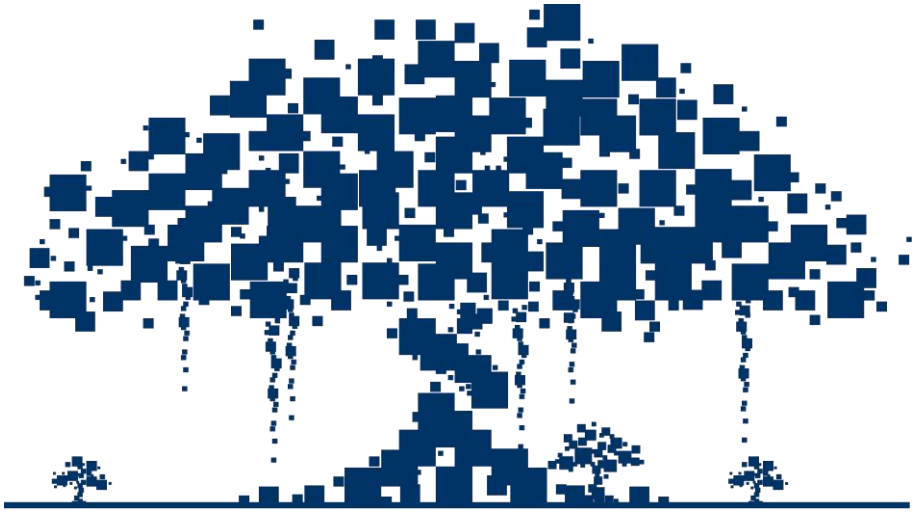


The No.1 Global Data Fusion Value Network

（Data Value Network，DVN）

Contents

1. Abstract

At present, the data industry is on the one hand hindered by the increasingly stringent regulation and on the other hand limited by an insufficient trust system in the competitive environment. The problem of data islands is becoming more and more severe, making it difficult to unleash the value of data. Credibility, traceability, tamper resistance, and decentralization of the blockchain technology provide solutions for reconstructing the traditional data value chain and maximizing the demands and interests of the participants in the field of data analytics, prying open a trillion-dollar Big Data market.

Banyan Network is a data value network based on blockchain technology. It is also the world's first distributed ecosystem of data economies raised and built by all participants in the field of data analytics.

The value of DVN is based on "symbiosis, mutual benefits, common governance, and common prosperity." The goal is to focus on blockchain-enabled trusted data connection, third-party data integration and governance, data applications and open market development, building a positive interactive value-linked network of data benefits by establishing standards, providing channels, and issuing tokens.

The data value network is equipped with an extendable and fast growing token system with rich scenarios, capable of promoting data aggregation in the widest range, exciting data stream at higher speeds, thereby enhancing usability and integration values, providing ways for multiplying values for data providers, processors, users, and other generalized contributors to the field of data analytics, creating a future sharing space of unlimited value. The data value network adopts advanced data matching and correction algorithms to implement and contribute to reward computation mechanisms, partnering with resourceful mainstream commercial data providers, basing the initial values on resources of branding for major clients, and providing convenient channels for enterprise and individual data sources joining the "data value network ecosystem."

Based on theories such as "three laws of data value" and mechanisms such as "tripartite model", the data value network covers data collection, cleansing, integration, and applications of complete business chains, to aggressively adopt the latest technical solutions such as high-performance blockchain (HPB), decentralized token exchange protocol (LOOPRING), and box computing (BC), to ensure the operation and gradual expansion of the entire network.

2. Abbreviation

BBN[1]（Big Banyan Network）

DVC（Data Fusion Value Chain）

DVN（Data Fusion Value Chain Network）

DPOS（Delegated Proof of Stake）

IRC（Introducing Rewards Contract）

CRC（Cleaning Rewards Contract）

APC（Apply Pay Contract）

TC（Transaction Contrac）

API（Application Programming Interface）

HPB （High-performance Blockchain）

3. Project Background

There have been widespread big data applications, and the era of blockchain is approaching. The common keyword of big data and blockchain is “distributed”, representing the future fundamental change from technological authoritarianism and monopoly, to decentralization.

The data industry is a super industrial cluster with huge market potential. In terms of scale, data infrastructure services and automated transactions are in tens of billions; precision marketing/pan-regional marketing,

[1] BBN is the name of the Token issued for this project.

information verification, and business/government/personal/market consulting are in hundreds of billions, while the market size of practical industry applications reaches the level of one trillion.

Take programmatic marketing, a classic product of data applications, for an example. The market size in China was about 11.5 billion yuan in 2016 and reach 25 billion in 2017, maintaining a 20% compound annual growth rate up to 2020. For digital marketing, a classic industry of data applications, the market size in China was about 240 billion yuan in 2016 and reach about 280 billion yuan in 2017, maintaining a 15% compound annual growth rate up to 2020. Regarding the overall industry, the total revenue of China's big data-related products and services was about 340 billion yuan and is expected to break the 1-trillion-yuan mark by 2020.

The data industry is also facing an intuitive and obvious development bottleneck. In terms of data sources, the barriers to entry into obtaining data are high, and data is often incomplete and fragmented, and each data source can only provide part of the available information;； there are large errors in data with a lack of multiple data sources for correction, and thus it is difficult to ensure accuracy. In terms of data products, the degree of commercialization is low, and connections are complex with no standardized interface, making it impossible to measure the effectiveness

of single solutions. Regarding data security, there lacks a compliance system, making it difficult to trace data sources or find pre-authorization.

From the perspective of the industry participants, the data volume, quality, and activity are the primary drivers of big data values, while data connection, aggregation, and applications are the catalysts for big data values. Currently, the issue of isolated data islands has not been solved and data security control is becoming more stringent. This double concern reflects a serious topic that has long been troubling the industry – the “data trust system” has not been established and is indeed difficult to build. Via its features of credibility, traceability, tamper resistance, and value sharing, the blockchain technology is speeding up its applications in various fields. Constructing the data value network based on blockchain will pry open a trillion-dollar big data market.

From the perspective of solvers of industry bottlenecks, data openness, connectivity, and value flow require not only legal, institutional, and policy protection, but also a strong solution that is an important and reliable carrier. Under the scenarios of big data applications with increasing focus on transparency and security, the blockchain technology allows multiple nodes to jointly participate in data computation and recording and to cross-check their validity, thereby making the data more

trustworthy and more valuable. Continuous growth and sequentially ordered blocks of the chained data structure will reshape the ecology of the data industry, becoming the future cornerstone of the era of the data economy.

For the realization of the value of data integration, blockchains can not only help transmit and transfer data values but also establish the foundation for trusted data connections. In the future, all participants in the data industry will be connected in a network where smart contracts or smart assets are formed through contractual relationships, and the blockchain will become an almighty ledger of data value chains. Based on this foundation, access right confirmation of data and commercialization of data resources will depend on this supporting technology, fitting a development model of sharing economy.

The data value network based on blockchain is to solve the above problems completely. One of the core strengths of DVN's decentralization is to avoid any illegitimate data copy, interception, storage, or even modification. There would be no possibility of theft or weakening for the data value, thus greatly reducing the cost of trust in DVN for data sources. Another advantage is the breakthrough in geographical and time constraints, maximizing the degree of transparency, extendibility, and efficiency of the

participants, leading to greater data liquidity and higher data values.

Therefore, an artificial intelligence industry based on DVN data will be reborn. DVN will serve as a data provision infrastructure for artificial intelligence, supplying all the data sources, data service procurement, and high-performance distributed data processing capabilities to meet the needs of the application and development of AI, providing adequate fuels for the future of artificial intelligence.

4. Business Structure

There is a rather large gap between commercial data supply and data requirements. The data generally lack liquidity and integration, even to the extent of being isolated, illiquid, or uncleansed and unprocessed such that their values cannot be fully realized.

DVN provides an integrated value network framework for all participants in the data industry, offering a systematic solution connecting data requirements and data provision. DVN supports value-added products and service development for all stages of the data value cycle, providing various fundamental or customized support for each party to more aggressively and actively participate in the construction and optimization

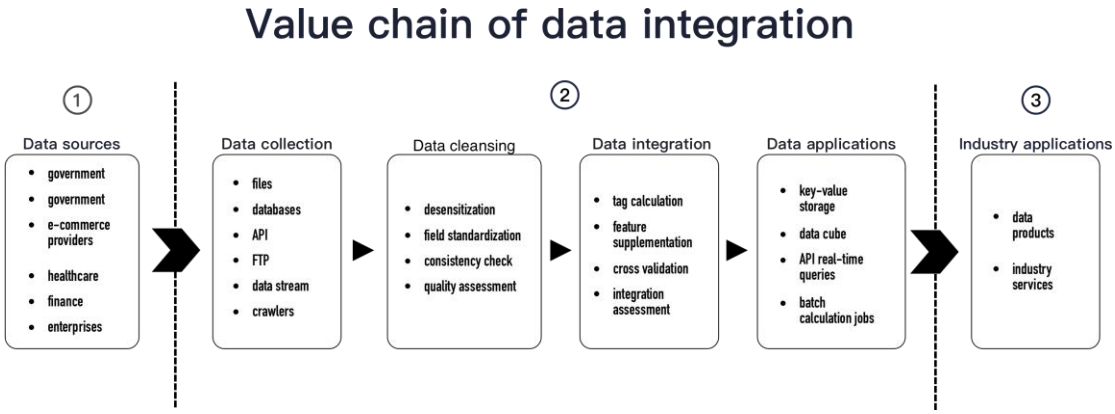
of DVN, to more efficiently promote the value gain.

Engine of a Rising Double Helix: the DVN data value network has a double helix structure of "data stream" and "value stream". The "data stream" promotes data aggregation, connection, access, and coupling, while the “value stream”, while the "value stream" promotes value mining, assessment, recording, and distribution. The "cross-section" forms a closed-loop structure connecting data demand and data supply, while the "slice" forms an exponential expansion structure that promotes value production and value acceleration, eventually forming an engine that drives the big bang of data value from the data contribution and value feedback of all the participants in the DVN.

4.1 The Link in Constructing the Value Network

Data value network DVN is created to meet the needs of all the participants in the data industry. Through co-building values in the business flow to break up the traditional distance between "data sources" and "industry applications" and applying links to distributing nodes to connect and integrate traditional data collection, cleansing, and integration (see figure below), lines of Data Fusion Value Chain (DVC) are formed with multiple DVCs overlapping to constitute a borderless data value network (DVN) of densely populated lines.

In the DVN, the parties are incorporated into a unified data value ecology, and the interests of all participants are ensured through the blockchain technology and supporting mechanisms.In the DVN, the parties are grouped into a unified data security system by employing the Security Multi-Party Computation (SMC) framework protocol of security and zero knowledge to ensure the security and compliance of data, records, and processes.



4.1.1 DVN-Collection

DVN supports quick and easy access to multivariate data in order to address access problems arising from differences in storage methods and formats between different data sources

Supported data sources: government, financial institutions, operators, e-commerce providers, the Internet, vertical industries, enterprises, individuals, etc.

Supported methods of data collection from data sources: files, databases

(relational databases, NoSQL databases, distributed databases, etc.), APIs, data stream, FTP, crawlers, etc.

Supported data formats for parsing: text, JSON, XML, unstructured data, custom parsers, etc.

4.1.2 DVN-Cleaning

For suspicious data as well as error values, missing values, and abnormal values in data, DVN applies multi-level "cleansing" to solve the problems of data preprocessing and quality improvement through concatenating fields to form formatted data.

The process also includes data desensitization, data consistency checks, data quality assessment, etc. In addition, virtual data governance positions are set up to attract organizations or individuals to get involved in the process of data quality.

4.1.3 DVN-Fusion

DVN integrates multiple data sources to achieve cross-data-source tag calculation and dimensionality expansion to solve the problems of multi-data-source aggregation and integration.

The data integration of DVN achieves cross-data source tag calculation, complementing another data source with the feature of a data source, to more fully describe the true properties of the data. At the same time,

cross-validation of multi-source data can be performed to further assess the data quality of the data source and evaluate the data integration. The integrated data is aggregated into a multidimensional Data Cube for later use.

4.1.4 DVN-DataApp

DVN data applications adopt the formats of data identification results, which are automatically encapsulated into different forms of data application services.

The calculated tag image data is saved in the format of a Key-Value, and the system imports it into a distributed database, providing API for external real-time queries. The Data Cube provides computing services for external batch jobs。

4.2 Supporting Applications for the Value Network

4.2.1 **Banyan Score**

DVN has a basic scoring system to provide a public rating service with standards, index systems, algorithms, publishing mechanisms, etc., for data sources, products, and services.

4.2.2 **Banyan Wormhole**

The DVN unified cleansing system provides services of data categorization and sorting, defect detection, optimization algorithms, complementary rules, etc., to quickly and efficiently standardize data packages and enhance usability.

4.2.3 **Banyan TagLib**

The DVN standard tagging system is equipped with data tag access, matching, and association mechanisms, etc. and provides cross-source, multi-dimensional combination, and joint tag usage services, based on data integration.

4.2.4**BanyanMaket**

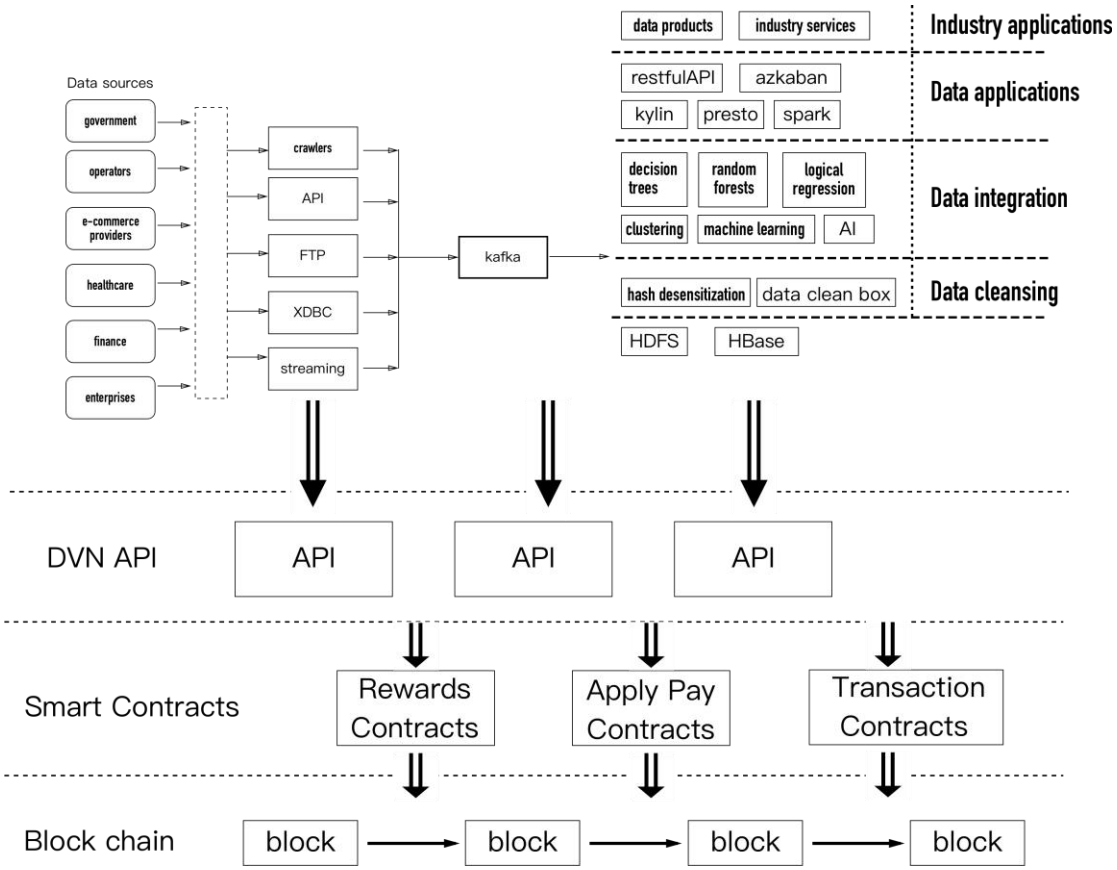
The DVN open application market is equipped with data supply recommendation, demand publishing, value matching, intermediate custody, etc., to provide an open application market based on data integration.

4.2.5 **Banyan Security Suite**

The DVN distributed security package is equipped with data governance, process management, risk assessment, certification marks, etc., to provide services of data security control for all participants.

5. Technology foundation

DVN supports lifecycle management for data applications by in-depth combination of big data technology and blockchain technology. All data in the entire data lifecycle interacts with the DVN through the DVN API. After the DVN API receives a data request, rewards, payments, etc. will be written into the blockchain records through smart contracts. Please see the sample technology architecture below:



Technologies involved in the sample technology architecture are as follows:

Crawlers, API, FTP, XDBC, Streaming, and other protocols of multi-data interactions;

Distributed file systems such as HDFS and distributed databases such as HBase;

Tool sets such as the hash algorithm, data clean box, etc.;

Data mining algorithms such as decision trees, random forests, logical regression, clustering, machine learning, etc.;

Big data platforms and tools such as apache kylin, presto, Impala, sparks, etc.

6. Theoretical Framework

6.1 Three laws of Data Value and the Embedded Parameters

The value of data is reflected in the application, and only via circulation and practical uses can the value of data be realized. Through validation by mature business models, "three laws of data value" are summarized：

First law: data in silence accelerates devaluation;

Second law: data in circulation produces values;

Third law: integrated data promotes value added.

In the above laws, denote data value by V, timeliness related to the age of data by A, data liquidity by D_y, and data integrability by F.

6.2 Parameter of Data Quality

Data quality Q is developed by considering current international standards (such as ISO8000) and relevant parameters of national and industry

standards, reflecting the order, consistency, accuracy, and integrity of data.

6.3 Parameter of Data Quality

Data liquidity D_y is related to the frequency at which the data is processed, traded, circulated, and applied. Among them, processing, trading and circulation can change the data value (V) and quality (Q); the frequency of application Fq is categorized according to industry experience of the number and level of data uses, which can be expressed by the following function:：

$$D_y=f_1(\Delta V, \Delta Q, F_q)$$

6.4 Data Liquidity and Integrability

Data integrability F is related to the degree of interconnectivity and association between different data sources, and the F value is equal to the dimension of actual association in the data chain.

6.5 Data Timeliness

Data age A reflects the data timeliness and is related to time T of the data generation, time $T_{\Delta Q}$ of data cleansing and organizing that lead to changes in data quality, time $T_{\Delta Dy}$ of data processing, trading, and circulation that lead to changes in data liquidity, and time $T_{\Delta F}$ at which data integration occurs. The specific function is as follows:

$$A=f_2(T，\ T_{\Delta Q}，\ T_{\Delta Dy}，\ T_{\Delta F})$$

,where the longer the data generation time T, the worse the data timeliness and the older the data age A; the longer the times $T_{\Delta Q}$, $T_{\Delta Dy}$, and $T_{\Delta F}$, the worse the data timeliness.

6.6 Data Value Function

According to the above definition, data value V can be expressed by the following function:

$$V=f_3(Q，D_y，F，A)$$

, where V is proportional to Q, Dy, and F, and it is inversely proportional to A.

6.7 Decision Mechanisms for the Definition of Data Parameter Functions

Definitions and values of the data quality parameters Q、f_1、f_2、f_3、f_4 (see 7.5)、f_5 (see 7.5) depend on the consensus of token holders (see 7.6).

7. Rules for the Tokens

7.1 Introduction to the Tokens

DVN Token (BBN) is a token that provides support for the BanyanChain. Its usage scenarios include data access bonuses, data cleansing rewards, data usage payments, etc.

7.2 Token Details

The purpose of the BBN issuance is to encourage developers and users of the ecosystems to enhance the quality, degree of integration, and data availability across the entire network, fundamentally promoting the regulation and positive development of the data industry, providing solid support and protection for the final data applications.

In DVN, many practical problems are solved by blockchain features, e.g. traceability and tamper resistance for data cleansing, integration, and product delivery. Namely, there are a lot of strong cases where BBN consumption is needed. For example, participants use BBNs in all stages of data governance and commercialization to participate in registration and top-up. Rewards are also paid in BBNs for the completion of data governance and product processing. Therefore, the prosperity of data industry is the support for the value of BBN.

7.3 Circulation model

The BanyanChain has a design of a complete set of BBN circulation mechanism with rich BBN usage scenarios, ensuring BBN liquidity through a series of intelligent contracts.

Introducing Rewards Contract (IRC): responsible for calculating and confirming the Reward for the introduction of data from data sources

Data on the BanyanChain form data products and services. After they have

been used, a certain amount of reward is distributed to the data source in accordance with the proportion defined by the governance committee.

Computing Rewards Contract (CRC): responsible for calculating and confirming the Reward for the participants in data governance.

The payment of a certain deposit (Deposit) is required for an application of data governance to obtain a certain number of rights for data processing and optimization. The processing tools are provided by the BanyanChain, while the nodes provide only computing resources. After the data has been used, a certain amount of Reward will be distributed to the data governor according to the ratio established by the governance committee. The specific function is as follows:

$$Deposit = f_4(V_0)$$

where V_0 is the data value V upon the deposit

$$Reward = f_5(\Delta V，time)$$

,where ΔV is the increase in data value after processing. If the data governor is unable to finish data governance within the promised time, the deposit will be confiscated (to prevent the data source from being occupied for a long time without governance).

Apply Pay Contract (APC): responsible for the calculation and confirmation of payment by data users after using the data service. The specific payment amount shall be implemented in accordance with the standards established by the governance committee.

Transaction Contract (TC): responsible for calculating and confirming the cost of data governance and fees for the use of products.

In addition, with richer and richer usage environments of data governance, there may be more and more positions and scenarios. Therefore, we do not rule out the possibility of adding other contracts during the process of system operation.

7.4 Holding and Weighted Voting Rights

Anyone who holds a BBN can obtain voting rights by getting a mortgage on the Token. Voting rights are positively correlated to the number of mortgages and mortgage time.

The governance of the governance committee includes, but is not limited to, the introduction and termination of data sources, data valuation, data governance rewards, payment schemes for data usage, etc. These adjustments can be decided by group voting in the governance system.

8. Governance mechanism

8.1 Underlying Operation

The underlying blockchain of DVN is based on Ethereum and is operated in public, because it is the most mature platform that supports smart contracts, and the community is active and the foundation works well. We

do not rule out the use of AntShares, HPB, and other independently developed technologies in the future.

8.2 Smart Contracts

We aim to develop generic smart contract templates for the business models and processes that have strong commonalities in the network to be used uniformly in the vast majority of business scenarios in DVN. We also plan to develop a smart contract repository with special tags for specific categories or subsequent additions, to distribute announcements, expand dynamically, and to efficiently operate with flexible configurations.

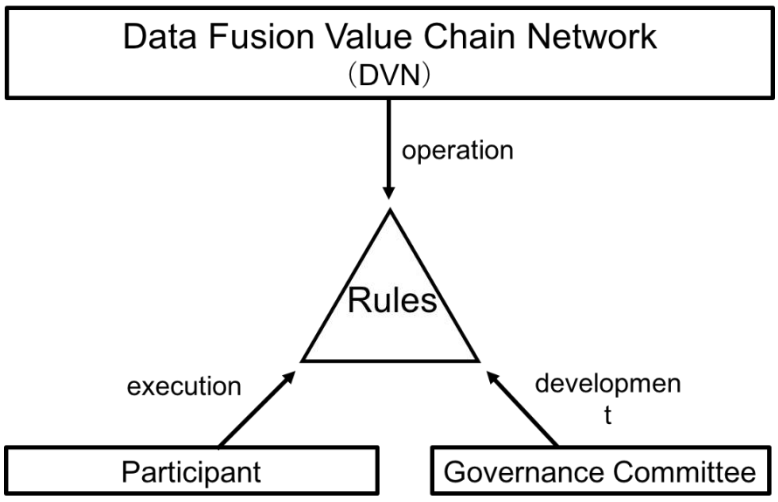
8.3 Consensus Mechanism

Of any data in DVN, the introduction, governance, processing, use and the associated reward, and payment and other Token circulation, are done through the DPOS consensus mechanism for recording and writing.

8.4 Tripartite Model

We adopt a tripartite model of network co-governance, including DVN, decentralized governance committee, and participant to ensure the operation of the entire value system through an operation mechanism with reasonable, appropriate, and limited distribution of rights. Among them, the governance committee is responsible for "rule developing ", and the participant is responsible for "rule execution", while the DVN is in charge

of "rule operation"(as shown in the figure below)



9. Technology Applications

9.1 Blockchain Applications

Current mainstream digital tokens, including Bitcoin and Ether, are based on blockchain as their core technology to ensure verification of currency transaction records, tamper resistance, and de-centralization of block validation storage.

DVN Token (BBN) also uses blockchain as the technological support for its circulation. In addition to ensuring security, trustworthiness and convenience of the token in the circulation transaction, it also allows the BBN users to establish confidence in market demand, giving BBN an opportunity to circulate in large volumes and to preserve in value or even appreciate like major digital tokens of bitcoin and ether.

9.2 Applications of Artificial Intelligence

Artificial intelligence based on the mainstream method of deep learning is a hot area for high value-added applications of Big Data. It is also a useful tool for big data collection, cleansing, and integration.

DVN on the one hand will use mature data as a material foundation for "training" artificial intelligence to develop AI applications in various fields into market products. On the other hand, it uses AI to simulate the manual data collection, cleansing, and integration processes performed by data engineers, and we aim to develop automated tools or packages to implement the tasks described above, thereby improving process efficiency and significantly reducing leakage, security risks, and other human negligence arising from human factors during data processing.

10. Team

10.1 Management team

David Zhou, CEO
Canadian, University of Waterloo, head of MIT incubator,
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Henry Li, Senior Software Developer of China, 7 years of experience in system design and software development, proficient in cloud computing and big data-related technologies and applications; worked at a number of well-known companies and successfully developed a cloud platform for data models

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Ryan Gao, Strategy of China, 9 years of experience in strategic management, data standards, construction of governance and security compliance systems; worked at SIST and UnionPay Smart; resourceful in public relations and partnerships

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Bob Wang， Founder of HPB

Qingwei Shi，Founder of Share Finance

Jinxin Li, Blockchain team researcher of Guotai Junan Securities

Hongfei Tian，Partner of Green Pine Capital

Albert Wang，Founder of PatPat


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Feng Li，Founding partner of FREES FUND


Yue Dong，Angel investor, senior technical consultant of public company


Sheng Xiao，Founder of SiGui, big data and data security expert

10.4 Cornerstone investment

Loopring Foundation HPB 共享财经 Share Finance

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Here we would like to express our sincere gratitude to all the past contributors who have participated in the technology, business, and management of DVN and those resource contributors who are participating in the model, platform, funds, etc., of the BBN issuance. We look forward to working with all the participants who are interested in this endeavor to build the limitless future of data integration.

BanyanNetwork Team

Dec 25th, 2017

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