

Blockchain-based Distributed Supercomputing Platform

CONUN WHITEPAPER



CONUN

Distributed Supercomputing Platform

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1. Background

Today, when an individual or enterprise is performing computing tasks that require high-performance computing resources, they rely on centralized cloud computing service providers such as Amazon, Google, Microsoft, IBM, etc., (such as a closed-in network, proprietary billing policies, and a way to allocate premeditated resources) or separately purchase and use expensive, high-performance workstation computers. In particular, the scientific and industrial worlds that are implementing big data applications or developing machine learning models are increasing the demand for high-performance computing power to run large amounts of applications and process large amounts of data.

In recent years, however, personal computers with remarkably high performance have been continuously introduced due to rapid technological advancement, and big data analysis and machine learning have become possible on personal computers. However, most of the work done with these high-performance computers is usually in the form of Internet browsing, simple documentation and computer games, and most personal computer resources are idle.

Therefore, we believe that we need a new form of distributed computing platform that recognizes this problem and utilizes the resources of many personal computers to enable high-performance computing at low cost.

On the other hand, we are seeing new technologies that provide a new approach to running distributed applications such as Ethereum. In particular, Ethereum enables developers to create smart contracts that run in the structure of a block-chain. It creates many use cases for designing and implementing services such as forecasting markets, cloud funding, web hosting, general contracts, financial services, and distributed data processing.

Based on these advanced technologies, we developed a platform for building a horizontally distributed desktop computing system where projects (applications) that require high-performance computing resources can be performed at low cost by sharing idle processing resources of personal computers, through this way, we will create an open structure that shares the distributed computing power through interpersonal interaction without proprietary intermediaries, and build an ecosystem that enables individuals to earn money according to the contribution of the participants.

Furthermore, we are noticing that smartphones are getting more powerful and perform better than previous high-end workstations, and are becoming more popular than PCs worldwide, we want to build platform that includes smartphone's computing performance as ad-hoc cluster in our distributed computing network.

2. Introduction

CONUN is a platform for building a horizontally distributed desktop computing system that can share the idle processing resources of personal computers to handle multiple projects (tasks) that require high performance computing resources. The platform includes not only personal computers but also the resources of smartphones that individuals carry.

CONUN connects a personal computer to a peer-to-peer (P2P) network from the Internet, the owner ("Requestor") of an application that requires high performance computing power leases some compute power from the computer of the person or group (the "Provider") that wants to share their computing resources. This configuration can be useful for projects that typically require large amounts of work and long processing times.

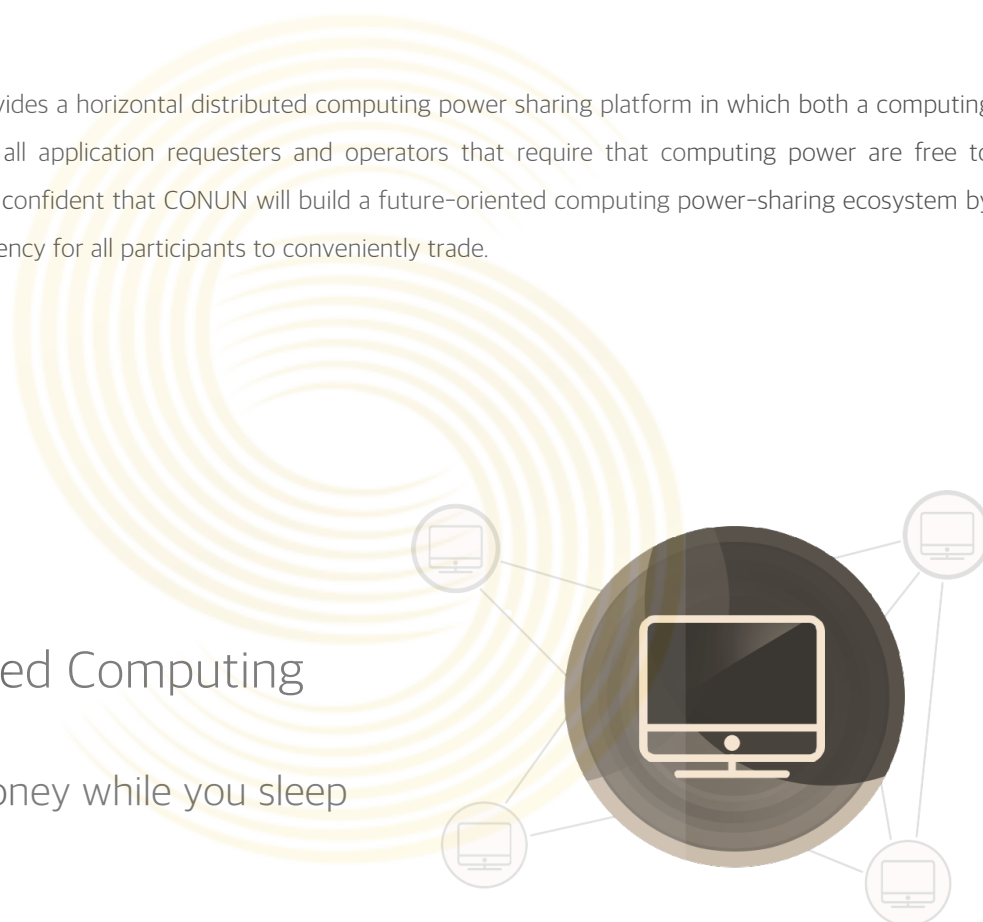
CONUN implements a method for organizing the necessary processes from the requestor's applications and effectively executing them on distributed computing resources. This approach replaces costly cloud computing services, reducing computing time and making complex applications such as scientific calculations and machine learning easier to use at lower cost.

CONUN does not have to pay for using existing cloud computing because it builds high computing power by collecting and sharing resources of personal desktop computers. In addition, because of the distributed computing architecture, certain groups do not have a single control authority to monopolize and regulate resources.

We will use our own tokens based on the Ethereum block-chain to provide value to distributed desktop computing to requesters and suppliers and investors participating in the platform to operate the platform ecosystem. . The token acts as a payment medium for processing the distributed computing services of the platform ecosystem. The requester and the supplier can use tokens to compensate for the use of computer resources. This means that a person who requires high performance computing power can pay using tokens to solve their computing performance problems, and a provider connected to the Internet can directly benefit from providing their computing resources.

Therefore, CONUN provides a horizontal distributed computing power sharing platform in which both a computing resource provider and all application requesters and operators that require that computing power are free to participate, we are also confident that CONUN will build a future-oriented computing power-sharing ecosystem by providing a crypto-currency for all participants to conveniently trade.

Distributed Computing
Saving the money while you sleep



3. Technology

3.1 Foundation, Vision, Goal

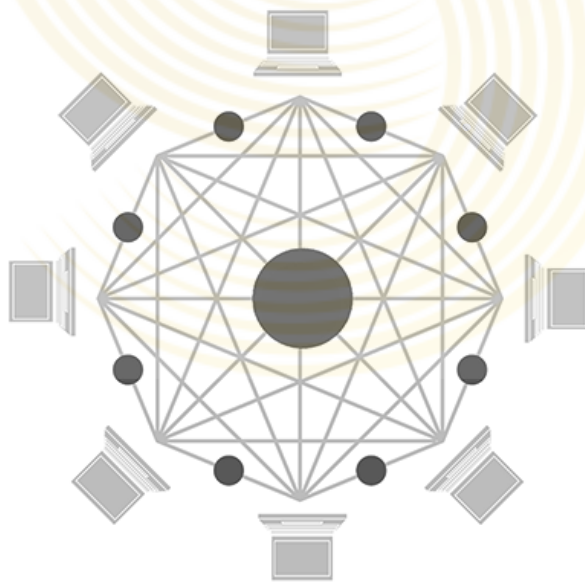
In recent years, we know from many sources that there is a growing demand for high-performance computing applications such as high-level applications such as scientific calculations and deep learning of artificial intelligence, and high-performance computing power to handle big data.

However, a common way to accommodate these needs is to utilize cloud computing services or build and use their own high-performance computer infrastructure.

In particular, the infrastructure of high-performance computers is complex and expensive, requiring expertise to operate them and separate human resources for management operations. In particular, the infrastructure of high-performance computers is complex and expensive, requiring expertise to operate them and separate human resources for management operations. In addition, traditional cloud computing is a closed-network, proprietary billing policy, and a pre-planned allocation of resources that cannot be deployed in a fully distributed infrastructure.

To solve these problems, we need to implement a breakthrough distributed computing resource sharing architecture that enables computing resource management and lowers computer infrastructure costs by using blockchain technology. Our system uses blockchain driven distributed applications (DApps) to automatically discover and deploy applications, data and compute processes, and costs to assist with the proper computing resources. Distributed application approach is now widely used, reliable and flexible enough to reduce the time and cost of implementing a block-chain platform.

Distributed Computing is a distributed processing model that takes advantage of the processing power of multiple computers connected to the Internet to solve huge computational problems. Distributed computing can take advantage of multiple computer networks, each performing part of an overall task to get results much faster than using one computer. The idea to utilize the processing resources of these idle personal computers appeared when ARPANET, also known as the introduction of the Internet, appeared in the early 1970s. In overseas, projects are being carried out on various applications such as bio, weather, artificial intelligence, mathematics, and cryptography. We refer to projects such as SETI @ Home, distributed.net, Berkeley Open Infrastructure for Network Computing (BOINC), and Folding @ home. These projects are being conducted by nonprofit organizations to run large parallel applications at low cost using idle computing resources through desktop computers.



We also develop a model for distributed computing processing using personal computers by referring to desktop grid computing technology and we will use the solution as a base architecture to build an infrastructure that shares computing resources across existing high-performance workstation and personal desktop computers.

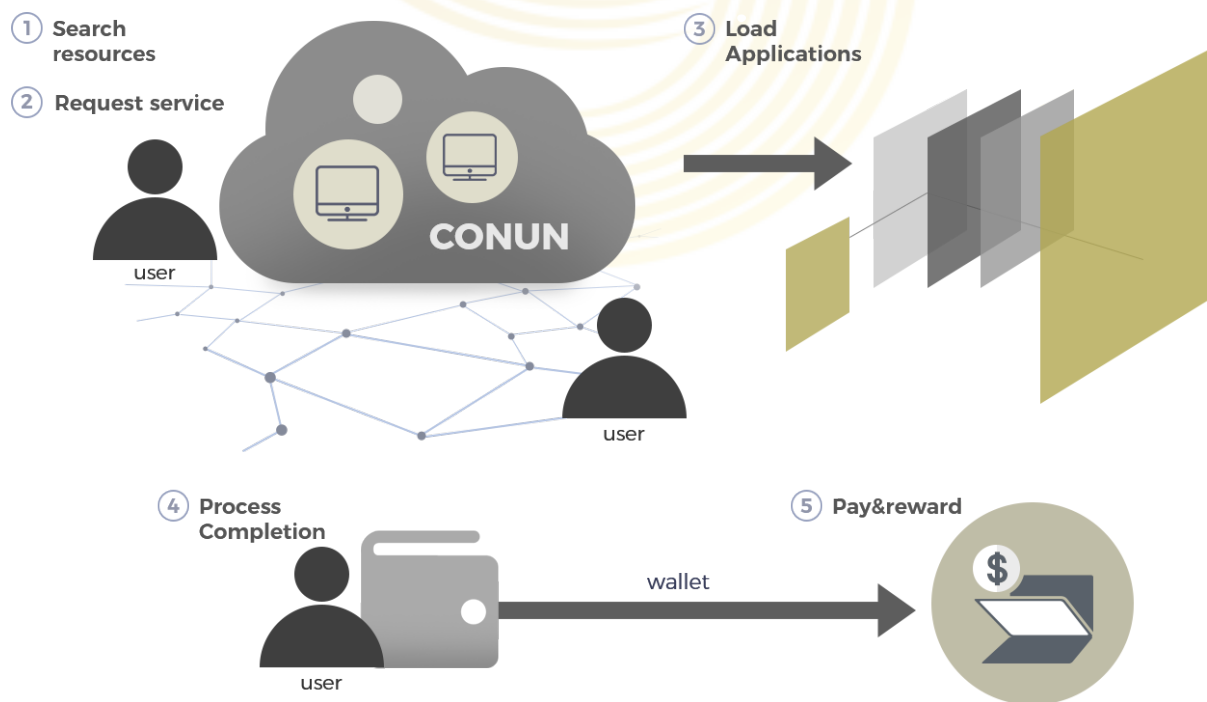
Grid computing is a distributed architecture that tries to build a virtual supercomputer by combining the computational power of many computers to solve complex problems such as high computation and high capacity processing. In a grid computing model, a server or personal computer runs independent tasks and is connected to the Internet or a network, however, in distributed computing different systems within the same network share one or more resources.

The advantage of grid computing is that it provides transparent access to resources to improve user productivity so that tasks can be completed more quickly and it also supports scalability and flexibility to deliver compute power where it's needed most, allowing the grid to seamlessly scale over time, consolidating thousands of processors into a single cluster.

We refer to the Desktop Grid open source platform (XtremWeb), which can apply the technology of grid computing to desktop computers. This open source platform is designed to build your own grid based on a voluntary resource PC on a desktop PC, university, enterprise or Internet and XtremWeb development is also used in scientific calculations and high-level application processing based on Desktop Grid, Global Computing and Peer-To-Peer distributed systems. Like other large-scale distributed systems, the platform uses remote resources (PCs, workstations, and servers) connected to the Internet and uses internal network pools (LAN, PC, workstation, server) to enable participants on the platform to collaborate by providing their idle computing resources.

We will look at the possibilities of using mobile devices such as smartphones and tablets in grid computing/ distributed computing, and we will configure how to apply the above technologies to mobile devices. The performance of the latest smartphones is growing fast and steadily, and the fact that they are always on will be a major reason for making smartphones a distributed computing platform.

In general, distributed applications must be abstract enough from the underlying platform to target different mobile platforms and different network topologies. The deployment work will be to implement platform-specific algorithm efficiencies and create different versions for each platform so that they can be performed in cross-platform technologies such as Java using abstracted virtual machines. In order to efficiently deploy work to multiple mobile devices and use it as a computing node, we will develop our system with reference to the University of Amsterdam's Java-based open source high performance distributed computing platform, University of Virginia OGS.NET, Architecture and technology framework already developed and in use, and BOINC, and Folding@Home mobile platforms as well.



CONUN allows the requester to run the application on the computer that joined the platform. Workers connected to the Internet simply create an environment where they can automatically participate in the project after downloading and installing the executable program and registering the account. This program uses only idle time on your computer, so you can adjust it to have a minimal impact on your actual computer usage.

CONUN will support devices that can provide more value to multiple platform participants to handle block-chain computing resources at a lower cost. To do this, we disclose supplier reliability so that suppliers can provide services transparently and in order to ensure a high level of service, it will be designed so that appropriate compensation can be achieved through transparent quality control according to the contribution of various suppliers and requesters.

3.2 Architecture

We will design a computing node that controls the components of the personal computer, such as CPU, GPU, memory, and storage, and configure the way that each node is modularized to process the application. Each node is operated in a virtual machine environment and is implemented so that it can run separately from the operating system of the computer based on the container operation method of Docker. And storage devices (disk drives) that store application data will be implemented with reference to distributed data storage solutions such as IPFS, Storj, and Sia, etc. The computers of each node can be run by remotely downloading and storing applications and data for service operations.

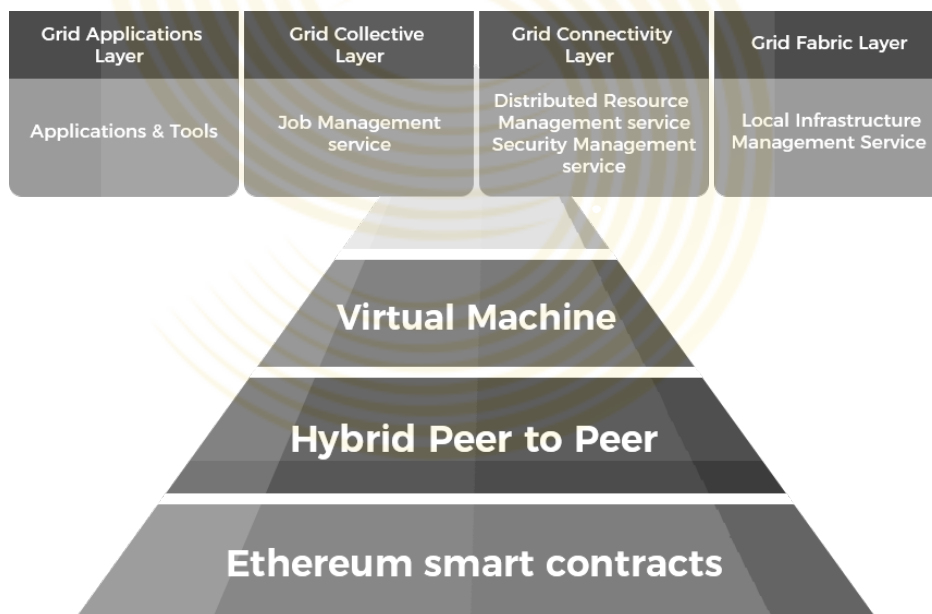
CONUN configures each node's computers to operate on a horizontally distributed network. This means that there is no centralized control over the aggregation of nodes. As the concept of the block-chain implies, each node will autonomously access the service and configure the platform ecosystem while controlling its own process control.

CONUN implements a separate resource scheduling algorithm that can manage multiple resources so that applications can be reliably and efficiently processed on multiple computer nodes.

This will essentially be a complex program model that can handle the security, management, and restoration of data.

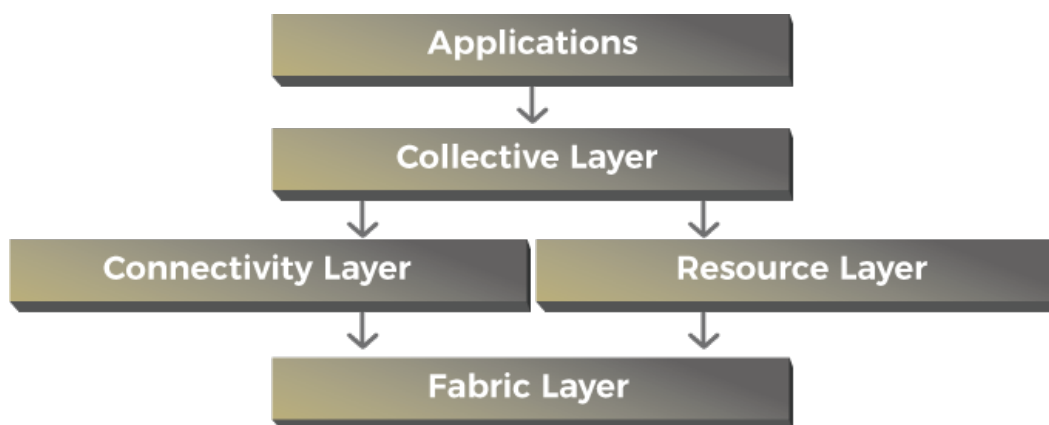
< Platform Architecture >

- Grid Computing Core
Distributed computing core functionality that uses computing resources to address computing tasks
- Virtual Machine (Docker Container)
An independent virtual processing system that deploys and automatically runs applications on each compute node without interference from individual operating systems
- Hybrid Peer-to-Peer Network System
All computers in the network act as clients and servers without distinction between types of computers
- Ethereum smart contracts
A system that transparently and securely exchanges transactions, agreements and payments without intermediary services



< Base Architecture (Layered Grid Architecture) >

1	Infrastructure Management	Fabric Layer	All computational resources, processors, disk storage, operating systems and software
2	Security Management	Connectivity Layer	Performs authentication and authorization of users Secure access to resources and services
3	Resource Management	Resource Layer	Resource monitoring, allocation and management
4	Job Management	Collective Layer	Access resources and Job scheduling of various jobs
5	Application Management	Application Layer	Actual Applications and tools



1. Fabric Layer

- ✓ Provides an interface to local resources at a specific site.
- ✓ The interface is tailored to share resources within the virtual organization.
- ✓ Provides the ability to query the status and functionality of a resource, along with features for managing real resources. Such as storage systems, clusters, networks, network caches, and so on.

2. Connectivity Layer

- ✓ Consists of a communication protocol to support grid transactions that span the scope of use of multiple resources, includes security protocols for authenticating users and resources such as communication, service discovery (DNS), authentication, authorization, delegation, and so on.

3. Resource Layer

- ✓ Manage a single resource. Uses the functionality provided by the connection layer and directly calls the interfaces available in the fabric layer. Because it is responsible for access control, it relies on authentication performed as part of the connection layer such as data access, computer access, network performance data access, etc.

4. Collective Layer

- ✓ Handles access to multiple resources. It is a service consisting of resource discovery, task allocation and scheduling for multiple resources, and data replication. This can be configured for a variety of uses and a variety of protocols, reflecting the wide range of services that can be provided to a virtual organization.
- ✓ (App) consistency control, replication selection, job management, virtual data catalog, virtual data code catalog. (Generic) Replication Catalog, Replication Management, Co-Allocation, Certification Authorities, Metadata Catalog

5. Application Layer

- ✓ Consists of applications that operate within a virtual organization and use a grid computing environment. (Discipline Specific Data Grid Application)

3.3 Application of Blockchain Technologies

The blockchain is designed based on cryptographic algorithms such as existing public and private keys on a P2P-based horizontal network, and a distributed ledger technology, provides a way to maintain the integrity of the books by verifying the trustworthiness of the transactions by the consensus of the participants without an administrator.

CONUN is implemented using block chaining technology to record all metadata related to computing power requestor's application processing and to manage work transaction through it. This provides a consistent and reliable environment because none of the contributors to the work can arbitrarily manipulate their work.

In addition, CONUN develops its own tokens based on the Ethereum blockchain in terms of providing value to distributed computing for users and investors, it is used by providers and requesters to compensate for application and computing resource usage as a media role for platform participants to request and exchange services.

3.4 Application Case

We understand the benefits and needs of distributed computing systems. Rather than processing the resources required by users from one computer to another, it is important to be able to process these distributed computers faster and more efficiently. This makes it possible to use an environment with high computation speed, easy system expandability, high availability and reliability; best of all, you can take advantage of the price-performance benefits.

This environment can be used to perform more common tasks as well as existing special scientific computing projects.

1. A scientific calculation project

CONUN can be used to perform scientific computing tasks that require complex and fast computing performance. In general, scientific calculations are mainly used to understand mathematical models using computers and to understand the research subjects and to derive results. For example, there are areas of academic research such as physics, biology, and chemical informatics, or social research purposes such as drug development, social statistics, climate prediction, and cryptanalysis, all of which require large-scale computing capabilities.

2. Deep Learning Model project

In recent years, deep learning has been one of the most active and rapidly evolving fields of artificial intelligence and machine learning. We have seen the need for a large-scale computing infrastructure to develop and implement a deep learning model, as we have seen in the case of AlphaGo. CONUN uses this distributed computing power to implement a multi-process environment capable of learning deep learning algorithms such as convolutional neural networks (CNN), circular neural networks (RNN), reinforcement learning, and used to quickly create a user-designed deep-running model. We are also considering developing a solution (API) to enable Tensorflow, Theano, and Caffe, which are currently active used deep-learning frameworks, in our distributed computing environment.

3. Big Data Analysis project

Big Data is a technology that extracts value from data, including large amounts of structured or unstructured data sets beyond the capabilities of existing database management tools, and analyzes and predicts results. Big Data has been highlighted for several years because of its potential to provide valuable information across all areas such as politics, society, economy, culture, and science and technology.

This requires a computing infrastructure that quickly computes and processes large amounts of data, such as in the case of deep learning. Most big data analysis techniques and methods are data mining, machine learning, natural language processing, pattern recognition, etc., which were used in existing statistics and computer science, it is required a computing infrastructure that quickly computes and processes large amounts of data, such as in the case of deep learning.

Especially, due to the increase of unstructured data such as social media, text mining, Opinion mining, social network analysis and cluster analysis are widely used in the public; and NoSQL technology is leveraging Hadoop, a distributed data-processing solution, for flexible and faster processing of data.

4. Computer Graphic Processing Project

In computer graphics, computer generated images (CGI) are movies, television programs, advertisements, simulators, simulations, and three-dimensional computer graphics. The CGI software used on computers is constantly evolving and becoming easier to use, making it possible for midsize businesses and individuals without specialists to produce professional-quality computer graphics content. However, this is also a limitation that high-performance GPU-equipped computer performance is required. CONUN is configured for computer graphics processing in a distributed computing environment so that users can run projects quickly and cheaply.

5. Life Science Research project

Biological research for improving existing therapies and developing new treatments for treating diseases is one of the areas that utilize distributed computing. There are several types of biology projects currently active through BOINC. Among them, GPUGRID.net is a nonprofit, distributed computing project that conducts biomedical research through atomic biological molecular simulation. They are performing tricky tasks that require supercomputer-class computing power consisting of a large number of graphics cards (GPUs). These researches have become a necessary research field not only in university research institutes but also in bio industry. For this research, distributed computing environment will become an essential computing infrastructure.

4. Blockchain Token

CONUN uses its own tokens based on the Ethereum blockchain in terms of providing value to distributed computing for users and investors. The token acts as a medium for platform participants to request and exchange services for processing. Tokens are used by providers and requesters to compensate for application and computer resource usage. Tokens are also required to process other processes after the application registry and transaction framework is implemented.

As mentioned in the application examples, almost any application requiring high capacity / high performance computing power, such as scientific calculation, deep learning, and big data analysis, can use the CONUN platform to handle their projects. Any person or organization connected to the Internet can use their CONUN tokens to solve their own computing power problems, and all Internet users who provide their computing resources can earn money directly or indirectly.

The CONUN token is a token issued based on the Ethereum blockchain. The design of the token follows the token implementation standard already adopted in many places, and the creation of the CONUN token is performed using the Ethereum smart contract feature. Applicants wishing to participate in the CONUN platform may purchase and retain tokens during pre-sale or cloud funding periods.

We will proceed with token pre-sale and provide tokens to the participants first.

Tokens supplied via pre-sales are converted to CONUN default tokens safely after ICO.

5. Development Roadmap

We plan to develop a step-by-step plan to build a horizontally distributed desktop computing system platform. CONUN would be a highly complex project as it would require the development of a newly constructed architecture based on the currently developed open-source solution.

We will add and distribute newly configured functions at every stage of development, and will initially test network services to test the project. Initial work is done independently of the ICO and may be faster, depending on the level of ICO in the future.

■ Phase 1: Platform Development (Late 2018)

CONUN development is the research and development of the technology that defines the platform base at the beginning. At the same time, we develop the blockchain core and token development of CONUN, Ethereum Smart Contract for token storage and transaction management. 합니다.

- A. Define work on the foundation of the platform and establish a framework and plan for each step. (Base platform definition)
- B. Implements a key part of an ethereum-based blockchain token and a Smart Contract core that manages transactions.
- C. Implement the user electronic wallet core and mining algorithm. (Wallet core & Mining Algorithm)

- D. Implement a virtual machine system for the application to work on a personal computer. (Virtual Machine base on Docker container)
- E. Work on the user interface for the application. (Application UI / UX)

■ Phase 2: Alpha Version Deployment (Early 2019)

This step implements a desktop grid system that can be the core of the CONUN platform. Develop an initial platform to implement deployed versions of user applications and run services through a test network.

- A. Design and implement the core of the desktop grid system. (Desktop Grid Platform)
- B. The peer-to-peer network architecture is the foundation of the desktop grid system. It is designed like a desktop grid system. (P2P Network Architecture)
- C. File transportation & Distributed data storage management: Design and implement a core point for storing distributed data to transfer and manage data from applications.
- D. The smart contract application implemented in phase 1 implements additional extensions that are added to the distributed computing processing environment.(Ethereum Smart Contract - Phase 2)
- E. Implementation of authentication schemes for CONUN application use and information security related tasks are implemented. (Authentication & Security)
- F. Implement the application interface that the user application needs to define to be used on the platform (CONUN Task API).

■ Phase 3: Market version Deployment (Mid 2020)

In this phase, you configure a live network environment in which the CONUN platform can actually operate, and implement a deployment version that can leverage tokens to handle your distributed computing requests. The live network is for everyone in the industry, including individuals and research

organizations and businesses. This phase can be broken down into several detailed steps depending on the classification of the project that will actually be applied to the platform. This is to avoid many of the risks that may arise if multiple large application projects are running simultaneously.

- A. Application category management by category (step-by-step), perhaps the start will be in the areas of scientific computing and deep learning. (Application Category Management)
- B. Supports community activities by strengthening the authentication and information security level of CONUN and by implementing a system that manages whether the platform works effectively according to the level of user participation. (Security & Reputation Management)
- C. Establish a management system that can monitor user activity and job processing status of CONUN. (Resource Monitoring)
- D. CONUN Supports network services where communities can be created and operated. (Community Network)

■ Phase 4: Mobile Cluster (2022)

By developing mobile grid system architectures and frameworks that enable distributed computing work on mobile devices, they also form a single network that is integrated with existing desktop grid platforms.

- A. Develop an architecture and framework for deploying tasks to multiple mobile devices and using them as compute nodes.
- B. Build mobile application governance and develop user interface.
- C. Integrate the desktop grid system with the mobile grid system.
- D. Now an environment is in place in which individuals can leverage computing resources from their desktop and mobile devices.

6. Safety and Security

A distributed computing environment is a complex structure that allows remote access to computing resources such as desktop computers, mobile devices, and workstations over the Internet. These environments, as well as others, can be exposed to security risks from malicious threats.

We know that we have to do risk management. This means that every activity on the CONUN platform must create a responsible security culture that can be done safely and transparently. This is to ensure that the computers of individual computing resource providers are secure and that the data and information of application users are protected by security threats.

We will design and operate systems to implement anti-fraud policies and systems for risk management and to protect systems from malicious hackers. This is accomplished by properly performing security policies, authorization and authentication operations that can detect, disassociate, block, and exit dishonest nodes from all nodes participating in the platform and keep private information private.

The security system basically applies password-based authentication & authentication systems that operate based on password-based authentication and tickets to ensure the integrity and confidentiality of data processed in the platform, and apply VO Level Systems, which provides integrated authorization services for virtual organizations, and Resource Level Systems authentication system, to grant access to resource sets. And in the execution area of the application, it will protect the user area by implementing a safe and isolated execution environment based on the sandboxed virtual system.

It takes a lot of steps to provide a secure, distributed computing environment for users, and building an environment where trusted external applications can run on desktop computers is a very important part. We are deeply aware of the importance of safety and security that we are concerned with and we will continue our research and development efforts regardless of each stage of development.

7. Blockchain Token

Our core service area will be a horizontally distributed desktop computing system platform that will serve the ecosystem to perform all applications requiring high performance computing at low cost, as shown in our application examples. We are also planning a related service that will enable us to create a second added value by leveraging our CONUN platform.

- Cryptocurrency Exchange, Continuing profit-making business for long-term business of CONUN, and additional service of the exchange with CONUN token.
- Commerce using CONUN's crypto token in a large online/offline designated shopping mall.
- Services that can attract advertisers to interact with platform members and earn revenue by viewing and participating in advertisements.
- Services that allow members to earn additional revenue by participating in surveys for research and development purposes.

8. Disclaimer

This document is intended only as a guide to provide information to help those interested in using the CONUN platform service. The contents of this document are irrelevant to any investment proposal or investment advisory purpose and cannot be construed as a contract for the sale or purchase of any of the CONUN tokens. If necessary, users are strongly recommended to seek advice from a legal or financial expert.

The statements, estimates, and conclusions set forth in this document may cause inconsistent results to be expected, and there may be technical inaccuracies or typographical errors, so nothing posted will guarantee accuracy. This document may be updated or revised and the latest version of the document will replace the contents of the previous version, and we are under no obligation to notify any changes or revises.

The users are responsible for purchasing, receiving and retaining the CONUN token at users' own discretion, deciding whether to use or resell it through the Service, and shall be exclusively responsible for the benefits, losses, and tax related assessment..

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