Bonus Cloud

The next generation infrastructure driven by blockchain

White Paper

2018 Version 1.1

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All contributions will be applied towards the advancing, promoting the research, design and development of, and advocacy for a blockchain-based infrastructure level platform and ecosystem which would seek to solve the existing systemic issues with the cloud computing industry, such as lack of industry standards, black box operating environments, and excessively high cost. The Foundation, the Distributor and their various affiliates would develop, manage and operate the BonusCloud Platform.

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Executive Summary

Social development goes hand in hand with that of human civilisation which is increasingly evolving towards trust and cooperation. Thanks to rapid development of computer technology, rules in many fields have been data-centric and digitalised, become more and more clear and easily duplicated, which increases social effectiveness.

The ecological impact and data credibility driven by Blockchain technology enhances trust and coordination to a higher standard and also aligns with social expectation towards trust and coordination.

The BonusCloud team aims to develop a decentralized, trustworthy global platform infrastructure combining Blockchain and cloud computing technology, which is the foundation for an open-ended shared ecosystem the BonusCloud team endeavors to build. Through connecting and utilizing each kind of resources with computing capability and converting them into digital assets value, the resulting DApp empowers entrepreneurs who intend to utilize Blockchain applications.

Through developing a global trading platform for the computing power, the BonusCloud Platform could effectively connect such global computing resources as present cloud computing platforms, enterprise data centers, personal computers and individual CPU/GPU/bandwidth. With millions of resource contributors, platform users and developers, The BonusCloud Platform can also provide trustworthy cloud computing platform services with ultra-low price, ultra-wide range and ultra-strong computing power, which reshapes business model and resources distribution structure of traditional centralized cloud computing. As a computing power resources platform, the BonusCloud Platform is featured with distributed, low-latency and intelligent, enjoying bright prospect in such industries as network access, data storage, digital currency mining, 3D rendering, live video stream decoding, AI learning and IoT protection, AR and VR. The BonusCloud Platform is closer to the device end, not only contributes to collection of data at the cloud end, but also has the upper hand in real-time data analysis in short cycle and intelligent processing, so as to better support timely processing and execution of local business and generate a more efficient and safe computing service. On the basis of this brand-new distributed computing platform, the BonusCloud team could develop a DApp store, so as to create an application ecosystem that is based on distributed computing and peripheral computing, and to create substantial social and economic value.

Executive Summary

Currently BonusCloud has completed 50% of coding for basic Blockchain service and completed small prototype verification of network test. Relevant functions will be released step by step. In parallel, BonusCloud began to develop computing resource framework combining container and Blockchain technology and prototype of resource scheduling.

Currently the BonusCloud Platform has completed 50% of coding for basic Blockchain services and completed small prototype verification of its network test. Relevant functions will be released step by step. In parallel, the BonusCloud team has begun to develop a computing resource framework combining container and Blockchain technology and prototype of resource scheduling.

Introduction about Background

1. Cloud Computing Platform

According to National Institute of Standards and Technology (NIST), cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.

That is to say, cloud computing offers IT infrastructure resources and capability, and decouples them with devices, thus achieving the experience of rapid delivery and application. Meanwhile, cloud computing alters the Capex model of traditional IT into OPEX model, thereby minimizing consumed cash flow for enterprises. This especially provides a friendly supply model for unexpected resource demands.

2. Centralized Cloud Computing Platform

Due to huge initial investment in cloud computing industry, it becomes a game among tycoon players, which caused many issues.

Lack of industry standards

Suppliers of cloud computing industry are mostly tycoon players in the big game. From the perspective of commercial value, each player wants to set the industry standard, so each cloud computing supplier has their own set of standards and systems for the users to define application standards. When users work with multiple platforms for the benefit of lower costs and higher stability, they have no choice but to adapt to the standards of multiple suppliers. Therefore, users have to bear the usage costs brought by competition among commercial products.

For upstream supply chain companies, they have to provide customized products for every tycoon to meet demands of their customers.

Black box operating environment

As a black-box environment offered to users, centralized cloud computing platform makes it impossible for users to keep their resources and applications in a reliable status. On the other hand, cloud computing enterprises tend to be intrusive to the resources of users due to the purpose of control and management. Under such an environment, there have been multiple examples of user data loss and application malfunction caused by cloud computing service providers' own bugs (e.g. certain public cloud's security products had deleted user files).

Introduction about background

Excessively high cost

Due to huge initial investments and multi-oligarch monopoly in the cloud computing industry, cloud computing vendors have strong pursuit of profitability. According to Amazon's financial statements, EBITDA (gross margin) of AWS reached almost 45% with operating margin of 25% (net profit). In terms of service model, cloud service providers could only meet resources usage and growth on a steady basis rather than temporary large-scale ones, as substantial investment cannot be rewarded in a timely manner due to uncertainty of resources usage. Therefore, current cloud computing platforms cannot meet the existing demands, causing a conflict between business and technology. But the repressed demand also has created a large blue ocean market.

3. Decentralized Cloud Computing Platform

Blockchain technology and its development give everyone a new trustworthy and collaborative ecosystem-model. And combination of Blockchain and cloud computing technology could solve issues in the centralized cloud computing platforms. A decentralized cloud computing platform is also an ideal application platform for future Blockchain DApps.

4. What is BonusCloud

Individual household networks have witnessed an evolution from ADSL to broad band and then fibre optic, and mobile network from 2G to 4G and 5G. While with increase of computing capability for common chips at user end and popularity of dedicated chip, difference of computing power between user end and server is not far from big. It is predicted that when internet access capability and terminal computing power further improves, user terminals and IDC servers in same region will not have any obvious difference, and when popularity of the related infrastructure has exceeded 20%, the industry will embrace an overall boom.

The BonusCloud team (BonusCloud.io) aims to develop a decentralized trustworthy global cloud computing platform to serve open and shared ecosystem platform in Blockchain application. The BonusCloud Platform connects and utilizes all resources with computing capability and converts them into valuable digital assets, so as to enable DApps to empower Blockchain application entrepreneurs.

Thanks to its computing power trading platform, the BonusCloud Platform could effectively connect such resources worldwide as current cloud computing, enterprise data centers, personal computers and CPU/GPU/bandwidth of user ends; it provides general computing services with an ultra-cheap price, huge scope and ultra-strong computing power to a range of industries, including network access, data storage, digital currency mining, 3D rendering, live video transcoding, AI learning and IoT protection. At the same time, the BonusCloud Platform will further promote development and upgrading of infrastructure through granting incentives to all the contributors in its ecosystem.

Technology Architecture

1. Next-Generation Blockchain (BonusChain)

In traditional cloud computing services, the matching of resource transactions and the distribution and execution of tasks are centered around the service provider in the form of centralization. However, at the beginning of its founding, the cloud computing and service was characterized by the distributed pattern. Compared with the distributed pattern of minicomputer and super computer, the traditional computing system is too centralized in the globalized Internet of today. But, the attendant consequence of this centralized resource service is the lack of information transparency and symmetry. The users are having difficulties in understanding the distribution and utilization patterns of resource and task in the cloud computing system. Besides various security risks, overbooking and other problems are also quite common.

The emergence of Blockchain technology, especially the Blockchain 2.0 represented by Ethereum, which extends the application scenes of through the smart contract mechanism operated by Ethereum Virtual Machine (EVM), and its characteristics of information transparency, openness and non-falsification provide a right solution to the problems facing traditional cloud computing.

The BonusCloud Platform can make further improvements based on this. On one hand, it can combine the virtualization technology of cloud computing with the Blockchain to enhance the functions of the Blockchain virtual machine to support more PaaS applications under the promise of ensuring its security. It can execute the smart contract as well as web application, storage application and computing application. Based on this, FaaS and Edge Computing can be developed with the virtualization technology of BonusChain. On the other hand, it stores all the transaction information and resource information into the Blockchain where the users can inquire and audit freely. Due to the differences in timeliness and data volume generated through differences in information, BonusChain uses the pattern of combining both the main and side chains. The main chain is in charge of the making of contracts and recording of contract information and other core content, while one or multiple side chains are in charge of recording resource information, log information and other forms of content with large data volume and low timeliness. The side chains can apply different technologies, such as DAG, different to the main chain according to requirements.

[More technical details will be continuously updated]

Technology Architecture

2. Open Hardware Platform (BonusNode)

As an infrastructure platform for decentralized cloud computing, the BonusCloud Platform adopts a software and hardware decoupling scheme to achieve rapid iteration and open sharing. At hardware level, open-source and open hardware platform is used to adapt and verify terminal hardware, so as to maximize shared resources and develop an open platform.

The hardware adaption of the BonusCloud Platform is mainly divided into three types: Lite, Normal and Super. Different hardware plans apply to different application scenarios, which equip clients with different customers different platform capabilities.

Lite client (light client): for the fulfilling of light network-related assignments, lean client hardware, namely micro-controllers and household routers, is mainly applied in network access and measurement, data acquisition, test of mobile APP etc. With batched processing, it emphasizes on the distribution capability and access capability of terminals, has lower requirements of signal node stability. It mainly focuses on assignments with short cycle and light workload.

Normal client: general hardware, namely PC+GPU, engages in calculating assignments and are applied in calculation of HPC, deep learning and rendering. With batched processing, it emphasizes on calculating capability, assignment breakdown and deployment capability of terminals, and has average requirements of signal node stability. It addresses assignments with short-period and heavy computing.

Super: represented by a Server scale setup, Super terminals have a wide range of application scenarios, as it mainly involves in network hub, fast storage access, scalable data processing and computing and enterprise applications. It tackles problems requiring enterprise-level service with real-time requirements, focuses on the stability of its terminal and rapid processing capability, and has strong demand for the stability of a single node. It is mainly deployed in IDC. It mainly addresses long-cycle and real-time enterprise service.

Users can choose hardware platform solutions based on their own requirements, develop and deliver their services, so as to flexibly allocate resources and rationalize utilization of resources.

Technology Architecture

3. Distributed Network (BonusNet)

The BonusCloud Platform endeavors to connect and utilize any qualified resources, so as to create a safe and reliable network that connects any resource is foundation for delivering all services.

BonusNet is a new internet-based cyberspace. In its cyberspace, independent basic components as DNS and Router could be designed. BonusNet adopts L2+L3 over Internet model, in which DHT framework, similar to the Kademlia protocol is adopted on the L2 layer, and encrypted tunnel protocol is used on L3 layer. It is supplemented by a new namespace addressing mode instead of the DNS protocol used on the Internet and provides compatible support to DNS agreement. With sufficient compatibility, a standard network space protocol, whether it is a public protocol (e.g. TCP/IP) or a user's private network protocol, can be seamlessly migrated from Internet cyberspace to BonusNet space.

Kademlia is a distributed hash table (DHT) communication protocol for decentralized peer-to-peer networks. A completely decentralized virtual or overlay network is formed out of the participant nodes. Each node is identified by a number or node ID. The node ID serves not only as identification, but the Kademlia algorithm uses it to locate values (usually file hashes or keywords).

Kademlia uses an XOR metric to define distance. Two node ID's or a node ID and a key are XORed and the result is the distance between them. For each bit, the XOR function returns zero if the two bits are equal and one if the two bits are different. The Kademlia network with 2's N-th power of nodes could only use a few steps to find searched node or value under the worst scenario.

Meanwhile, the upgrade of a Kademlia network node is featured by the maximizing of existing node information and ranging by time sequence. From an inspiration perspective, this means has a certain logic: a node that has been online for a longer time is more trustworthy, as it has been online for several hours, is more likely to be online for the next hour than for the node one has recently visited.

Technology Architecture
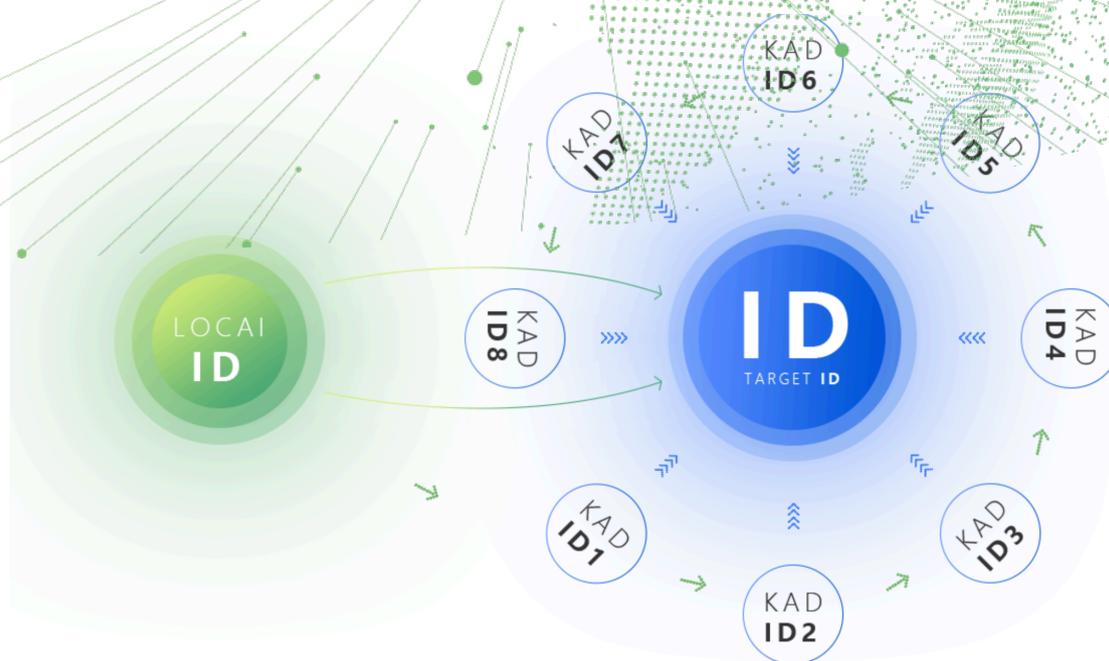
The decentralized network structure also has upper hand in being able to significantly improve anti-attack capability. Even if a whole batch of nodes in the network suffers from extensive attack, availability of network will not be affected. Through the bypassing of these loopholes (the attacked nodes) and rewiring the network, the network could restore its availability.

In Kademlia algorithm, distance of selected node has nothing to do with physical distance but XOR result, so selected nodes have higher chance of being located in different regions or even different countries. BonusNet introduced the concept of physical distance, which converges on physical distances every time a loop in neighboring nodes is found. At the same time, one could also divide and aggregate BonusNet based on features of the user's basic network, such as region, operator, etc., so as to provide more efficient and robust network access capability. In the transaction matching process, application users could raise selective requirements in certain area of network to workers, and resources with different characteristics could also be quoted differently.

Technology Architecture

In a traditional Kademlia network, connection between nodes is protected by private network protocols, and applications could not match and use the Kademlia network without altering transmission agreement. In order to develop more compatible application and to address issues of address management, data transmission security etc., The BonusCloud Platform develops an exclusive encrypted network on the basis of Kademlia network architecture, which adopts an IPv6 address to accommodate all nodes. All nodes are connected through an encrypted tunnel to ensure the security of transmitted data.

So, nodes of the BonusCloud Platform could all be connected to build a set of seamless network system in parallel with current basic one. Even if nodes are behind a NAT or a firewall, they can also break regional restrictions of user base network through the utilization of NAT penetration technology.
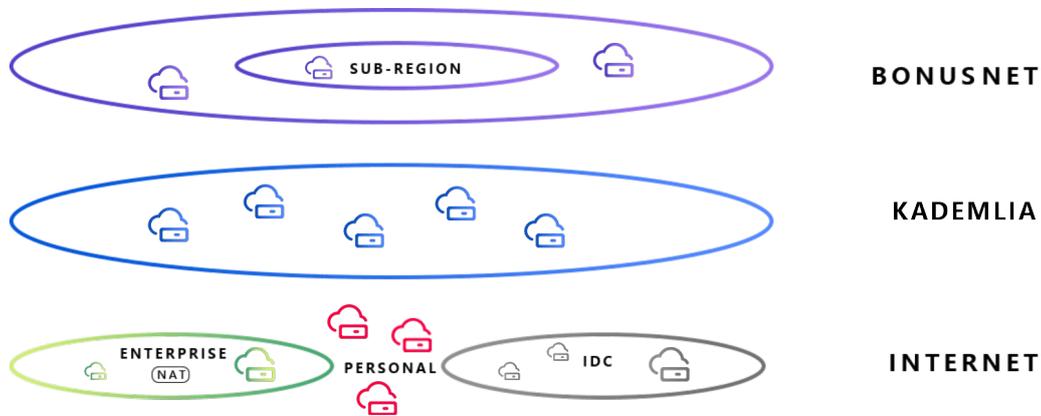
As the basic network of the BonusCloud Platform, BonusNet will act as a cornerstone for the cloud platform itself as well as platform application.

Technology Architecture

4. Distributed Computing Platform (BonusComputing)

Through the means of evolving and executing decentralization of centralized cloud platform software, the BonusCloud Platform relies on BonusNode to provide community with three different kinds of computing environments, which are BonusContainer, BonusAppEngine, and BonusServerless, so as to meet the requirements of different developers. Users may build DApps on their own or purchase DApps provided by application developers. The BonusCloud Platform is in charge of packaging DApp operating environment into Docker files, distributing them to the leased resource nodes securely and reliably based on directives of demand side, to activate and operate.
BonusVM, the virtual machine of BonusChain, is in charge of the lifecycle management and task allocation, so as to set up safe connections within BonusNet.

Although containers have fundamentally change means of development, package and application deployment, security remains one of the key issues in the usage of containers in public resource scheduling platforms. How application programs access system resources in traditional Linux containers is exactly the same as that of regular (non-contained) applications, which is directly deploying host kernel. The kernel runs in a privileged mode, allowing it to interact with the necessary hardware and returning results to the application. The kernel imposes some restrictions on the resources that an application can access by using Linux control groups (cgroup) and namespaces, but not all resources can be controlled through this mechanism. In addition, even with such limitations, the kernel still faces big exposure of being attacked, which can be directly attacked by malware.

To improve container isolation, it could make each container operate within its own virtual machine, being completely isolated from the host. Even there are loopholes in guest system, programs in virtual machines could still isolate itself from host and other programs/ containers on it. Container technology of the BonusCloud Platform allows the one with virtual isolation technology to have isolation and security features at virtual machine level as well as maintain flexibility and performance at container level.

Image registry is used to store and distribute Docker images uploaded by users, which is not essentially a centralized repository, but only provides interfaces for uploading and downloading. In such a distributed computing environment as the BonusCloud Platform, a centralized image storage and distribution is unable to meet system requirements. Therefore, the image registry relies on the distributed storage service provided by the BonusCloud Platform, and combines technologies such as intelligent compression, intelligent flow control, and P2P distribution to achieve low-latency accelerated distribution of images.

Technology Architecture

BonusContainer

BonusContainer provides container resource services, mainly meeting requirements of resource usage from users. Users can apply for designated case of CPU, memory, and storage specifications. The platform selects the most suitable computing node to run the container through scheduling. With BonusContainer, users will firstly upload Docker image to BonusRegistry, and then select the image name and label from BonusRegistry to create registry. Users can choose certain scheduling policy, such as geographic location, affinity, resource requirements, etc. BonusController will select the most suitable node to create resources based on user scheduling requirements.

Advantage of BonusContainer:

Security	Runs in an exclusive kernel, and provides isolation of CPU, memory, network, and IO. Strong hardware isolation can be achieved through the usage of virtualized VT extensions.
Compatibility	Supports OCI container format, industry standards of Kubernetes CRI interface, as well as traditional virtualization technologies.
Simplicity	No need to embed an operating container in a completely virtual machine, usage method is similar to Docker.
Performance	Performance is aligned with that of Linux container.

Technology Architecture

BonusAppEngine

BonusContainer is applicable for users with certain container usage background. It requires users to create a container image in a certain format and determines means of utilizing resources. It is the most flexible computing environment with certain technical threshold. In order to make it easier for application developers to use the platform, the BonusCloud Platform also provides BonusAppEngine function, which is a DApp application runtime sandbox. Users can use the SDKs in different languages provided by the BonusCloud Platform and upload the coded program to platform.

BonusAppEngine has the following characteristics:

I.   It supports mainstream programming languages: it could run Java, Node.js, Ruby, Go, Python, PHP to code applications.

II. Easy to use: thanks to BonusAppEngine, developers could only focus on coding, rather than infrastructure. BonusAppEngine could fully manage traffic change of application, balanced loading, monitoring of system running, failure recovery and automatic updates of the infrastructure.

III. Control of version and A/B Test. Different versions can be released on grayscale to complete A/B test.

BonusServerless

In comparison with BonusAppEngine, BonusServerless has more advanced features, which could provide operation environment for functional-level programs, support business logic and forward network requests to user-defined functions by means of network requests.

Advantages of BonusServerless:

I.   No need to manage servers, as it can achieve flexible scale-up, highly automated expansion of capacity and recovery of failure.

II. More granular billing, better control of cost, and no need to pay for idle time of AppEngine in comparison with BonusAppEngine.

III. Provide third-party tools and open source project ecosystems to simplify the buildup, test and deployment of development and production process.

Technology Architecture

5. Distributed Storage (BonusStorage)

For the convenience of app developers and community users, the BonusCloud Platform provides distributed node-based BOS (BonusObjectStorage) and will launch BonusBlockStorage (BBS) services in the following plan. With regards to platform design, BOS focuses on scale of data storage, while BBS focuses on latency of data processing, both of which have certain difference in design and utilization of bottom-level resources. There would be certain difference between the two in design and resource utilization at underlying layer.

There are two mainstream means of data distribution in distributed storage system, which are hash distribution, such as Kademlia DHT, Amazon Dynamo, etc., and central node-based distribution, such as google GFS, Hadoop HDFS. At implementation level, object storage and KV storage generally adopt hash distribution ratio, while block storage and distributed database often use central node distribution. BonusStorage could support two data distribution strategies, as well as negotiate during resource request at the same time.

Supported by BonusStorageEngines, the BonusCloud Platform provides different types of storage to serve BOS and BSS.
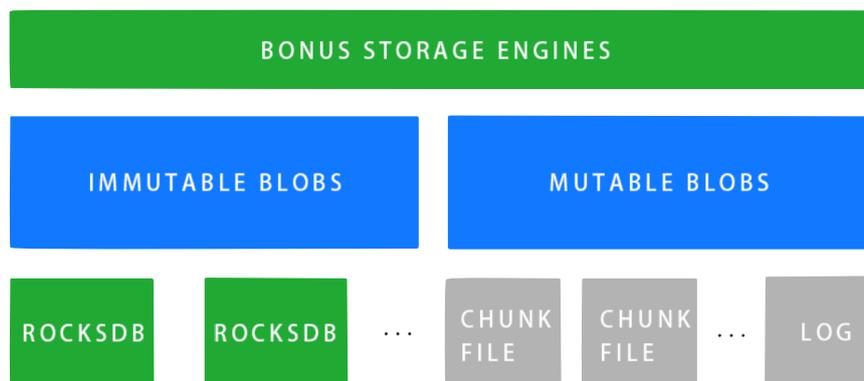
BonusStorageEngines supports two types of blob： immutable blob for BOS and mutable blob for BBS.

Object storage could be realized by one write and multiple read, so underlying level uses immutable blob, whose specific execution is to maintain a set of rocksdb on the local disk with key of the blob's hash value.

Technology Architecture

Block storage is required to support random read and write, so the underlying level uses a mutable blob, supported through a set of chunk files and logs. Each chunk file matches with certain chunk content of a volume and is required to maintain current version. Once each request is written, it has to be updated, and a log is used to record requests with focus on data checking and recovery.

BonusCloud Object Storage (BOS)

BOS Storage Model

BOS provides decentralized and encrypted object storage services. On the client terminal of BonusStorage, if an object (file) is to be stored, the terminal will first be encrypted on the client, and then split into multiple immutable blob-data. The check block blob-code of the erasure code will be calculated according to the blob-data, and then the data blob and the check blob will be stored in the BonusStorage with the hash value of the blob as the key. This set of blobs will be stored in a combination of multiple instances and erasure codes in the BonusStorage. Specific strategies will be negotiated at the time of creation.
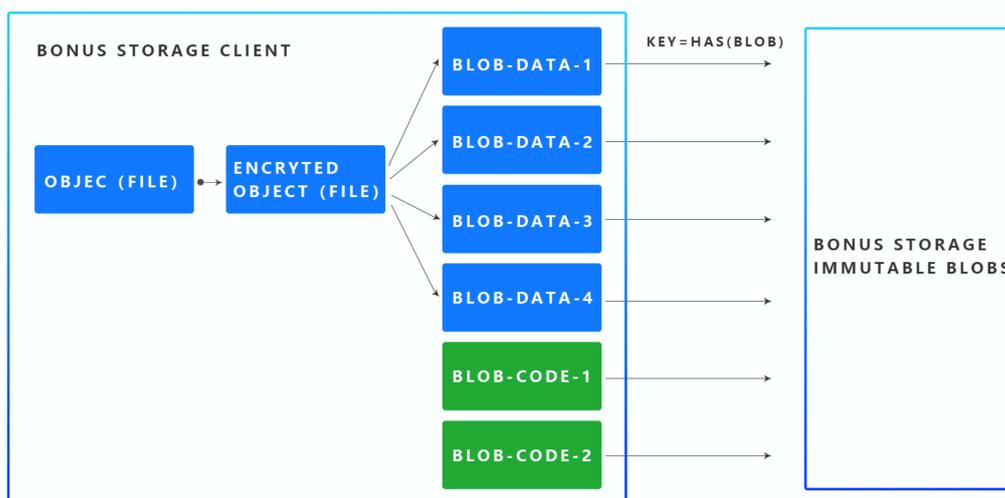
Technology Architecture

BOS Data Distribution

Business scenarios of BOS cover PCDN distribution, standard types, low frequency types and archived types, which combines traditional CDN and cloud object storage capability, and supports flexible conversion.

The BonusCloud Platform supports three hardware solutions. Different workers will be allocated to support different scenarios matched according to their different storage and bandwidth capabilities.
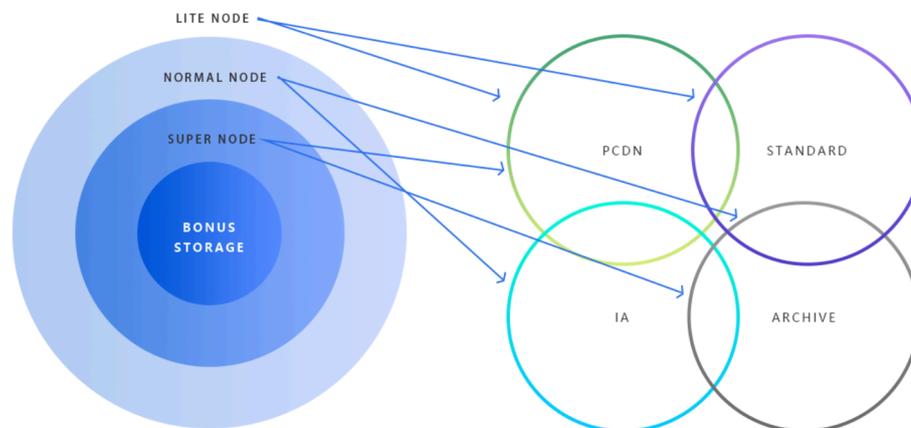

When BonusStorage client uploads an object, it could designate storage type and change it later during the process of converting object storage type.

Technology Architecture

6. Ecosystem Model

The BonusCloud Platform will develop a bilateral (multi-lateral) ecosystem, which is composed out of workers, bookkeepers, application developers, application users, and resource trading platforms. Bilateral market will lead to "bilateral network effect" which is cross-side network effect: the value captured by users at one side of market will depend on number of users on the other side. Take the example of Uber's business model, the user value of passengers depends on the number of drivers (the more drivers they attract, the shorter time of idling while driving, hence the higher incomes they will generate). The two sides promote each other to amplify the network effect. Therefore, in the ecosystem of the future, first of all, the BonusCloud team will focus on supply increase, such as increase of the number of workers as resources suppliers and their online time, incentivizing bookkeepers and application developers to provide more sound, transparent and diversified products and services. Secondly, efforts will be made to stimulate user demand by means of marketing and penetration in global market, with the goal of mutual promotion of supply and demand, development effect of scale during competition and forming of competitive barriers. The whole ecosystem of the BonusCloud Platform is an economic system. The BonusCloud team would focus on increasing the overall activity in the economic system.
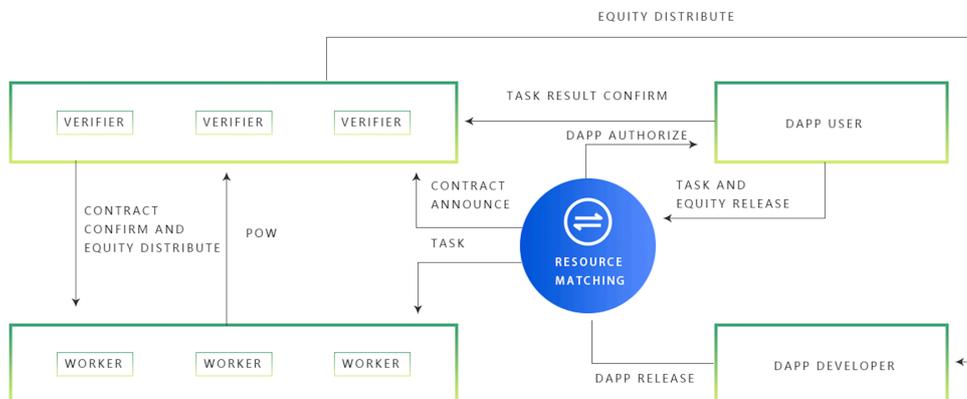
Technology Architecture

There are several roles in ecosystem of the BonusCloud Platform: :

Workers

Workers are contributors of basic resources of the BonusCloud Platform with specific computing capability, storage, network and other resources. After tasks are released on trade matching platform, workers whose current idle resources can meet the conditions of application users will compete for the tasks.

Through the execution of DApps, workers are paid in BxC to complete tasks. Newly joined workers and veteran workers will have different remuneration algorithms. The remuneration of workers will be deducted, if their nodes are interrupted abnormally. They will be fined through the deduction of their remuneration or lowering of their probability to receive new assignments.

Based on different levels of resources (lite, normal and super), workers can receive different types of tasks and obtain different incentives depending on the level of resources they provide (lite client, normal client, and hyper client).

In addition to having the remuneration paid by application users, workers could play the role of a bookkeeper to obtain further remuneration.

Bookkeepers

Bookkeepers are responsible for identifying the rights of application developers and accountable for each transaction. Bookkeepers communicate block content and hash values with other bookkeepers who will verify them before putting them into the chain.

After workers are assigned with tasks, bookkeepers are responsible for registering task information in the chain and opening service IP and port to application users. After the task is completed, workers provide proof of work to the bookkeeper to prove their workload. Then bookkeepers notify application users to check the work proof record provided by the workers and confirm the completion of the application.

After workers have completed the task, bookkeepers account for the payments due to the worker, for the payment of the application users, and assign the corresponding payments to application developers and account for the corresponding payments based on the service contribution and the quality of service provided by the worker and the smart contract. Bookkeepers will also be incentivized with BxC correspondingly in proportion to the work performed.

Technology Architecture

Application Developers

As important participants in the BonusCloud Platform, application developers develop DApps with various functions based on resources and services provided by the BonusCloud Platform, package DApps into a Docker image to complete all preparations before distribution. DApp usage payment is determined by a system algorithm and is written into a smart contract when the DApp is used. Once application users are authorized to use it, BxC payments will be transferred from user account to developer account. Quality and usage of the DApp represent contribution of the DApp to the community, which will affect calculation results of DApp's usage remuneration.

Application Users

Once application users are authorized by application developers to use, they can release resources and computing assignments according to the actual needs, including requirements of resource allocation for assignments and price. Application users submit a container image that contains assignment requirement to resource platform and spend the corresponding amount of BxC required to complete these tasks.

Resource Trading

The BonusCloud Platform is responsible for matching transactions between application users and workers. The workers or application users publish the resources they are about to rent or lease and the corresponding BxC quotations for the collection / payment on the resource trading platform, and the BonusCloud Platform helps both the buyers and the sellers to complete the match quickly. Once the transaction is approved by both parties, the smart contract will be triggered automatically to ensure fairness in the transaction. Depends on the different application types, the factors that affect the quotation include but is not limited to the floating-point operand, the occupied storage space, memory space usage in a unit of time and traffic flow usage in a unit of time, etc. User factors and random factors will also be introduced in the transaction matching to ensure a certain randomness and distribution, so that the task assignment is not too centralized.

In each transaction match, the resource trading platform will charge 1% of the transaction amount as the technological service fee (payable in BxC) to support the development of the Foundation.

Technology Architecture

Developer Incentive Protocol

The BonusCloud Platform provides developer incentive protocol (DIP) to DApp developers. DApp that reached certain contribution levels in the recent cycle (including number of usage, number of users etc.,) will be chosen between a certain number of blocks, so as to incentivize its developers. Newly released DApps and existing DApps will have different incentivization strategy to reach different results. With the help of DIP's incentive mechanism, more developers will be continuously encouraged to create DApps with more utility value, so as to develop forward feedback facing developer community.

Consensus Algorithm

The BonusCloud Platform adopts a hybrid consensus algorithm of DPoS+PBFT. Bookkeepers are regularly elected by workers according to their contribution value. Contribution value is calculated based on a series of factors (such as computing capability, network bandwidth capacity, transferred data amount size, data storage capacity, data storage time and node health, etc.). When they become bookkeepers, the value of some factors will be cleared to encourage them to keep providing services for application users in the next period. Bookkeepers will turn over a certain amount of stakes as a margin which will be returned once they are no longer a verifier. But if they are proved to have committed any malicious conduct, the margin will be held in the token pool to be distributed as community incentives for contributions. When the bookkeeper election is completed, the list of current bookkeepers will be randomly sorted (to ensure that the order of each round of bookkeepers is different, and that the next round cannot be predicted), and then each bookkeeper will create a block successively. If the bookkeeper has the right to account for this round but is not online, the right to account will be handed over to the next bookkeeper in sequence. This will not result in any deduction of the margin but will be recorded as a related factor for the next election.

Technology Architecture

Based on the analysis above, the system consensus protocol workflow is as below:

I.   Verifier Registration

To register, verifiers are required to provide margin, Vb. The margin must be greater than the minimum margin parameter set by the system, B_Min. At any time, the party who register may exit from the registration, but the margin will have a waiting period, which is normally set as one month. The contribution value of verifier who runs for election is Vc.

II.   Equity Holders Vote to Elect Verifier

Token holders can vote on verifiers. If the weight generated by the voters is St, the ranking weight of the verifier would be Wc= St*Vc. If the verifier does not obtain any votes, its weight is Wc=0.

III. Campaign of Qualified Verifier

The verification nodes for registration are kept in a table that lists n higher ranked Bookkeepers sorted according to weight. They are the qualified bookkeepers and the ones who can participate in the competition of generating blocks. For those who are qualified as Bookkeepers, there will be an eligible deduction of their contribution value, Vc.

IV.   Qualified Bookkeepers Package Deal

With the parent block header hash value Hp, the current transaction Merkle root Hm and the timestamp T, a nonce generates the candidate block header hash, Hn, and then broadcasts a proposed transaction. Each qualified verifier can only send one proposed transaction per round, anybody who sends proposed transactions repeatedly in the same round will be considered to be a malicious node. If reported, the margin will be confiscated. Only if the system has not reached a consensus within a certain period of time (the system's consensus timeout parameters), can the qualified verifier change the nonce to regenerate the hash value of a new block and initiate the proposed transaction.

Technology Architecture

V. Confirmation of Transaction Information

After every qualified verifier has received the proposed transaction, other Bookkeepers will first verify the node that initiates the proposed transaction and the transaction in the block. After verification, the verifier will calculate a voting weight value, Vw, vote on the proposed transaction that corresponds to the highest current Vw, and initiate the Vote Block message. The original proposer will initiate the Commit Request message after receiving the Vote Block message from more than 2/8 of the Bookkeepers. Each verification node will verify whether the Vote Block message corresponding to the Commit Request message exceeds 2/3. If it does, the commitment of the Commit Request message will be carried out and broadcast. Each qualified verification node will broadcast the New Height transaction after receiving more than 2/3 commit transactions. Each node will confirm the transaction and update the respective local Blockchain after receiving the New Height transaction. The New Height transaction also allows the new block to be confirmed and not to be forked before the block. For the avoidance of doubt, only bookkeepers who have participated in the consensus would receive token incentives.

VI. Contribution of node:

Letter P represents device contribution, P includes online contribution of P_O and contribution of device assignment P_T, in which P_T is the sum of on-grid contribution of assignment P_W and completion contribution of assignment P_B, weight of online contribution is W_O and weight of assignment contribution is W_T. As for designated user X, total contribution of user X is $P^X = W_O P_O + W_T P_T = W_O P_O + W_T (P_W + P_B)$. Continuously online devices could accumulate online contribution P_O without interruption and will be benefited by the same amount of share generated by new block at this stage, based on P_O's current percentage in the overall network after a phased block is generated. Meanwhile, Power value is used to express difference of different hardware cost, energy consumption and computing capability. So with different power at different types of node, accumulated speed of P_O will be different too.

Technology Architecture

T is a function of CPU's usage (C), memory usage (M), bandwidth usage (B), storage space usage (D), so current contribution of this transaction is $P_W = P(C, M, B, D)$

Taking the block generation time as the unit time, if its starting time is set as t_0^S, the current time is t^S, if certain device serves several applications at the same time, contribution of overall device at the moment of t is sum of contribution from all assignments which is

$$P^x(t) = \Sigma P^x(t^S, t_0^S)$$

Application Scenarios

Performance Monitor and Pressure Test

Enterprise-level clients are provided with an application performance monitor, network performance monitor and APP and Web (with IP node on independent public network) pressure test capability, via large-scale monitoring and testing network composed out of agent applications distributed on periphery computing nodes.

P2P Computing and Cloud Storage

On-demand and elastic content/storage/application distributed architecture is called as CDN-aaS. Users who voluntarily connect to periphery computing node devices provide services for media content sharing and distributed encrypted file storage and obtain quantifiable remuneration through the means of sharing idle computing capability and providing storage resources and network bandwidth.

VPN Periphery Access

Users run a heterogeneous-platform-compatible client application on the edge node of the voluntary connection, which is connected to the cloud and is encrypted in communication. The edge nodes are used as CPE devices that make up the SD-WAN. Users with high bandwidth can cluster as a super node through the sharing of bandwidth.

Application Scenarios

IoT Data Aggregation Analysis

Traditional cloud computing modes can send out computing directives, and then the centralized back-office will operate and respond to the results, which can meet most of the application scenarios other than applications that require real-time responses within the millisecond. With the current cloud computing mode, data will be passed on to the cloud over thousands of kilometers away through the delayed and jittering network within an uncontrollable distance, and results will be passed back after computation is completed. This obviously cannot meet the needs of real-time computing applications. But if the network, computing, storage, application and data that are close to the device end can be combined, the result would be a real-time compatible response.

Peripheral computing applications adopt processing power of IoT devices to filter, pre-process, aggregate or score IoT data, and leverages on strong computing power and flexibility of cloud services to run complex analytics on those data.

Public Chain Carrying

Public chains of Blockchains need to be deployed in decentralized distributed platforms, such as BTC and ETH, which is also the initial form of Blockchain. But so far there is no decentralized platform to support the deployment and operation of public chains. From observation of the current market situation, many public chain enterprises and teams are faced with this problem, and some of them have tried to solve the problem through distributing devices of their own. However, this deployment mode undoubtedly increases the costs of investment and operation of public chains. Consequently, decentralized cloud computing platform is well positioned to address the issues of distributed deployment and operation within public chains. DApps now and in the future will also face the same problems as the public chains of today.

With booming of Blockchain industry, it is necessary to put a decentralized cloud computing platform into place to provide solid support, so as to equip DApp with rapid deployment, testing and release capability.

Distribution Plan

The native digital cryptographically-secured utility token of the BonusCloud Platform is a major component of the ecosystem on the BonusCloud Platform, and is designed to be used solely as the primary token on the platform. As a project with huge customer value, significant application value and market potential, the minting process of the BonusCloud Platform has strong relevance with its economic application value. Each token may be exchanged for a certain computed value of service offering, and its utility value will gradually increase with increased difficulty of service offering, increase of number of workers, gradual advancement of the community and increasingly growth of related applications.

The name of the token to be issued is BxC. The Distributor which issues and sells BxC shall be an affiliate of the Foundation. The Distributor shall issue a total number of 7 billion BxCs, 40% of it will be allocated to the community through incentives, 20% to the team, 10% as development reserve fund, 30% will be allocated to strategic partners and well-known institutions through token subscription.

Use	Proportion	Number (BxC)	Memo
Institutions	20%	1.4 billion	It will be unlocked evenly by quarter in 1 year.
Strategic Partners	10%	0.7 billion	35% will be unlocked after listing, the rest will be unlocked evenly by quarter in 1 year.
Incentives	40%	2.8 billion	It will be unlocked evenly within 4 years.
Founding Team	20%	1.4 billion	It will be unlocked evenly by quarter in 3 years.
BonusCloud Foundation and Ecosystem	10%	0.7 billion	It will be unlocked after listing.

Distribution Plan

BxC is a non-refundable functional utility token which will be used as the unit of exchange between participants on the BonusCloud Platform. The goal of introducing BxC is to provide a convenient and secure mode of payment and settlement between participants who interact within the ecosystem on the BonusCloud Platform. BxC does not in any way represent any shareholding, participation, right, title, or interest in the Foundation, the Distributor its affiliates, or any other company, enterprise or undertaking, nor will BxC entitle token holders to any promise of fees, dividends, revenue, profits or investment returns, and are not intended to constitute securities in Singapore or any relevant jurisdiction. BxC may only be utilized on the BonusCloud Platform, and ownership of BxC carries no rights, express or implied, other than the right to use BxC as a means to enable usage of and interaction within the BonusCloud Platform.

BxC would also provide the economic incentives which will be consumed to encourage participants to contribute and maintain the ecosystem on the BonusCloud Platform. Users of the BonusCloud Platform and/or holders of BxC which did not actively participate will not receive any BxC incentives. BxC is an integral and indispensable part of the BonusCloud Platform, because without BxC, there would be no incentive for users to expend resources to participate in activities or provide services for the benefit of the entire ecosystem on the BonusCloud Platform.

In particular, it is highlighted that BxC:

(a) is non-refundable and cannot be exchanged for cash (or its equivalent value in any other virtual currency) or any payment obligation by the Foundation, the Distributor or any affiliate;

(b) does not represent or confer on the token holder any right of any form with respect to the Foundation, the Distributor (or any of its affiliates), or its revenues or assets, including without limitation any right to receive future dividends, revenue, shares, ownership right or stake, share or security, any voting, distribution, redemption, liquidation, proprietary (including all forms of intellectual property or license rights), or other financial or legal rights or equivalent rights, or intellectual property rights or any other form of participation in or relating to the BonusCloud Platform, the Foundation, the Distributor and/or their service providers;
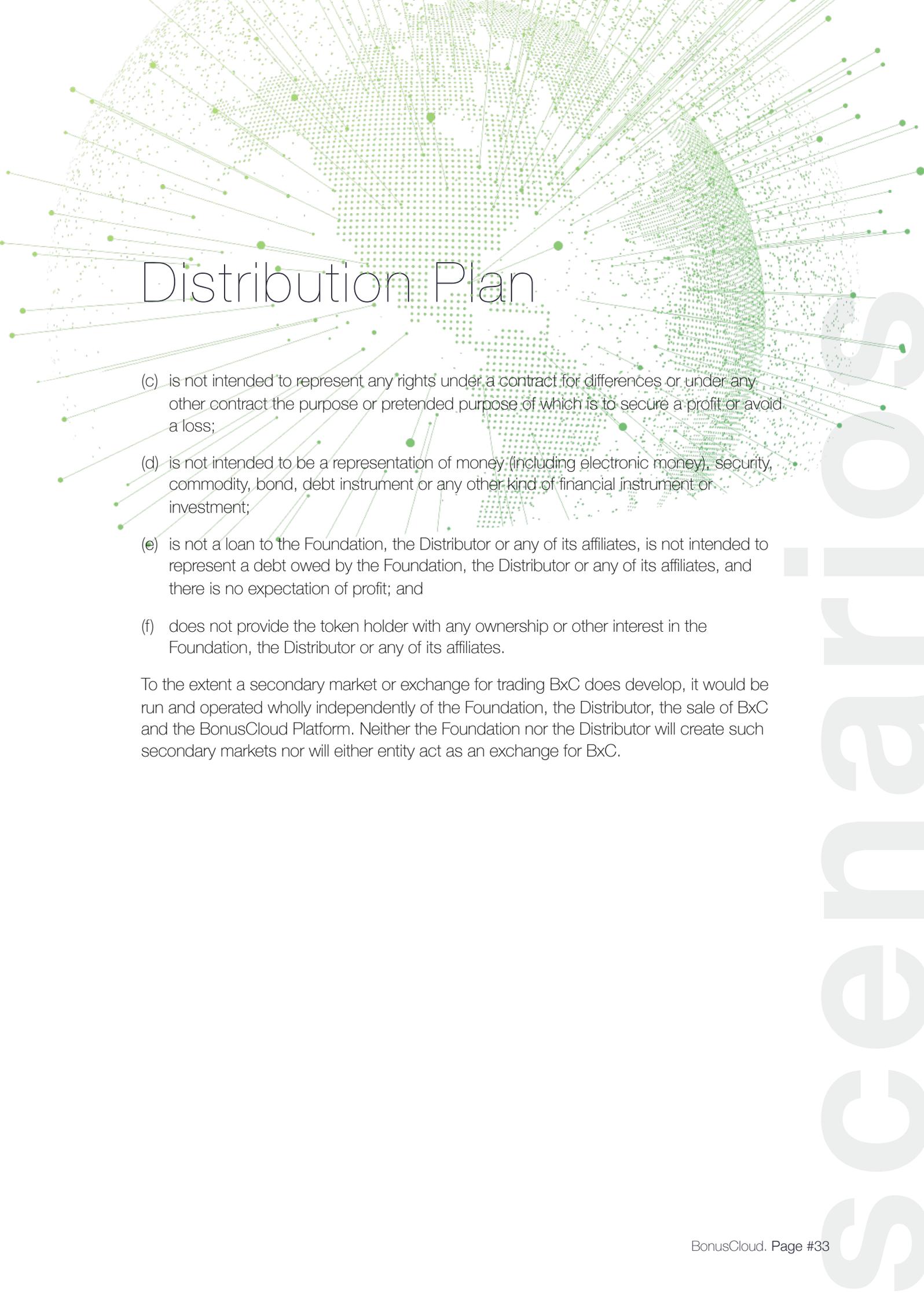
Distribution Plan

(c) is not intended to represent any rights under a contract for differences or under any other contract the purpose or pretended purpose of which is to secure a profit or avoid a loss;

(d) is not intended to be a representation of money (including electronic money), security, commodity, bond, debt instrument or any other kind of financial instrument or investment;

(e) is not a loan to the Foundation, the Distributor or any of its affiliates, is not intended to represent a debt owed by the Foundation, the Distributor or any of its affiliates, and there is no expectation of profit; and

(f) does not provide the token holder with any ownership or other interest in the Foundation, the Distributor or any of its affiliates.

To the extent a secondary market or exchange for trading BxC does develop, it would be run and operated wholly independently of the Foundation, the Distributor, the sale of BxC and the BonusCloud Platform. Neither the Foundation nor the Distributor will create such secondary markets nor will either entity act as an exchange for BxC.

Foundation and Team

Governance Mechanism

The BonusCloud Foundation is established by the strategic partners, the project executive committee, lawyers and treasurers, who shall coordinate with each other to oversee the development of the BonusCloud Platform, safeguarding assets and token assets through utilizing the multiple key signature mechanism of Blockchain. They shall jointly and transparently use assets, regularly declare to relevant regulatory bodies and disclose details to the public. Virtual tests and small-scaled tests at local level shall be conducted before the project is released. The project cannot be truly rolled out and executed without being proved successfully. A certain percentage of tokens shall be locked and distributed to community and market in stages.

The BonusCloud team shall set up BonusCloud Foundation overseas, acting as main body to oversee the development of the BonusCloud Platform, so as to standardize management of its technology development and application development.

The contributions in the token sale will be held by the Distributor (or its affiliate) after the token sale, and contributors will have no economic or legal right over or beneficial interest in these contributions or the assets of that entity after the token sale.

BonusCloud Founders

Psymon Li - CEO

Former CEO of Meituan Cloud, former director of Network Department of Alibaba, former chairman of Baidu System Technology Committee.

Grace Gao - COO

Former General manager of CISCO XaaS and Cloud Partner Greater China, former chief director of global technology strategy cooperation of Alibaba.

Sid Wong - CTO

Former CTO of Meituan Cloud, former director of network product research and development of Ali Cloud and Alipay.

Foundation and Team

BonusCloud Team

Sean Ley - System Operation Lead

Former head of SRE and Devops of Meituan Cloud, Meituan technical expert , former senior system engineer of Baidu.

Will Wong - Network R&D Lead

Former Meituan network and security technical expert，former senior network and security engineer of Sangfor.

Felix Ying - Blockchain R&D Lead

Former head of Storage team of Meituan Cloud. Meituan technical expert. Abundant experience in distributed systems and high concurrency systems.

Geiger Gao - Hardware R&D Lead

A senior IT industry expert with more than 15 years of experience in Information Communications Technology. He was responsible for planning and designing multiple carrier-level products.

Candice Chen Front-End Developer Lead

Former Meituan senior front-end developer, lecturer of Meituan Internet+ College, former senior front-end developer of iQIYI.

Foundation and Team

BonusCloud Team

Shawn Wong - Brand Lead

Senior brand public relations expert and public opinion big data expert, has many years of experience in the field of Internet marketing and new media communication.For SMG, Youku and dozens of first-line stars, many years of marketing public relations and public opinion big data services.

Di Lee - Marketing Lead

Senior media and digital currency mine construction expert, has many years of experience in media marketing, distribution and publicity, And has many years of mine construction, node deployment experience.

Yuqing Chen HRD

Former Meituan HRBP, worked in Baidu and Russell Reynolds Associates, expert in recruiting, compensation and benefit.

Sinan Wong Growth Lead

Former Meituan product operation expert, senior business analyst of Meituan Cloud.
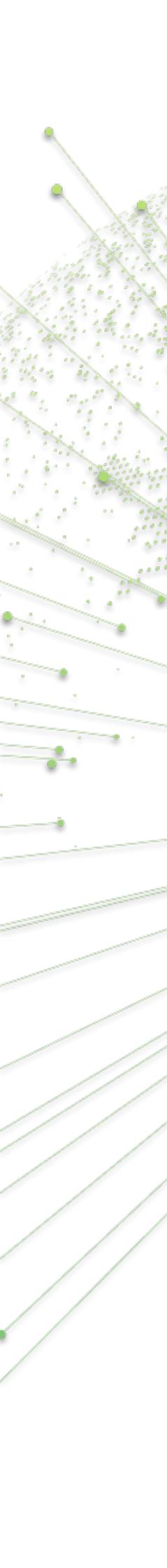
Foundation and Team

BonusCloud Advisor

Binsheng Wang, Consultant of Blockchain Development Organization, professor at Graduate School of Chinese Academy of Social Sciences.

Coly Li, Linux Kernel Maintainer, former founder of Taobao kernel team.
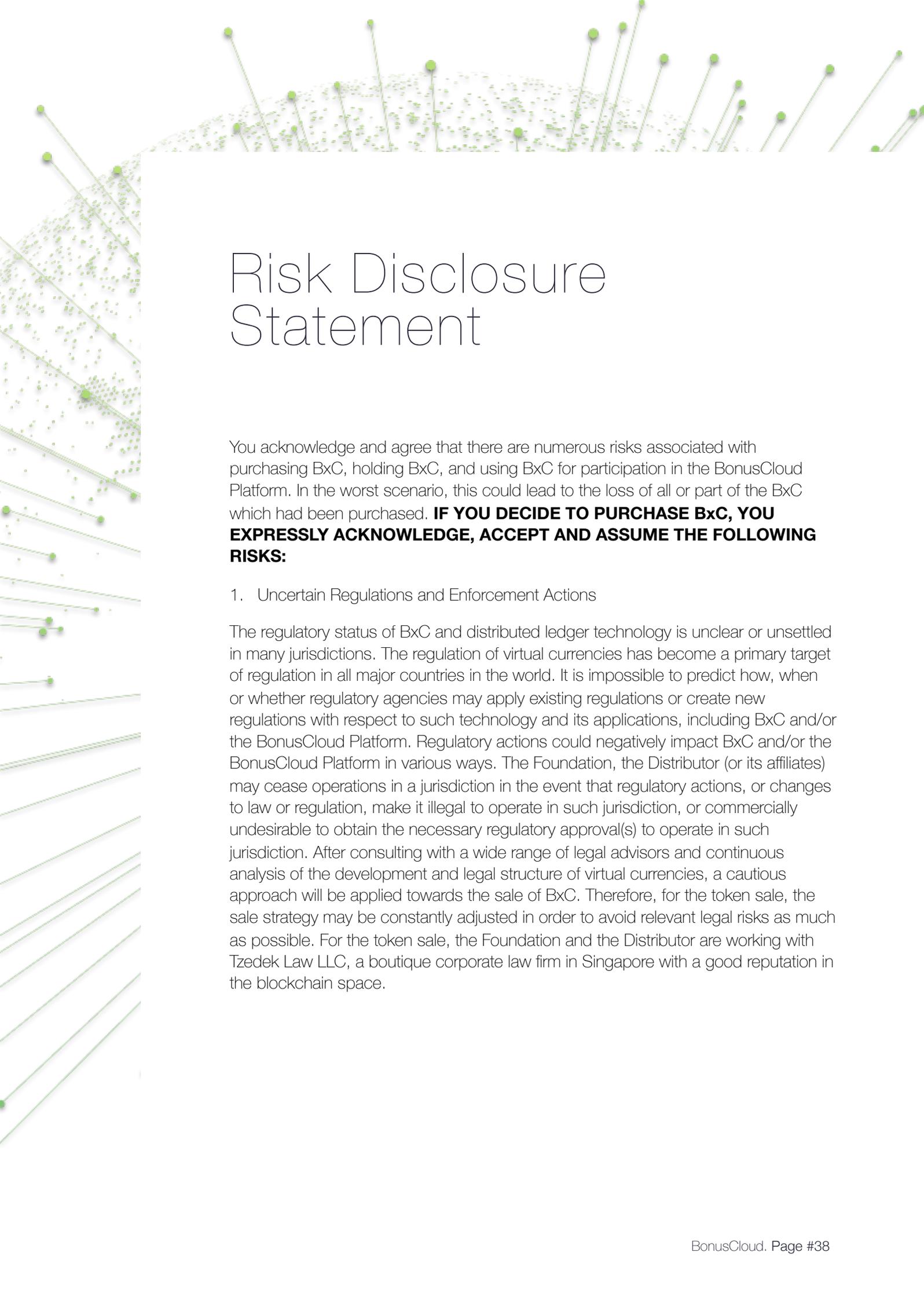
Risk Disclosure Statement

You acknowledge and agree that there are numerous risks associated with purchasing BxC, holding BxC, and using BxC for participation in the BonusCloud Platform. In the worst scenario, this could lead to the loss of all or part of the BxC which had been purchased. **IF YOU DECIDE TO PURCHASE BxC, YOU EXPRESSLY ACKNOWLEDGE, ACCEPT AND ASSUME THE FOLLOWING RISKS:**

1.   Uncertain Regulations and Enforcement Actions

The regulatory status of BxC and distributed ledger technology is unclear or unsettled in many jurisdictions. The regulation of virtual currencies has become a primary target of regulation in all major countries in the world. It is impossible to predict how, when or whether regulatory agencies may apply existing regulations or create new regulations with respect to such technology and its applications, including BxC and/or the BonusCloud Platform. Regulatory actions could negatively impact BxC and/or the BonusCloud Platform in various ways. The Foundation, the Distributor (or its affiliates) may cease operations in a jurisdiction in the event that regulatory actions, or changes to law or regulation, make it illegal to operate in such jurisdiction, or commercially undesirable to obtain the necessary regulatory approval(s) to operate in such jurisdiction. After consulting with a wide range of legal advisors and continuous analysis of the development and legal structure of virtual currencies, a cautious approach will be applied towards the sale of BxC. Therefore, for the token sale, the sale strategy may be constantly adjusted in order to avoid relevant legal risks as much as possible. For the token sale, the Foundation and the Distributor are working with Tzedek Law LLC, a boutique corporate law firm in Singapore with a good reputation in the blockchain space.
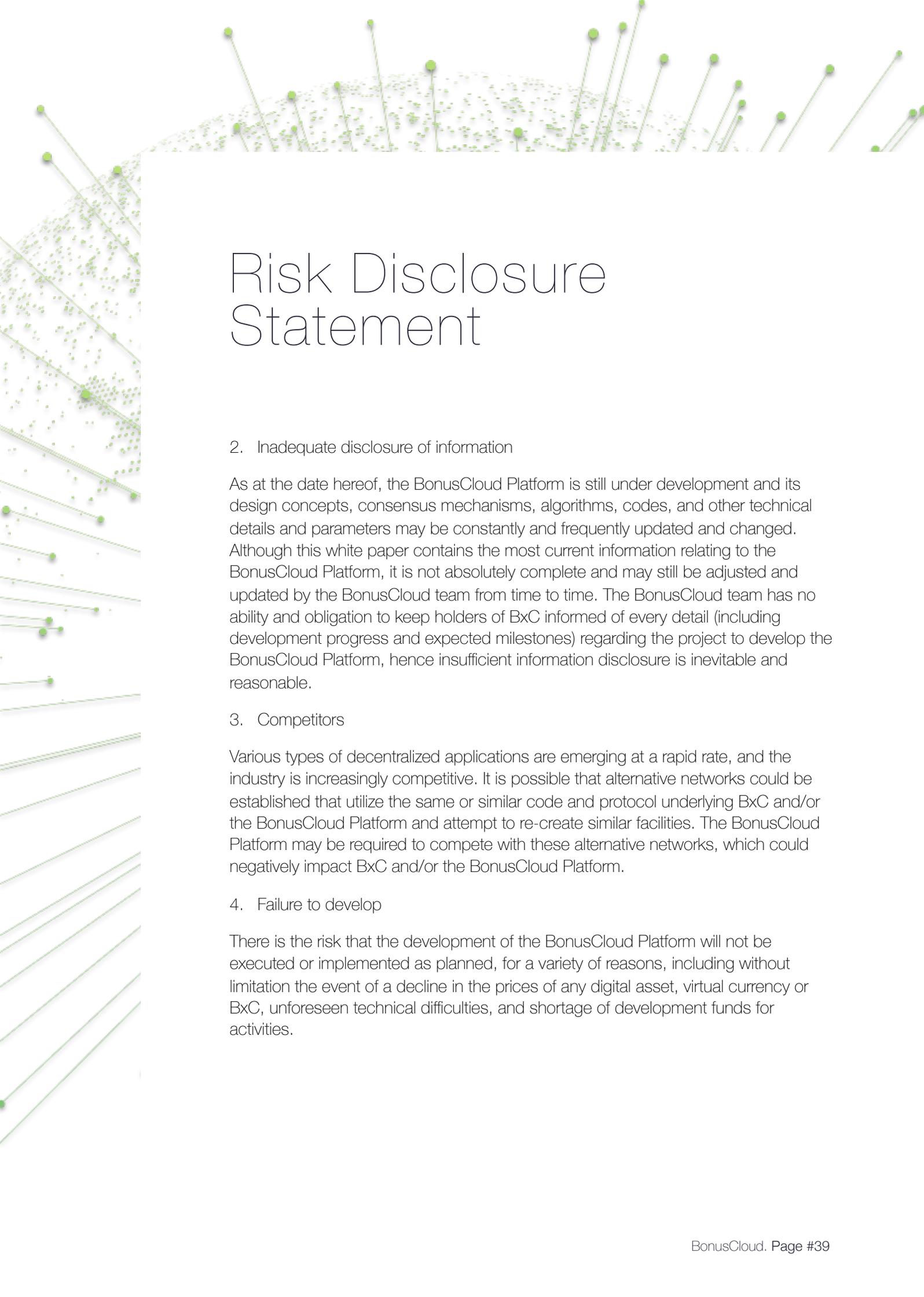
Risk Disclosure Statement

2. Inadequate disclosure of information

As at the date hereof, the BonusCloud Platform is still under development and its design concepts, consensus mechanisms, algorithms, codes, and other technical details and parameters may be constantly and frequently updated and changed. Although this white paper contains the most current information relating to the BonusCloud Platform, it is not absolutely complete and may still be adjusted and updated by the BonusCloud team from time to time. The BonusCloud team has no ability and obligation to keep holders of BxC informed of every detail (including development progress and expected milestones) regarding the project to develop the BonusCloud Platform, hence insufficient information disclosure is inevitable and reasonable.

3. Competitors

Various types of decentralized applications are emerging at a rapid rate, and the industry is increasingly competitive. It is possible that alternative networks could be established that utilize the same or similar code and protocol underlying BxC and/or the BonusCloud Platform and attempt to re-create similar facilities. The BonusCloud Platform may be required to compete with these alternative networks, which could negatively impact BxC and/or the BonusCloud Platform.

4. Failure to develop

There is the risk that the development of the BonusCloud Platform will not be executed or implemented as planned, for a variety of reasons, including without limitation the event of a decline in the prices of any digital asset, virtual currency or BxC, unforeseen technical difficulties, and shortage of development funds for activities.
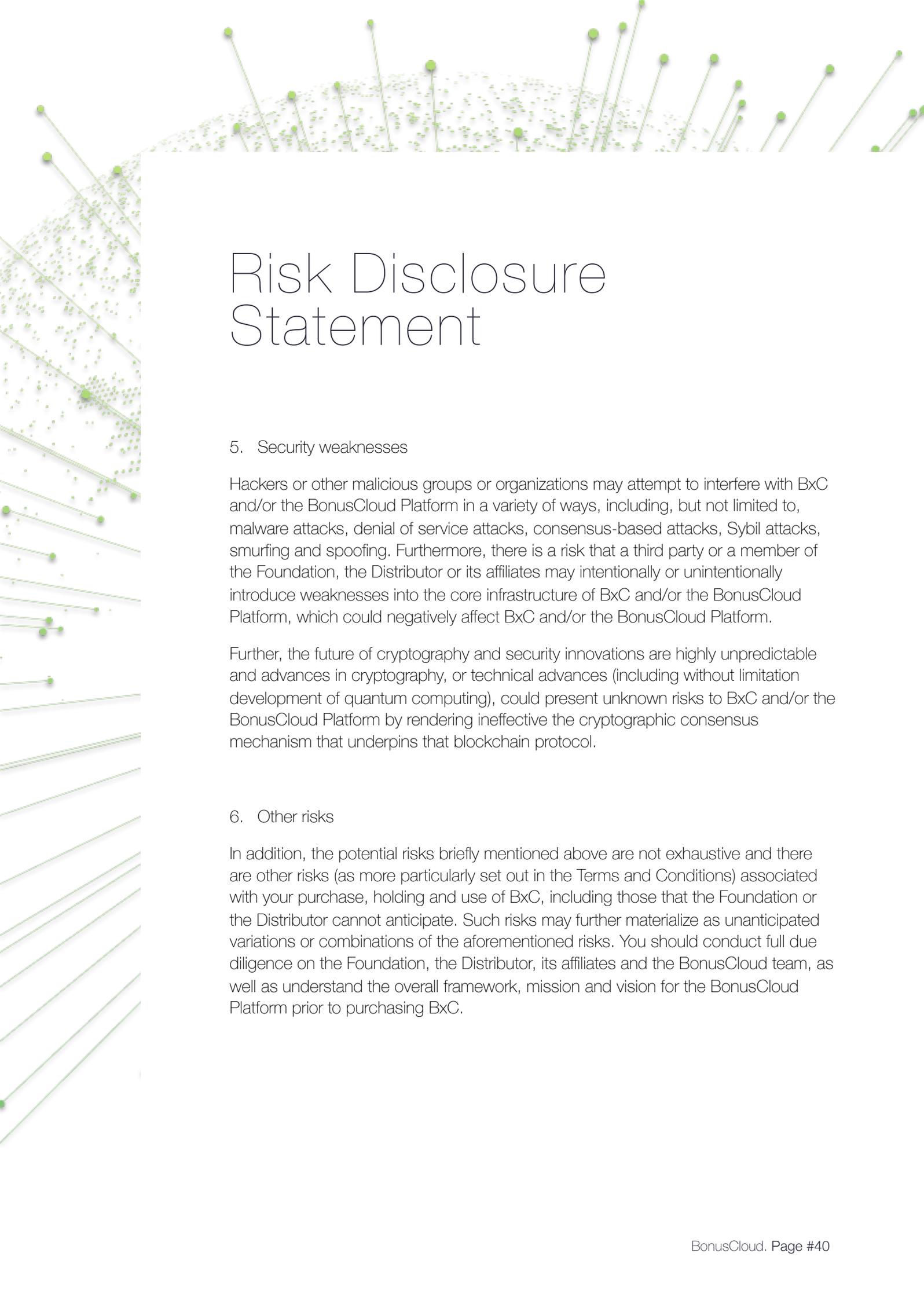
Risk Disclosure Statement

5. Security weaknesses

Hackers or other malicious groups or organizations may attempt to interfere with BxC and/or the BonusCloud Platform in a variety of ways, including, but not limited to, malware attacks, denial of service attacks, consensus-based attacks, Sybil attacks, smurfing and spoofing. Furthermore, there is a risk that a third party or a member of the Foundation, the Distributor or its affiliates may intentionally or unintentionally introduce weaknesses into the core infrastructure of BxC and/or the BonusCloud Platform, which could negatively affect BxC and/or the BonusCloud Platform.

Further, the future of cryptography and security innovations are highly unpredictable and advances in cryptography, or technical advances (including without limitation development of quantum computing), could present unknown risks to BxC and/or the BonusCloud Platform by rendering ineffective the cryptographic consensus mechanism that underpins that blockchain protocol.

6. Other risks

In addition, the potential risks briefly mentioned above are not exhaustive and there are other risks (as more particularly set out in the Terms and Conditions) associated with your purchase, holding and use of BxC, including those that the Foundation or the Distributor cannot anticipate. Such risks may further materialize as unanticipated variations or combinations of the aforementioned risks. You should conduct full due diligence on the Foundation, the Distributor, its affiliates and the BonusCloud team, as well as understand the overall framework, mission and vision for the BonusCloud Platform prior to purchasing BxC.

Bonus Cloud

The next generation infrastructure
driven by blockchain