sup>4</sup>.

### 2.1 Value Issue

Metaverse enables an individual to create virtual identities and to build a virtual world parallel to the real world. It is an aggregation of virtual space-time constructed with a series of augmented reality, virtual reality, (including mixed reality or extended reality) and the internet.

Digital asset chain is being conspicuously formed since NFT not only converts physical assets into digital world assets but also capitalizes digital content created in metaverse. This is one of the deepest layers of the metaverse ecosystem. With the increase in the number of real products NFTized or digital products created in metaverse, the value of digital assets will rapidly increase in the near future.

To successfully cope with this 'value' issue, metaverse should provide tremendous value load and commercial environment at the same time.

### 2.2 Data Storage Issue

To ensure the true permanence and uniqueness of NFTized digital assets, distributed data storage systems such as IPFS can provide a complete solution to overcome the problems with NFT storage caused by the use of centralized data storage servers where data is likely to be tampered with or deleted.

Since a distributed data storage system is based on a decentralized storage protocol, it can theoretically (1) store large amount of data in various forms and (2) prevent data from being modulated. In this sense, the ownership of NFTs can be secured only through the use of a distributed data storage system.

**With the continuous increase of NFT data in metaverse, it is anticipated that distributed data storage technology will be widely adopted. The large-scale commercial use of it is impending.**

## 3. Classification of Metaverse Ecosystem

For a better understanding of metaverse ecosystem, we use an alternative analytical framework of

Infrastructure (I) - Platform (P) - Content (C) - Intellectual Property (IP)

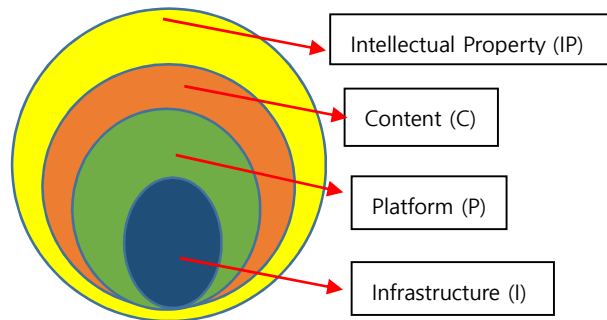
instead of a conventional classification of IT industry ecosystem which is

Content (C) –Platform (P) –Network (N) – Data (D).

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<sup>4</sup> This section is indebted to <https://inf.news/en/tech/2f2a9cc66f9d127c5c1b66ac4913e8d0.html>

### Metaverse Ecosystem Layers



### Classification of Metaverse Ecosystem

Classification	Description		Key Business/Service Providers
Infrastructure (I)	Data Storage Service	Cloud (Data Storage) Service	Azure(MS), AWS (Amazon)
		Distributed Data Storage Service	Filecoin, <b>BIXEN</b>
	Hyper-connected network environments		5G, 6G
	Devices that support immersive experiences		Oculus, Google Glass, Gear, Vive
Platform (P)	Operational basis that enables the development, distribution, and service of more realistic content		Microsoft, Meta Google, <b>BIXEN</b>
Content (C)	Creative works in cultural, educational, medical, and industrial fields that are realized through VR/MR/XR or other technologies		Fortnite Roblox, Animal Crossing
Intellectual Property (IP)	IP with originality or brand value of digital goods produced in areas such as fashion, entertainment, games, etc		Gucci, Nike, DKNY, MLB

- Infrastructure including Data/Network enables the buildup of virtual world in metaverse
- Intellectual Property (IP) area creates economic value (added) protecting the originality or brand value of the contents created in metaverse.

# BIXEN FOUNDATION

## 1. Foundation Information

BIXEN FOUNDATION (hereinafter, “we”) is a nonprofit organization incorporated in the United States.

### 1.1 Mission

We are to make our Metaverse as a Service with Distributed Data Storage Platform applicable to real business world in a manner to empower our prospective clients to build their own digital world.

### 1.2 Vision

We will move towards the development of technological tools to ensure the data ownership of data created in digital world based on our data storage and management technology.

### 1.3 Goals

- (1) One of our main goals is to provide our blockchain based platform for the successful formation of our own distributed data storage ecosystem (hereinafter, BIXEN Platform), where our BIXEN coin functions as a medium of exchange between data storage service providers and data storage users.

We have been working on how to make the structure of platform practicable. We plan to provide our distributed data storage services applicable to real business world, which enables companies and/or individuals to get easy, fast, and safe access to data storage services provided through BIXEN platform. Our BIXEN Platform will be the substrate on which various types of metaverse grow up and thrive.

- (2) The other is to make our own metaverse solutions recognized as a technical standard, which is most challenging.

Currently, there exists no technical standard in the development of metaverse(NFT) due to the application of non-homogeneous technologies across metaverse projects. As the first step towards this goal, we plan to launch our own metaverse solutions/NFT trade marketplace (being under development) in the very near future.

## 2. What kind of services do we provide?

- Distributed data storage service (with BIXEN's metaverse protocol) optimized for the sustainable operation of metaverse platform
- Metaverse as a Service (hereinafter, “Service”)

Combined with our distributed data storage service that supports the infrastructure of metaverse, we provide various technology services including blockchain and metaverse application solutions, which enables fast and easy the development of metaverse tailored to specific business/public purpose.

### 2.1 Characteristics of our Service

- Developer-friendly environment for secure & convenient development

- Metaverse utility marketplace where a creator of digital designs can effortlessly sell and market their digital designs in the metaverse
- Secure distributed data storage service
- Competitive price offers

## 2.2 Applicable Business Areas

Our Service will be applicable to the following business areas:

- ✓ Gaming
- ✓ Real Estate
- ✓ Entertainment
- ✓ Finance
- ✓ Retail
- ✓ Education
- ✓ NFT marketplace



## BIXEN Distributed Data Storage Ecosystem

### 1. BIXEN Distributed Data Storage Service Platform

BIXEN Distributed Data Storage Service Platform (hereinafter, “BIXEN Platform”) is a distributed data storage service marketplace. The primary goal of it is to provide data storage service for various type of metaverse projects. However, any type of data storage demanders can use data storage service at a reasonable cost in its hacking-free environment.

The BIXEN Platform is a coin ecosystem based on Blockchain technology with its own native coin called BIXEN (Ticker, “BIXEN”). Data storage demanders pay for data storage service with BIXENs which will be the source of data storage service providers’ revenue.

#### Definitions

- (1) “Data Storage Resources” comprise data storage space, bandwidth, CPU, online time, etc.
- (2) “Data Farming” means the activity of generating revenue in terms of coins/tokens by providing data storage resources<sup>5</sup>.
- (3) “Data Farming Organization” is organized by either (1) an individual or a business entity or (2) a group of individual data storage providers.
- (4) “Data Farmer” is a data storage resource provider to the network who successfully acquires the membership of a data farming organization.

#### 1.1 Key Structural Design of BIXEN Network

BIXEN Network (hereinafter, “Network”) consists of various data farming organizations in the form of either firm (corporation) or cooperative. Each data farming organization is incorporated by a ‘validator’ who obtains the approval of BIXEN FOUNDATION. A business entity or a group of individual data storage providers is able to apply for the position of a validator.

Hence, there exist two types of data storage service groups in the BIXEN Network: (1) Validator groups (2) Individual data storage resource providers. An individual data storage provider who wants to be a data farmer should subscribe to one of the data farming organizations who offers most favorable terms and conditions. In this sense, the data farming organizations in BIXEN Network should compete with each other in order to recruit high quality members out of the pool of data storage providers

##### ➤ Validator

##### (1) Qualification

Anyone can apply for a validator position. (1) an individual or a business entity or (2) a group of individual data storage providers.

Once appointed as a validator through application process, it should make a security deposit in terms of BIXEN coins. The deposit rule is basically 1 BIXEN per 1 TB.

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<sup>5</sup> Refer to Maidsafe Whitepaper.

- Deferral of Security Deposit

The deferral of security deposit is allowed if a validator decides to provide data storage resources in response to the homepage event announcement. In this case it does not need to pay the deposit in advance for the initial provision of data storage up to 10,000 TB. Instead, it can pay it with the BIXEN coins after securing sufficient BIXEN coins through the participation in mining process. Beyond the initial provision limit of 10,000 TB, the additional deposit will be required following the deposit rule: 1 BIXEN per 1 TB

(2) Reserved Rights

- Incorporation of its own data farming organization
- Setup the policy of operating its own data farming organization

As aforementioned, each validator owns the right of organizing its data farming organization. Conforming with BIXEN FOUNDATION's policy, each validator is eligible to set up and implement its own policies of the operation such as reputation system, and incentive/penalty schemes including the distribution policy of its revenue among its members. For example, it can set up its own recruitment policy offering very competitive terms and conditions of contracts with data farmer candidates.

- Participation in Block Production

Only validator groups can participate in the block production (mining) – validating a new block of transactions. Otherwise, they verify the block in each round of block production process. Only validators are eligible to obtain coin rewards through mining.

(3) Obligations

It is necessary for each validator to recruit new data farmers of its own organization through advertisement and administrate the status of its members (for example, based on reputation system), keeping them up to date with the current state of BIXEN Network. Each validator should maintain its data storage resources including its own data storage capacity as well as its members' data storage resources over time through periodically monitoring the status of its members' data storage resources.

(4) Source of Revenue

- Running a data farming organization
- Participating in the block production process

➤ Data Storage Providers

(1) Requirement for data farming

A data storage provider should join in one of the validators' data farming organizations at the start. A validator may require security deposit for a data farmer status. The amount of BIXEN coins for security deposit may vary across validators depending upon their own policy rule.

## (2) Regular data farmer status<sup>6</sup>

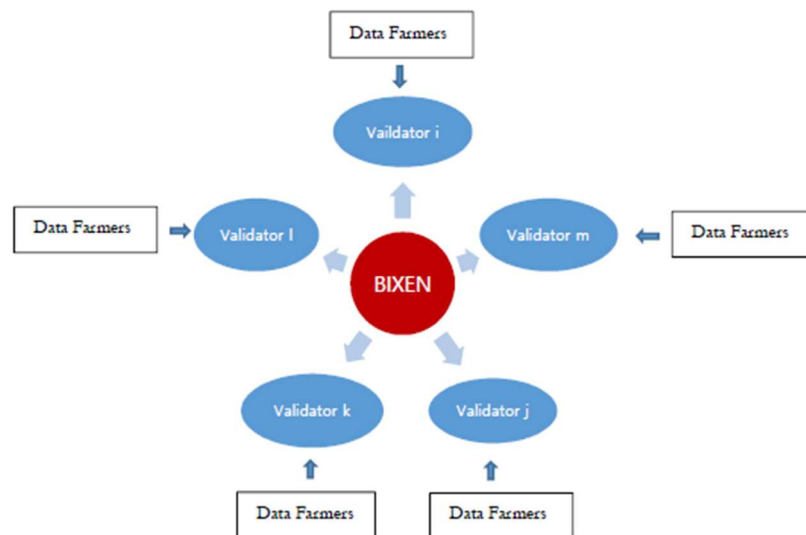
Subscribing to a data farming organization, a data storage provider becomes a temporary data farmer of the said organization. A temporary data farmer becomes a regular data farmer through the vetting process carried out by the said organization. As a regular data farmer, a data storage provider is eligible to make revenue by providing its data storage resources to the said organization. A data storage provider (either a temporary or regular data farmer) is free to participate in any data farming organization, and leave it or immigrates to other organization.

## (3) Source of Revenue

Basically, a data farmer can generate its revenue in terms of BIXEN coins based upon its total data storage resources provided to the data farming organization to which it subscribes.

Note that the compensations may also vary due to different rules across the organizations. A data farmer might obtain a certain portion of the mining rewards from its data farming organization depending upon the terms and conditions of the contract made between both party.

BIXEN Network Structure



## (4) BIXEN FOUNDATION

BIXEN FOUNDATION stipulates a set of policies on (1) regular data farmer status, (2) collateral requirement for Validator, (3) reward/penalty for Validator, (4) coin distribution, and (5) data storage and maintenance in the Network.

## (5) Data Storage Demander

Data storage users comprise (1) an individual, (2) business entities, and (3) non-profit organizations.

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<sup>6</sup> This is the general rule of BIXEN FOUNDATION applied to any data farming organization.

## 1.2 Incentive/Penalty Schemes, and Fees

### (1) Reward

- Reward for Block Production

This is the reward from the Network for a validator who makes contribution to block production (mining). Total rewards for mining per day will be approximately 1,000 BIXEN. (Each block takes one (1) minute to mine.)

### (2) Penalty

- Validator

In case a validator maliciously or selfishly damages the Network, his appointment shall be cancelled and his security deposit shall be forfeited.

- Block Producer

In case a validator proposes adding a block with inaccurate information, it shall be permanently deported from the Network, losing its security deposit.

### (3) Fees (to be determined)

- Fee for the Use of Network Resources

There is a fee of small amount that union should pay for the use of the Network resources such as data storage and maintenance services provided by BIXEN FOUNDATION. This fee will be used for the operation of BIXEN Network.

- Transaction Fee (Gas Fee)

Each transaction requires a fee since each transaction requires computational resources of the Network. A certain portion of the transaction fee is included in the rewards for a validator who produces a new block.

## 2. Coin Distribution Policy

BIXEN Coin (Ticker: BIXEN) is a medium of exchange that enables market participants to utilize BIXEN Data Storage Ecosystem with its smallest unit called OXEN in order to facilitate smaller transactions where an OXEN is equivalent to 100 millionth of one BIXEN. Our basic principles of coin distribution policy are including but not limited to;

- We do not make no initial coin offerings.
- We do not sell any coins unrelated to the growth of coin economy
- Total coin supply is capped at 20,000,000 BIXENs over time.
- There is no initial coin allocation for BIXEN FOUNDATION, developers, or contributors.

- There is no free coin distribution such as airdrops for early birds or community builders.

### 3. A Brief Description of Data Storage System Components

This Section succinctly explains the main system components in the Network. Even though Blockchain, data storage processing, and data storage market system are closely interacted. the use of system decoupling/loose coupling technology make it possible for each system to separately operate without having an effect on other systems.

#### (1) Blockchains

There exist two types of blockchains in the Network: (1) BIXEN-chain (2) Subchain

- BIXEN-chain is a main blockchain to keep a digital ledger of recording events such as data storage service transactions between market clients and data farming organizations (validators) verified through ‘group consensus’ across validators on the BIXEN Network.
- Subchain is a blockchain that may be used in each data farming organization, working separately from but being connected with BIXEN-chain. The main function is to keep a history of event such as incentive sharing, penalty or revenue sharing records verified through ‘consensus’ among the members of a data farming organization. Note that it is not mandatory that each organization use local blockchain. Instead, it may use an alternative method of keeping its own verified event history. However, any data farmer in each data farming organization can get access to a history of BIXEN-chain block information or a record of event history its own data farming organization.

#### (2) Nodes

The type of nodes that participate in the Network is classified by the service provided by a node.

- BIXEN-chain Verification Node

BIXEN-chain verification nodes consist of only validators.

All the validators are entitled to participate in the block production of BIXEN-chain, validating/verifying blocks to reach consensus.

- Data Storage Market Provider Node - Validator Node

Validators as data storage market providers should also implement data storage market provider services to interact with storage market and be capable of processing data transfer through data transfer module.

- Data Storage Node –Data Farmer Node

Data storage nodes consist of data farmer nodes including validator nodes. They should implement data storage as well as data transfer through data transfer module.

- Data Storage Market Client Node

Data storage market client nodes should implement data storage market client services in order to interact with storage market and be able to do data transfer through data transfer module.

(3) File and Data

A piece of data called “Chunk” is the unit of negotiation for data storage services in the Network. The size of a Chunk is to be determined by BIXEN Foundation.

(4) Coin

BIXEN is a formal currency which is a medium of exchange for data storage transactions.

(5) Data Storage Market

Data storage clients can find data storage service providers, which are validators (data farming organizations) through the list of validators with data resources currently available displayed on screen. Finding a validator (a data farming organization) appropriate for the storage of its own data, a storage client proceeds to make a contract with it.

(6) Virtual Machine

BIXEN virtual machine is the system component that is in charge of execution of smart contract. Execution of smart contract on the virtual machine incur a gas cost.

#### 4. Consensus Algorithm for BIXEN-chain

Practical Byzantium Fault Tolerance(PBFT)<sup>7</sup> consensus algorithm combined with a proof of stake protocol<sup>7</sup> will be used to expedite block production process as follows;

At each round, the random selection process selects a group of block producing candidates from whole validator nodes who stake their coins of the same amount. (This means that the probability of being randomly selected as a candidate is equal across validator nodes.)

- (1) In the first phase, the random selection process will automatically choose a group of candidates from whole validator nodes and then, only one candidate as a new block producer will be selected out of a candidate group and the rest of candidates in the group become verifiers of the block validated by the selected block producer.
- (2) In the second phase, the selected block producer checks whether the transactions in a block to be processed are accurate or not. Once validation is done, the block producer transmits to verifiers in the group.
- (3) As soon as verification is completed with the agreement of (super)majority of the verifiers, this new block will be immediately propagated to the rest of validator nodes that will add it to BIXEN-chain.

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<sup>7</sup> The Algorand blockchain uses a decentralized Byzantine Agreement protocol that leverages pure proof of stake.

## 5. Data Storage Network<sup>8</sup>

BIXENClient<sup>9</sup> program play an important role of empowering each type of nodes to connect with the Network and to make use of its services such as node discovery system, caches node addresses, storage of object metadata, storage node reputation management, data transfer module for storage, retrieval, audits and repairs, aggregate billing data, payment system to storage nodes, and management of authorization and user accounts.

### 5.1 BIXENClient Program for Data Storage and Maintenance Process

#### (1) Selection of Validators (Data Farming Organizations)

BIXENClient for client (end-user) displays the list of validators (data farming organizations) with current information on data resources. A client (end-user) selects a validator from the list. Contacting the validator selected, the contract stipulating specific terms and conditions should be made between both parties.

#### (2) Data Storage

Data is divided into Chunks with encryption and directly transferred to the said validator's data farmer nodes (including validator itself since it is one of data farmers) for storage, simultaneously generating metadata (data map). Data farmer nodes cannot identify the stored data itself.

In order to ensure data availability, replication for redundant storage is preferred instead of erasure coding<sup>10</sup>. With replication, a simple copy of the Chunks is distributed to each selected data farmer node. A disadvantage occurs when replication seriously increases storage overhead and maintenance bandwidth. However, the risk of data lost or damaged drops to almost zero.

#### (3) Maintenance

For the integrity of data stored at data farmer nodes, BIXENClient program provides deterministic guarantees of periodic auditing data storage at data farmer nodes, using timeouts/heartbeats to detect data farmer node failures.

#### (4) Repair

In case more than a certain number of data farmer node failures are detected, BIXENClient program triggers its data rejuvenation operation which entails the recreation and a new dissemination of lost Chunks in order to ensure data availability. BIXENClient will store the Chunks at other data farmer nodes and generate the corresponding metadata.

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<sup>8</sup> Our system is designed to protect data stored from various type of possible attacks such as destruction, man-in-the-middle, collusion and denial of service and attacks against repair of data.

<sup>9</sup> This term is different from market client who is a data storage demander.

<sup>10</sup> Erasure codes are more complex than replication and in particular, the maintenance of coded data blocks introduces additional computational costs since it requires performing the coding again. Communication costs are also needed to retrieve a minimum number of coded blocks from several holders.

## 5.2 A Brief Overview on Data Storing/Retrieving Process<sup>11</sup>

### (1) Storing Data

As a client (end-user) store data with BIXENClient program, data is encrypted and then broken into multiple chunks. The chunks are distributed to storage nodes selected across the network. Simultaneously, metadata (data map) is automatically generated and saved in BIXENClient program.

### (2) Retrieving Data

Retrieving the data from the network, a client (end-user) identifies the locations of the chunks previously stored by referencing the metadata. Then the client (end-user) retrieves the chunks, and reassembles the original data on the end-user's local machine.

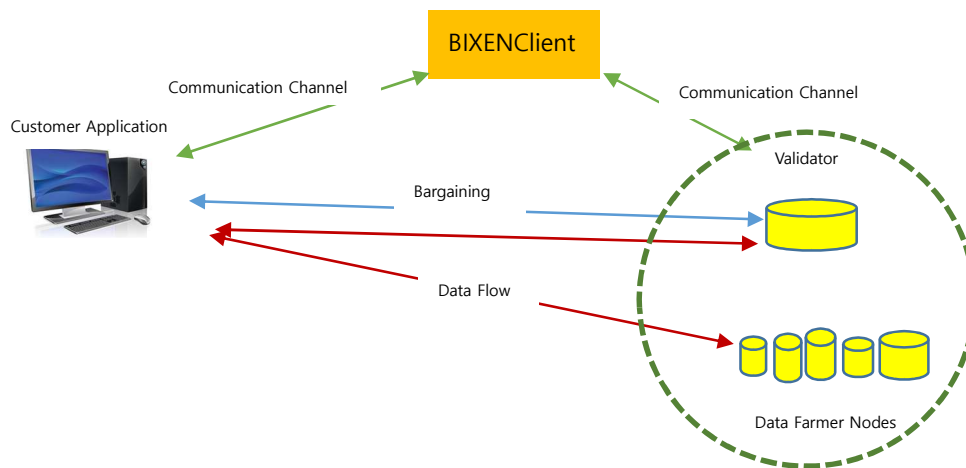
### (3) Maintaining Data

In case a chunk lost or damaged are detected by BIXENClient, the missing chunk will be regenerated and replaced.

### (4) Paying Fees for the Service

A client (end-user) should pay fees in terms of BIXEN for services rendered.

### Data Storing/Retrieving Process with BIXENClient



<sup>11</sup> Please refer to BIXEN technical whitepaper for the detailed information that will be published later.



## CONCLUSION

Metaverse is in the rapidly growing trend and expected to become an important part of people's future life, promoting the close economic integration of the reality and the digital world.

As one of the leading players in developing distributed data storage service system, we are very well prepared to enter a new era of 'metaverse.'

We have designed a BIXEN distributed data storage ecosystem, ultimately applicable to the buildup of metaverse, based on blockchain protocol combined with data storage network in a manner to overcome the limitations of distributed data storage system.

Our implementation plan is to (1) successfully activate BIXEN distributed data storage ecosystem that will be the substrate on which any type of metaverses will grow and thrive, and (2) develop our own metaverse solutions that can be recognized as a technical standard. To do so, we plan to launch our metaverse platform and NFT marketplace in the immediate future. (The detailed information is currently confidential.)

We always keep in mind that the most important key to success is "Making Ceaseless Efforts."

[The End]

Thank you!

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