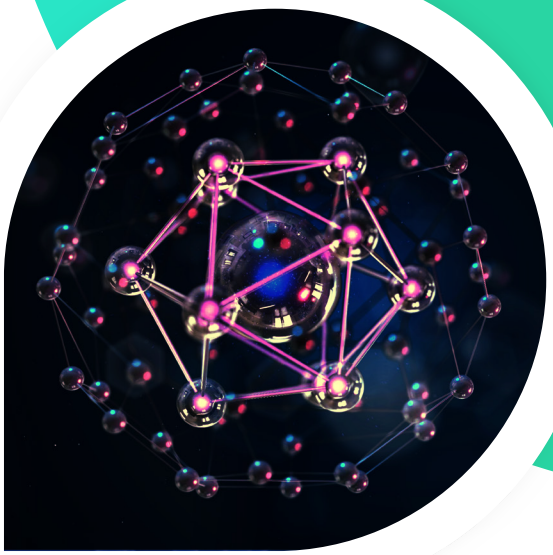

GENEBANK TOKEN

Whitepaper Version 1.0

May - 2021

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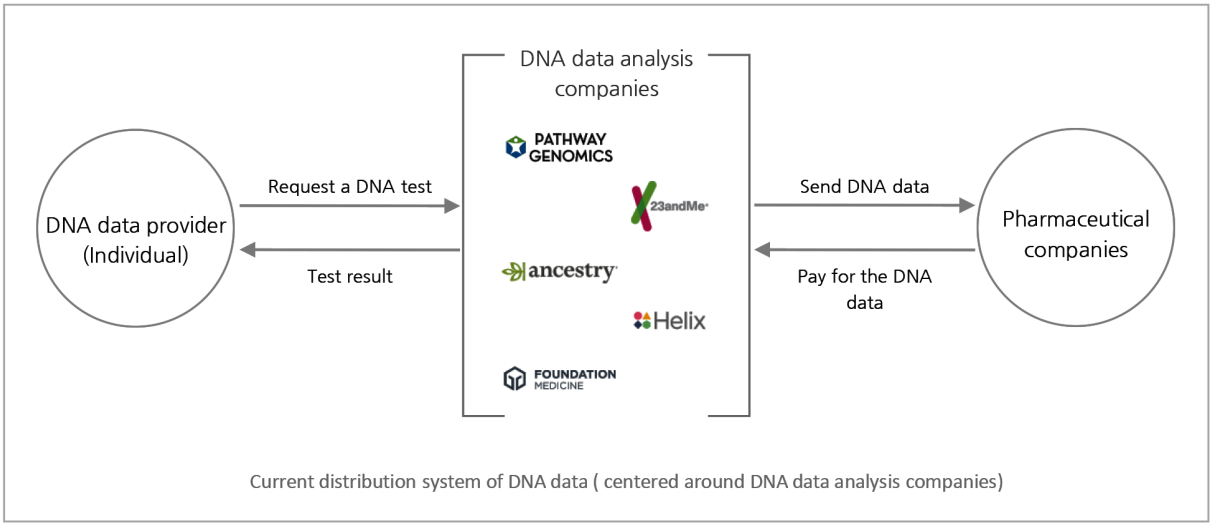
1. Abstract

Using genetic data for healthcare and diagnostic solutions brings many opportunities and especially offers the hope of accurate and specific treatments, based on each person's individual characteristics. Each genome consists of 3 billion base pairs that can be sequenced, analyzed, and referenced to understand further the advent of diseases. Although offering endless possibilities from a medical viewpoint, genetic data gathering and storage poses a huge problem in terms of logistical and ideological capacities. We propose a solution that integrates blockchain as a record-keeper for genetic data, allowing it to exist in a decentralized manner, independent of third-party interveners. The GENEBANK blockchain will exist as a platform where users can access vital information needed to determine their susceptibility to certain diseases as well as treatment effectiveness. Since the storage will not be in the hands of anyone entity, no third party will play the custodian of important health information. Along with this, they would also be unable to destroy or lose essential data. GENEBANK offers such a blockchain solution, collecting and holding users' genetic sequences as well as helping them use it for medical purposes. The platform will also provide incentives in exchange for information, with its own native token being used to access genome data storage services.

2. The Problem Statement

The growth of the genetic data market is not just responsible for speeding up the development of medical and genetic engineering but is also associated with applied technology. The futuristic personalized genomic analysis is regarded as a catalyst for bringing on the age of precision medicine. Large-scale research in the field, such as Whole Genome-seq, Transcriptome-seq, and Epigenome-seq aims to help in bringing this future closer. However, the problem that remains does not arise from the development of sequence techniques entirely. In fact, a major problem that the industry faces and will face in the future as well is in securing DNA data from patients.

As of now, private companies specializing in genomic data analysis are gaining huge profits while collecting and analyzing large amounts of genetic data. As part of their process of collecting and analyzing genomic information, they are also forcing customers to give up ownership and control of their genetic data. This information is then sold by them to pharmaceutical companies, which utilize them in the creation of new drugs. It is an unethical practice and is seen as taking advantage of consumers.



Current distribution system of DNA data (centered around DNA data analysis companies)

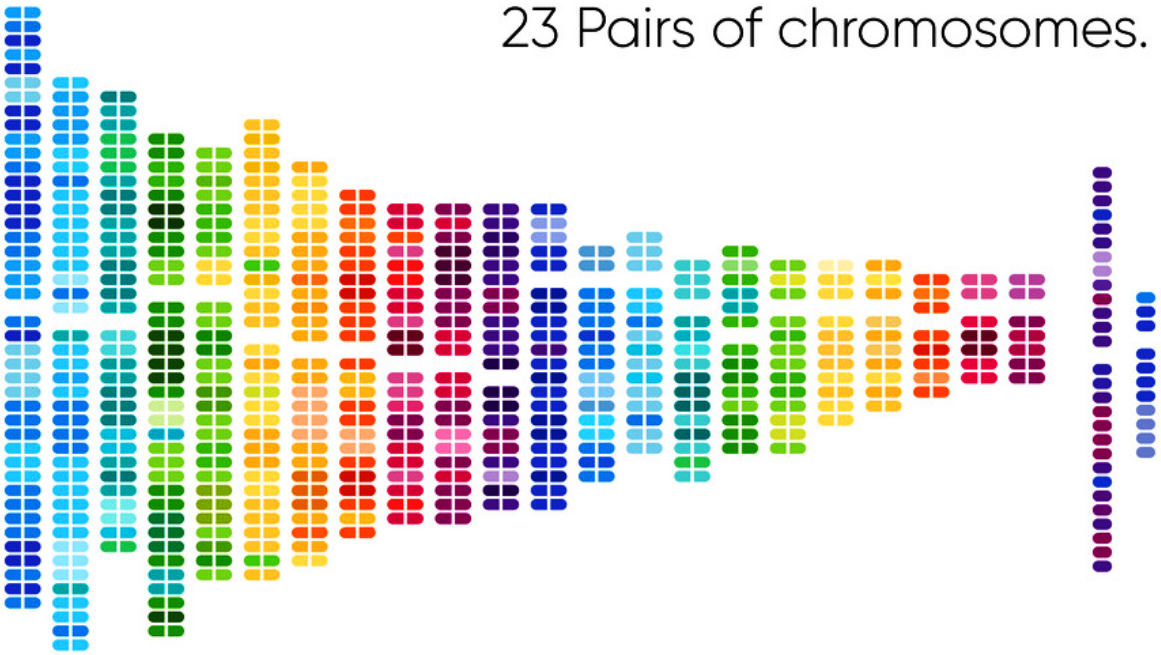
In terms of creating an ongoing process of developing precision medicine, this system will soon exhaust and leave only specific companies to monopolize the distribution market. This makes it imperative to return control over DNA data to its individual owners and create an ecosystem enabling direct contact between them and research institutions or pharmaceutical companies. A voluntary system for individuals to be able to share or restrict access to their DNA can greatly help the cause of developing new drugs, especially for genetic disorders.

3. Introduction to GENEBANK

3.1 Gene/DNA

Each human being is born with almost 20,000 to 25,000 genes[1] that they inherit from their parents and further pass on to their children. It is the section of the DNA that contains essential information coding for specific proteins. Skins or bones of humans are some encoded proteins as well as others that are biological molecules. These help in adjusting the human metabolism's reactions including digestion or absorption of nutrients. In this sense, one could call the gene a storage area for proteins necessary for life to exist.

DNA is what chromosomes are made up of. It contains genes and histone proteins, and those that are inherited from parents or passed on to children are wrapped around with strands of DNA. Each person's genes for every particular chromosome are arranged in a specific order. In that sense then, the nucleus for a human cell contains 23 pairs of chromosomes.[2] Genes also exist as alleles, which are an alternate form and are found at a specific point of a chromosome. These determine visible traits of human beings such as color and texture of hair.



A person's entire genetic information can be extracted from a genome. It is a blend of the words gene and chromosome, marking both of their values in determining this information. To attain this genetic information, a specific gene can be analyzed. The results can be later used for multiple purposes, for instance, to predict and diagnose diseases, as well as for medical treatment.

3.2 Genetic Testing

DNA/genetic testing has multiple practical world applications. For example, it is most commonly used for personal identification through analyzing the DNA structure, and also for the prevention and treatment of diseases by conducting a functional study of DNA/genetic mutations. As is apparent, this has great potential to lead the way for precision medicine.

As such, there are two kinds of DNA tests; one involves examining a specific gene while the other looks at a human being's entire genome (total DNA). Disregarding which type of test is conducted, the technique applied is known as genetic sequencing. This refers to any method used to ascertain the order of the four bases that DNA consists of; adenine, guanine, cytosine, and thymine. This is also known as a nucleic acid sequence.

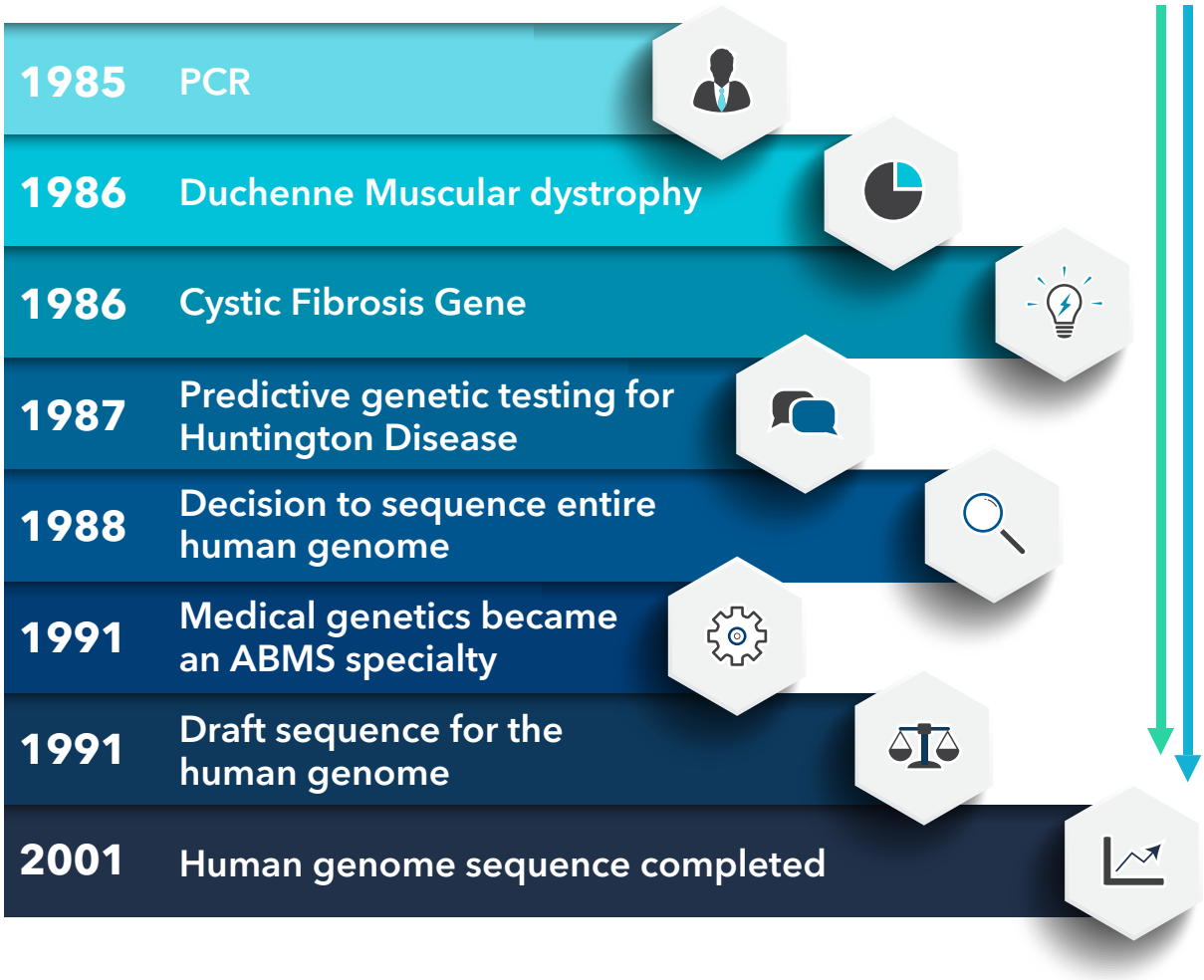
Three ways to determine the sequence are:

- **Maxam-Gilbert Sequencing**
  This method uses purified samples of double-stranded DNA and is known as chemical sequencing.

- **Chain-termination Methods**
  This is also known as the Sanger sequencing method.

- **NGS, Next Generation Sequencing**
  This enables the sequencing of millions of DNA molecules at the same time.

A Conceptual History of Medical Genetics



DNA/genetic analysis was first introduced in the 1980s, making slow growth in technological advancement until mid-2000. Since then, DNA analysis has undergone rapid growth.

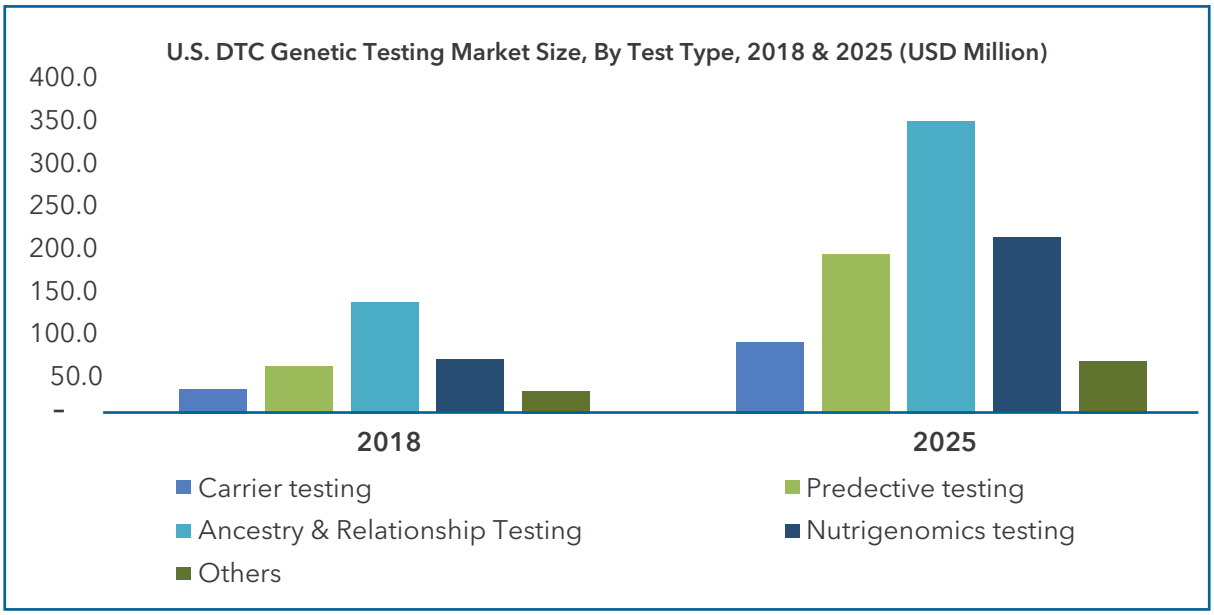
In 2014, National Human Genome Research Institution predicted that DNA analysis technology's speed in development will surpass the speed of computing power improvement that is shown in Moore's law.[3] As a result, the cost of DNA sequencing was expected to plummet by the end of 2008.

3.3 Direct to Consumer DNA testing

Direct to Consumer (DTC) DNA/genetic test is a health screening service for use in disease prevention. Consumers can directly request such a test from DNA testing/analysis institutions without the involvement of a third party or any medical institution.

The difference between this and existing health-related services lies in consumers' ability to directly send a self-collected genetic sample to a genetic test institution which isn't necessarily a medical facility. This way, they can undergo DNA testing and receive results without having to involve a hospital or a doctor. This will make the entire process easier and let consumers be more in control of their personal health decisions.

However, DTC poses serious privacy concerns and is very sensitive to legal or technical restrictions. Each country has its own policies when it comes to the DTC (genetic) test.



Part of the reason why such issues arise is the lack of medical supervision for a process closely emulating a medical one. It is almost unheard of to undertake a disease-related test in a non-medical context, and moreover, a testing kit, in this case, is acutely similar to actual medical devices. Some examples of regulations set for DNA/genetic testing are:

- USA: 30 categories of tests available but mainly for serious illnesses.
- England: Almost no regulations
- China: Up to 300 categories of DNA/genetic tests are available including Parkinson's and Alzheimer's disease
- Japan: Almost 260 categories available, including Parkison's and Alzheimer's disease.
- South Korea: For non-serious illnesses, 12 categories available.

Consumers need only submit self-collected DNA specimens i.e. saliva, hair, to the testing center for getting a DTC DNA/genetic test report. It can come paired with a diet plan or personal healthcare journals. With greater awareness of getting an early diagnosis for a disease, there is a great opportunity to reduce the death rate and prevent unnecessary complications.

With reference to a December 2018 report by Global Market Insights, DTC DNA/genetic testing markets will expand rapidly if their applicability to early cancer discovery, cancer prevention, and discoveries of other genetic or rare diseases is proven. It follows naturally that cancer mortality will be reduced if there is better awareness of early diagnosis and timely, accurate treatment. However, technological innovations with regard to the precision and accuracy of test results are critical to its acceptance.

3.4 Current and Future Challenges of DNA Testing Market

Genomics pertains to the study of genes and genomes of organisms concerned with the structure, function, evolution, and mapping that can inform the structure through DNA sequencing.

As recorded in 2000, the Human Genome Project cost about $2.6 billion to analyze one genome. Since then, the price has drastically dropped to $880, thanks to the introduction of Next Generation Sequencing (NGS).[4] In addition to that, the analysis time for such tests

has also reduced, especially important now that demand for this kind of testing is expected to reach over 1 billion by 2025, with the market expanding by more than $88 billion. Keeping these in mind, the genomic market expects to grow by 10% annually.

Lines	Chemistry	Sequenced Reads	Total Num. of Bases	Avg. Length*	SD Length	Avg. Q-score	SD Q-score
DH12075	454	1,289,496	450,850,003	350	131.6	33.1	8.4
PSA12	454	826,680	289,078,010	350	101.1	32.6	8.5
Express	454	827,074	313,062,567	379	105.4	31.4	8.4
V8	454	711,244	261,475,787	368	121.5	33.7	8.2
Tapidor	454	778,116	257,650,369	331	95.1	31.6	8.5
Ningyou-7	454	803,553	288,413,071	359	112.8	33.2	7.9
Rainbow	454	742,283	248,197,873	334	129.9	33.7	8.1
YN-429	454	735,005	254,920,458	347	101.3	32.4	8.5
CGNA1	454	742,361	267963689	364	118.7	33.1	8.4
CGNA2	454	717,016	270,568,629	374	117.6	33.3	8.3
DH12075	Illumina	167,215,495	8,225,138,523	49	-	40	2.3
Express	Illumina	184,559,482	10,908,314,681	59	-	42	2.1

Abbreviations: Num.=Number; Avg. = Average; SD = Standard deviation; Q-score = Quality.

* Length in base pairs (bp).

doi: 10.1371/journal.pone.0081992.t001

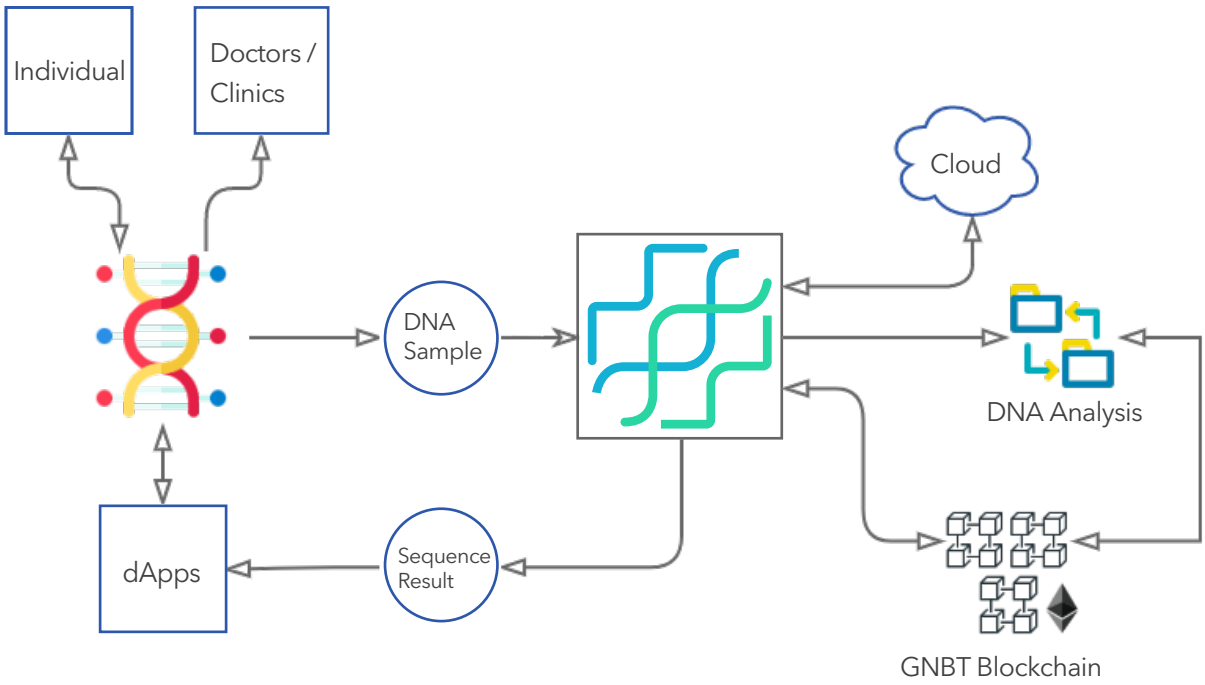
DNA data will allow accurate diagnosis, effective treatment along with prediction and prevention of disease. For any individual to lead a healthy life, these solutions could be life-changing. Not only can they improve health for individuals, but they can lead to effective healthcare management and cause an overall decrease in healthcare costs. On par with the appeal of its applications, the global genetic testing market is growing rapidly in hopes that early detection of genetic diseases could become possible.

Gene-based medicinal and diagnostic use has opened up a plethora of opportunities healthcare-wise. However, the grand potential of genomic data in solving modern world problems comes with its own set of problems especially concerning its access, storage, security, and privacy. Living in the generation of 'big data' has opened pathways to analyze entire lifetimes as individual data points. Part of this analysis is the successful processing of very large datasets. In that sense, genomic data analysis presents a major problem of requiring very large amounts of computational resources to reference genomes and annotate gene variants.

To put this into perspective, a single human's genome comprises nearly 3 billion base pairs. The recording or referencing of these takes up to 1.5 GB of data. This sort of large-form data then requires either (1) very powerful third-party databases such as centralized data repositories with access control, or (2) distribution among concerned parties through standard file transfer protocols. Further, if any reanalysis is required, high additional loads of computational data may also need processing. The advent of these issues then asks for innovative approaches that fit the title of being a 21st-century advanced-tech solution.

That is where genetic testing begs for a more advanced tech solution. For years, technology has led the way to innovative and accurate medical discoveries. For instance, in 2016, IBM's Watson, an AI computer, successfully diagnosed cancer. In 2017, Illumina, owner of 70% of the global genetic analysis market, announced plans to create the world's largest next-generation sequencing[10] lab and security database. It aimed to create an ecosystem of consumer-driven genome applications utilizing big data. Further, the recent few years saw many businesses announce plans to come up with blockchain encryption technology for genetic data. There is a growing expectation amongst key stakeholders that blockchain will serve as the ultimate solution to problems faced with genetic data solutions.

3.5 GENEBANK Platform Mission and Vision



Mission

GENEBANK believes in a proper DNA distribution system, streamlining the development of human medicine with precision like never before. It hopes that if ethically implemented, the disciplines of medicine and genetics combined can open up a new age of medication and diagnoses.

GENEBANK's purpose is to build a shared economy based on (high value -added to) DNA data provided by individuals. All information distributed within the GENEBANK platform will belong to the information providers, and the ownership belongs to the individual. Transactions will be transparently managed for all information and goods.

Moreover, the value of decentralization should be achieved by distributing the rights equally to all stakeholders participating. GENEBANK does not require a centralized controlling power to maintain a democratic decision-making process. GENEBANK will do its best to research and develop core technologies to achieve complete decentralization.

Vision

Technology implementation on the GENEBANK platform aims to achieve a shared economy using an optimal and efficient distribution of DNA data.

To establish a global genomic data distribution platform to enable individuals anywhere in the world to share their genome information freely and regardless of race, country, sex, or age. We will build a global sequencing alliance to enable everyone to actively analyze genomic information. Also, to build a decentralized network system that is based on blockchain technology where genetic information can be distributed in a transparent and secure way.

Apart from this, we aim to establish a tokenized economic system to enable users to pay, be compensated with GNBT when each transaction is made, and continuously improve GENEBANK dApps environment so stakeholders on the ecosystem can access and utilize resources on the platform.

4. GENEBANK Solutions

4.1 Genetic Data Distribution and Blockchain Technology

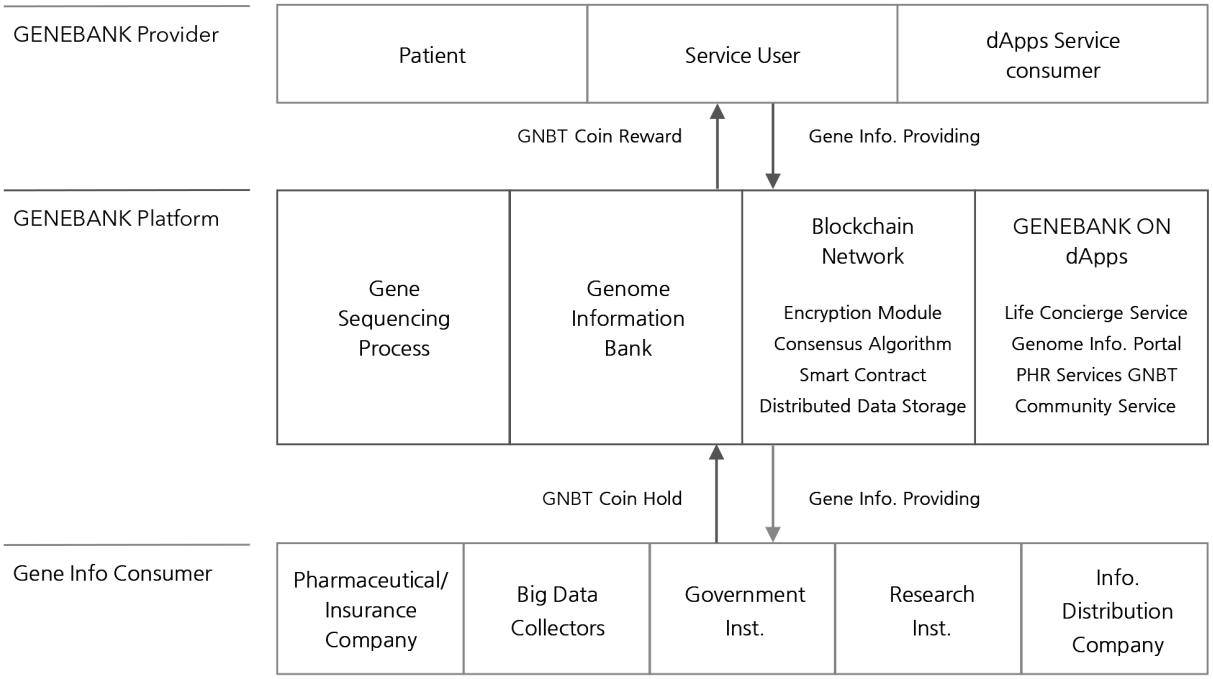
As per the above discussion, the genetic data market is being ruled by data analysis companies that collect DNA data from individuals and distribute it to pharmaceutical companies in need. This not only results in an opportunity for DNA data analysis companies to charge very high brokerage fees but also results in an inefficient distribution system. For this reason, a Peer to Peer network is proposed where the providers and receivers of DNA data are directly connected.

That is where blockchain technology steps in. Its decentralized system allows active sharing of information. Stakeholders that are part of the blockchain can securely exchange DNA data using an active decision-making structure. They can respond to the requirements of organizations

asking for biometric and DNA data proactively by establishing a reward system between themselves.

4.2 Blockchain-based DNA Data Sharing Platform

GENEBANK is a global blockchain data-sharing platform that allows the distribution of DNA data. Using the platform, an individual provider can use dApp to request and receive an analysis of DNA data. From here, it can be securely managed following its encoding and storage process at the decentralized distributed storage within the GENEBANK platform.



In other cases, for example, if a customer is seeking DNA data, they can request it via consumer dApps, where they can access a list of unidentifiable DNA data.

The DNA owners whose DNA data meet the specific requirements of such consumers can search distribution channels via the dApp and can selectively grant access rights to view the data. On the other hand, consumers can gain access and pay for the data with GNBT through dApps.

4.3 Permanent Control of Genome Sequencing data

GENEBANK empowers users with complete control over their entire genomic data, such as for monetization or use for their personal medical records. Since the data will be recorded on a decentralized platform, any issues such as unauthorized use will not arise.

Users can also make the choice to supply this data for medical research, which comes with the opportunity to earn money. The need for this exclusive control arises because, in the past, many people have suffered from medical facilities double and triple-using sensitive information without consent. In other cases, medical institutes have outright denied from returning gene data to owners.

4.4 Exclusive Data Access and Sharing

Benefitting from its existence on a blockchain, users can access their genome sequence from anywhere without the need to pay for costly storage facilities. This access can be consensually given to doctors, medical professionals, or pharmacists to help engineer the owner's treatment.

This access control is really important, especially in a healthcare-related case as for instance, data-owners would like to speak to a few different doctors about their medical condition before they make any significant decisions. Since their genetic data will be available on a blockchain, they can make such consultations easily.

4.5 Incentivizing Genomic Data Computation and Sharing

GENEBANK will identify opportunities for users to monetize their recorded genomic data and utilize smart contracts to create immutable records. The platform's native crypto token, GNBT, will be the chosen medium of exchange as well as the incentive for these transactions.

The token's interoperability is beneficial to users as they can make use of this opportunity to dabble into the crypto ecosystem. It also provides a transparent and traceable way for transactions to go through, ensuring their integrity.

Enabling users with access to a blockchain-enabled and secure platform that makes use of cryptocurrency as its main mode of payment is synonymous with inviting the future in through the front door.

5. GENEBANK Ecosystem

5.1 GENEBANK Ecosystem Services

There are many unique factors that set GENEBANK apart from the many blockchain projects out there. As we have mentioned a bit in the abstract, our platform aims to create blockchain-based solutions based on people's genome data to lead a healthy and affluent life.

With all these said, the main highlights of the platform can easily be understood through the unique factors that we have laid out in this section of the whitepaper. These are the following unique factors—Generic Data Storage Powered By Blockchain, Decentralized Big Data Analysis and Tracking, and Access Data Within The GENEBANK Platform.

5.2 GENEBANK Data Storage Powered By Blockchain

The data storage will interact with the blockchain. Then the platform will proceed with the interaction with end-users, applications, and the data storage itself to capture and analyze the data. The platform will also show the main facilities that are required to make the GENEBANK blockchain run. The entire volume of the GENEBANK Platform and the associated decentralized applications will create "genome data storage services."

5.3 Decentralized Big Data Analysis And Tracking

With GENEBANK, you can analyze people's genetic data within the platform. You can also track the details of your medical treatments through the blockchain to get precise diagnoses.

Once we can gather the data from users, it will be combined and analyzed by our algorithm. The analytics will then be reviewed by data engineers and released to the public to help in any human-related diseases.

Because of blockchain, we can verify, analyze, and track to help you understand further the advent of diseases. Because of such technology, it will be easy to avoid any mistakes in your treatment on our platform.

5.4 Direct Upload And Access Data

Users can directly upload their data to the platform. Multiple nodes will then verify these data. After that, it will be fully available for use within the GENEBANK platform.

Blockchains remove the need for mediators or people who are charging hefty costs for the smallest of services. With our platform, users can directly access data without the need to go through an intermediary service.

To encourage people to use the GENEBANK platform and store their genome data, GENEBANK has implemented Gene Rewards. A capability to launch marketing campaigns such as loyalty programs and affiliate partnerships. Users will receive endless benefits as incentives for sharing their data with the blockchain.

5.5 DNA Data Provider

A DNA data provider is a user who requested DNA data analysis, received a test report from GENEBANK, and finally agreed to share the use of genetic data on the GENEBANK platform via DNA Management dApp.

Users can request a DNA test on GENEBANK. They can ask to know about their family histories or any major diseases, including cancer, cardio, cerebrovascular, and rare and incurable diseases. Also, users can join the GENEBANK platform community and request genomic testing at an affordable price.

Users who want to get the DNA testing will request GENEBANK for a DNA test. GENEBANK will send a test kit to the users and then ask for permission to collect the sample. Users who agree will send a sample of any cell of their body that contains their genetic code (blood, buccal swabs, hairs, bone, teeth, fingernails, etc.).

Furthermore, GENEBANK will conduct DNA analysis and then write the test report and store the genetic test report of GIC to IPFS (InterPlanetary File System) Content Storage[8] on the GENEBANK platform. Moreover, GENEBANK will give access to users to view and check their reports via DNA Management dApp.

However, users can choose to agree or disagree to share the genetic data via DNA Management dApp on the GENEBANK platform. Users who agree will become "Gene Data Providers" on the GENEBANK platform, and those who disagree will remain "regular users." It means users who disagreed with sharing the genetic data via DNA management

dApp are categorized under "general user." So, the available user's DNA data is encrypted and saved in IPFS Storage on the GENEBANK platform and is prevented from being used by affiliated companies. However, users who agreed to share the genetic data via DNA management dApp will become "DNA Providers" after requesting DNA testing.

Like a general user, a provider's data is also encrypted and saved in IPFS Content Storage on the GENEBANK Platform. The DNA data is converted into an unidentifiable format and shared with enterprises and organizations, which becomes an important asset and basis for maintaining GENEBANK's ecosystem.

In addition, a DNA data provider will receive tokens as rewards for their contribution to the GENEBANK platform. The token has a monetary value on the GENEBANK platform. Users can use these tokens to purchase goods or services offered by affiliated companies. Besides, the providers can pursue economic activities on GENEBANK platform dApp. They can join the community of genetic information providers, share medical knowledge and explore trends in the healthcare industry, including drugs and therapies for various diseases.

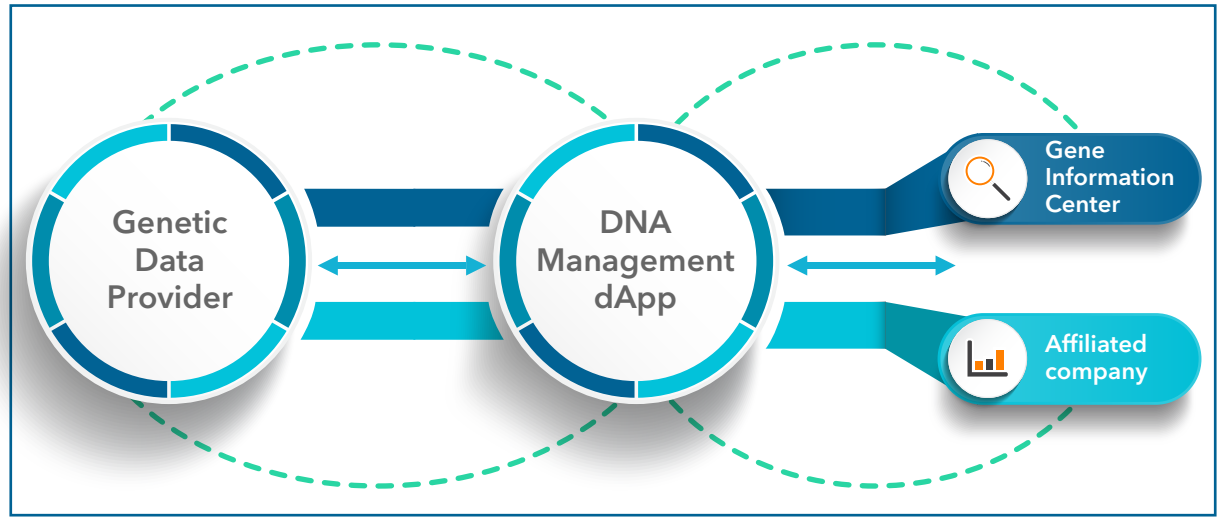
5.6 Gene Information Center (Global DNA Sequencing Alliance Headquarter)

GIC will be the GENEBANK DNA testing center. Its plan is to receive clients' samples (saliva, body hair, primary surveys, etc.) and carry genetic tests. It is the most significant part of the GENEBANK platform. Stakeholders can join the GENEBANK network as a node.

Gene Information Center shall oversee and organize these genomic data collected from individuals and companies. It adds data security by establishing a Global DNA Sequencing Alliance. GIC will also deliver the genetic test report to the GENEBANK platform.

5.7 DNA (genetic) Data Management and Distribution: DNA Management dApp

The below image shows how GENEBANK DNA Management dApp works.



All gene data stored in the GENEBANK are managed and distributed through DNA Management dApp. Affiliated companies can purchase tokens through GENEBANK's DNA Management dApp or Exchange. Also, the companies that explore and request genetic data from GENEBANK's DNA Management dApp can purchase these tokens. The searched genetic database is a non-discriminant database. Only minimal information is open to identifying the genotype.

Further, DNA Management dApp sends approval forms to users who partners or companies select. The DNA testing users can choose to agree or disagree with the use of genetic data. Approved data will be converted into an indiscriminate form and shared with a partner or company. Therefore, the DNA testing user becomes a gene data provider.

Affiliates companies can send tokens to the DNA Management dApp to purchase the required genetic data. As a matter of fact, DNA Management dApp sends the gene data gathered with the gene data provider to partner companies and partners. DNA Management dApp sends tokens

received from companies and organizations to DNA providers. Gene data providers can use these tokens to purchase products, services, or cash out through GENEBANK's affiliated organizations and companies.

5.8 Pharmaceutical Company

Pharmaceutical companies can recruit participants and conduct clinical trials to demonstrate the safety and efficacy of new drugs, foods, medical devices, and new ideas.[6] Usually, the participants for the clinical trial will be examined after submitting the required documents and then go through basic tests such as blood tests and screening. The company can decide whether the participants are suitable for clinical trials.

All the economic and temporal expenses are all paid by the pharmaceutical company despite frequent appearances of those who qualify for the trials. However, if the pharmaceutical company uses the GENEBANK platform to check who is suitable for clinical trial conditions, the accuracy of the recruitment of participants will be different.

The pharmaceutical company describes the purpose and reason for conducting the clinical trial. The company then gives the numbers of participants and plans for the reward of participation to GENEBANK. GENEBANK selects many DNA providers who match the above criteria for the clinical trial via DNA Management dApp. Then, GENEBANK informs the participants through their pages on DNA Management dApp. The participants can confirm if they are willing to join clinical trials.

Furthermore, GENEBANK connects pharmaceutical companies with DNA providers who wish to participate in clinical trials. Pharmaceutical companies can conduct clinical trials and pay tokens to DNA providers in compensation for their cooperation. This allows pharmaceutical companies to increase the accuracy of clinical trials. It also enables them to reduce costs and time for recruiting participants for clinical trials and research. GENEBANK's method of selecting clinical trial participants will ultimately add credibility to clinical trials and research.

5.9 Beauty Or Healthcare Company

Beauty or a healthcare company can use the genetic information offered by GENEBANK's DNA Management dApp.

Diet Industry

Consumers have been able to choose dietary products based on ads on social media and reviews of products yet couldn't expect many benefits as the selected products do not meet the physiological traits. However, diet products provided upon gene data set a standard for choosing personalized products. They help to avoid unnecessary consumption of foods. They also help reduce weight in efficient ways.

Companies providing dietary products can conduct various research on diets through gene data. This makes it possible to produce personalized diet products for those who have genes that are likely to cause obesity. The company collects many de-identified genetic data to produce dietary products and classify genes in various ways. Therefore, there will be more specified and larger sections of nutritional products.

GENEBANK implemented dApp to allow consumers to check the distribution of products such as production date and location of diet products with blockchain technology. It is a process to build trust and credibility in the products.

Diet To Prevent Hair Loss Company

Companies that produce hair loss products can research data related to hair loss prevention and treatment to slow down the ongoing hair loss through gene Data. Companies can also develop new products for hair loss prevention or treatment and gain new customers based on the gene info.

Genetic hair loss is challenging to cure.[7] However, with an advanced dApp, companies can handle many customers, including providers of

gene info interested in hair loss prevention and treatment. Users can receive a variety of additional services from the company's dApp. Users can purchase hair loss prevention and treatment products through the company's dApp. This allows them to participate in a community of people who have genes that cause hair loss.

People can share information on hair loss through the GENEBANK community. They can attend conferences and seminars. Also, they can receive upcoming and new treatments and medical expertise.

Manufacturers And Distributors Of Cosmetics

Beautifier companies can build a new type of database by merging DNA data with stored skin databases. Moreover, they can efficiently use the data to make products that meet consumer needs, including analytic data on skin types and genetic factors for aging, increasing consumer's reliability. Consumers cannot choose personalized cosmetics based on the results of genetic tests through GENEBANK. Even if the results are not possible, consumers can purchase cosmetics products that match physiological and biological traits by examining specific products.

Consumers can also reduce the side effects of cosmetics by selecting products based on research and development to control gene expression. In addition to periodical genetic and skin type testing, the data guide selects cosmetics suitable for the current status of skin, seasonal and situational contexts. Companies can use the gene data for marketing goals such as new product development and product review with providers of gene info before launching. All these procedures reduce the marketing cost of the company and enable price competitiveness.

Users can search for the details of (cosmetics) products such as raw materials, ingredient list, and distribution process via GENEBANK dApp.

5.10 Genome Research Center

GENEBANK aims to create a Global Alliance for Genomic data sharing for smooth management of the GENEBANK platform. DNA sequencing analysts represent each country's plan to hire qualified companies operating in their home country for years and give accurate DNA analysis results to clients who have requested DNA testing to GENEBANK.

Suppose the quality of gene data from certified institutions couldn't be compared to those based on unidentifiable sources of gene DB, the research institution can specify genetic databases with a clear source of origin into regions, gender, disease, physiological and biological traits, etc. They can then use them in various ways for research purposes. Besides, different gene databases can help to reduce the cost of clinical trials and clinical studies.

GENEBANK data that is distributed across the Gene platform does not reveal the identity of gene info providers. The distribution of gene data on the GENEBANK blockchain-based platform ensures data integrity and security. Therefore, it prevents data loss.

Research institutions can profit from the accuracy of gene data and secure distribution networks on the GENEBANK platform. Stable gene information on the platform can help the research institutions efficiently manage research investment and improve research outcomes.

5.11 Health Facility

Based on the results of genetic tests received from the GIC, the gene database provider can send an extra inspection report to the medical institution for further report analysis.

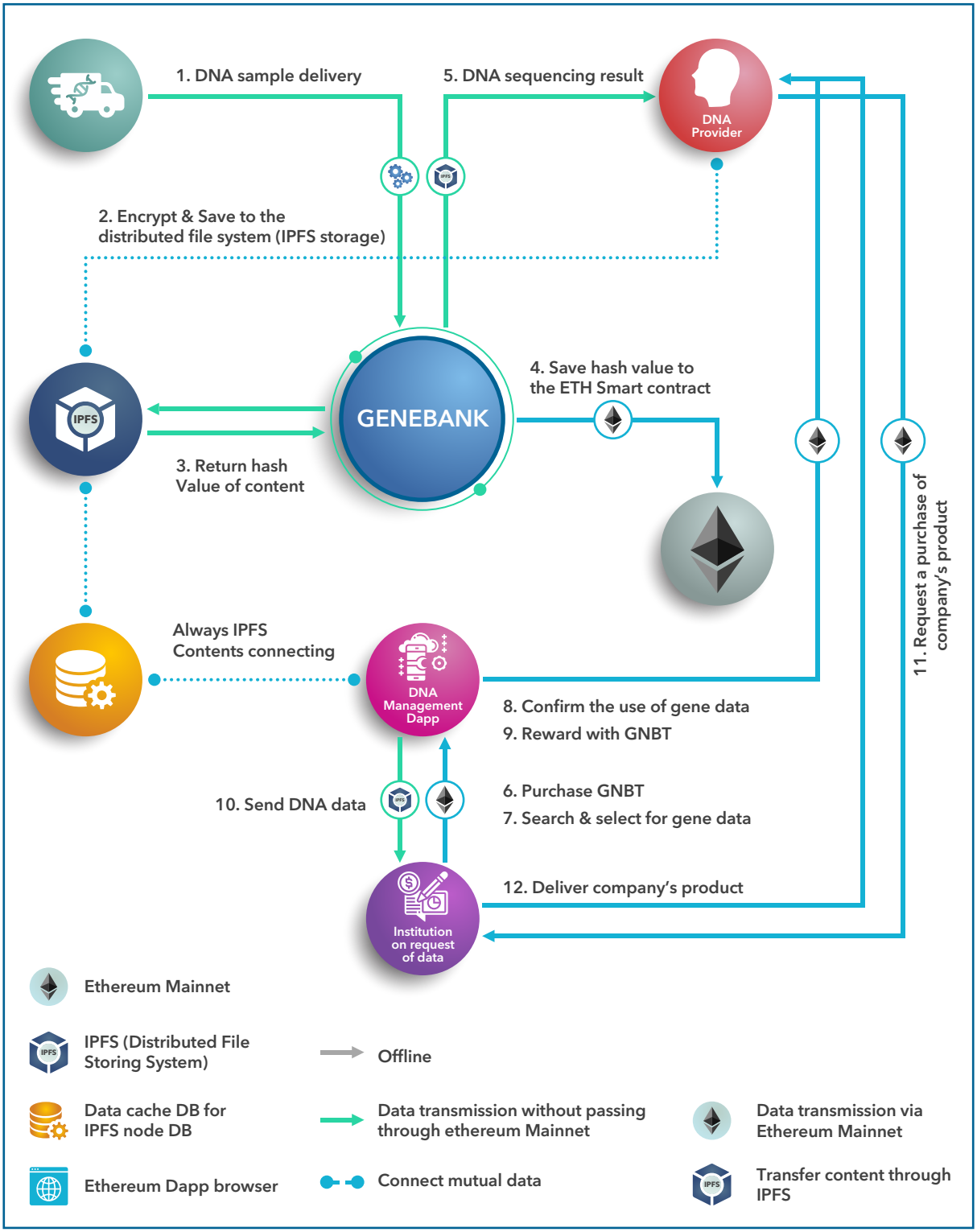
DNA provider will verify gene test results through GIC, but if the gene is presumed to cause disease such as BReast CAncer gene 1 (BRCA1), BReast CAncer gene 2 (BRCA2), etc. the provider of the gene can request more testing at a medical institution affiliated with the GIC.

On the other hand, a DNA provider can pay a token to the medical institution. The health facility will accurately analyze the provider's gene and then send genetic test results to the provider. All this process is done through the GENEBANK platform.

In addition, if the research institution needs to compare its gene database with other gene databases, it can use GENEBANK tokens to pay for the gene database of the DNA provider.

6. GENEBANK Technology

6.1 Structure of GENEBANK Platform



6.2 Components of GENEBANK Platform

6.3 Ethereum Blockchain

As Ethereum is the second-generation blockchain technology, the public blockchain Mainnet is the most significant part of the GNBT platform. Not only is it essential for the transmission of GNBT traded in the GNBT platform, but it is necessary for the operation of dApp as well.

Vitalik Buterin, the person in charge of Ethereum's blockchain technology, gave much attention to Bitcoins and discovered that the blockchain could not only keep cryptocurrency transaction records but also other types of information such as contracts. With continuous improvement, GENEBANK has created a decentralized network system with existing computing resources. This system can keep records of email, SNS, and electronic voting.

GENEBANK can work with several contract patterns between dApp through smart contract and is in the transition of implementing new Proof of Stake (PoS).

6.4 Decentralized File Distribution Storage System

GENEBANK platform is different from others as it introduces a decentralized file distribution system called Inter Planetary File System (IPFS). As we all know, blockchain is a decentralized storage technology that decentralizes the ledger (e.i., a ledger is exclusively owned by a specific company, however a decentralized ledger can be owned by all the nodes in the ecosystem). With the decentralization of the ledger, both the user and non-user can access the transaction details.

In particular, decentralized IPFS serves as a peer-to-peer distributed file system where individual nodes store data. When specific data is uploaded onto this IPFS, files will be divided into hundreds of files and will be stored in a storage network. The split files are given a common

hash value that is different from the actual file name. This hash value can not tamper. Meanwhile, if you know only the content address, you can browse and download the file at any time.

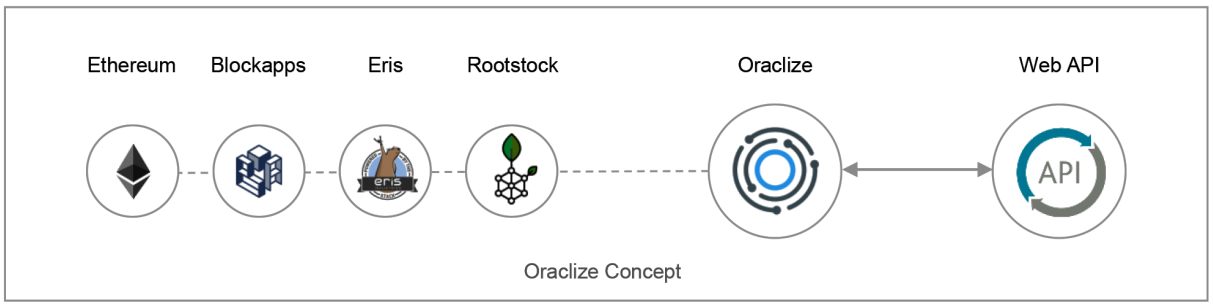
With this kind of structure, service providers will be able to share files with users through IPFS and can actually save on file management costs. GENEBANK platform aims to combine this decentralized information storage system with an Ethereum blockchain network. The process will be as follows:

- The DNA test result of the individual generated by GNBT is encrypted and stored in IPFS.
- IPFS clients (i.e., pharmaceutical companies, healthcare systems, research institutions) will search for desired content such as DNA sequencing result documents using Interplanetary Name Service (IPNS) in the cache database linked to each client.

  With a small number of tokens paid in the DNA management
- dApp, the report of test results can then be downloaded from IPFS storage.

Through this process, the GENEBANK platform introduces a storage mechanism that is unique compared to the ones that are based on existing cloud infrastructure. GNBT is a true platform that not only the bite code of smart contracts and token transactions but the content itself is also decentralized.

6.5 Oracle Problem and the Introduction of Oraclize



Basically, Oraclize is a solution that helps external data to be used as an input within the blockchain network. Oraclize is the name of the Oracle Service that provides API-based authentication after various times of off-chain verification through structured systems for Blockchain operators who want to use Smart Contract.

Meanwhile, Oracle means accepting data inputs from outside the blockchain also known as an on-chain.[9] It is not easy to counterfeit or modulate stored data in blocks of Blockchain. However, if the data is not stored in the block from the moment that the data is entered, the data will become unreliable. The same happens when there is a problem with the modulation in the process of data storing, it becomes unreliable.

The process of putting Off-chain data to On-chain (blockchain) is not that simple. First of all, data should be in a clean state. With regards to Off-chain, someone should enter the data on the blockchain network or be entered by automated software. The Oracle Problem is a trust problem for the enterprise that attempts to push external data onto the blockchain. It starts with the fundamental question 'How can you trust the subject (person, software, etc) that enters the Off-chain?'

Consequently, the GENEBANK platform aims to apply Oraclize middleware through the following method.

- An individual (DNA info provider) who delivers a product to GENEBANK through a direct visit, mail, etc., with physical appear ances such as hair follicle, blood, or saliva.
- GENEBANK can track the provider's DNA distribution process in the Logistics System and can proceed to reward the provider with GNBT via dApp. With a reliable middleware (Oraclize), it ensures the accuracy of input data and clean state which are accepted from the off-chain.

Unlike any other platform, the GENEBANK platform is a complete plat-form where it guarantees the reliability of external input values.

6.6 GENEBANK Validation Service

As its business evolves, GENEBANK must also expand and adapt its operational infrastructure. The business will rely on its blockchain-based software systems, cryptocurrency wallets or other related token storage mechanisms, blockchain technology, and smart contract technology.

When you send tokens, interact with a contract, send GNBT, or do anything else on the blockchain, you must pay for that computation. Miners must validate this transaction. Whether the transaction succeeds or fails, you pay for the opportunity to transact.

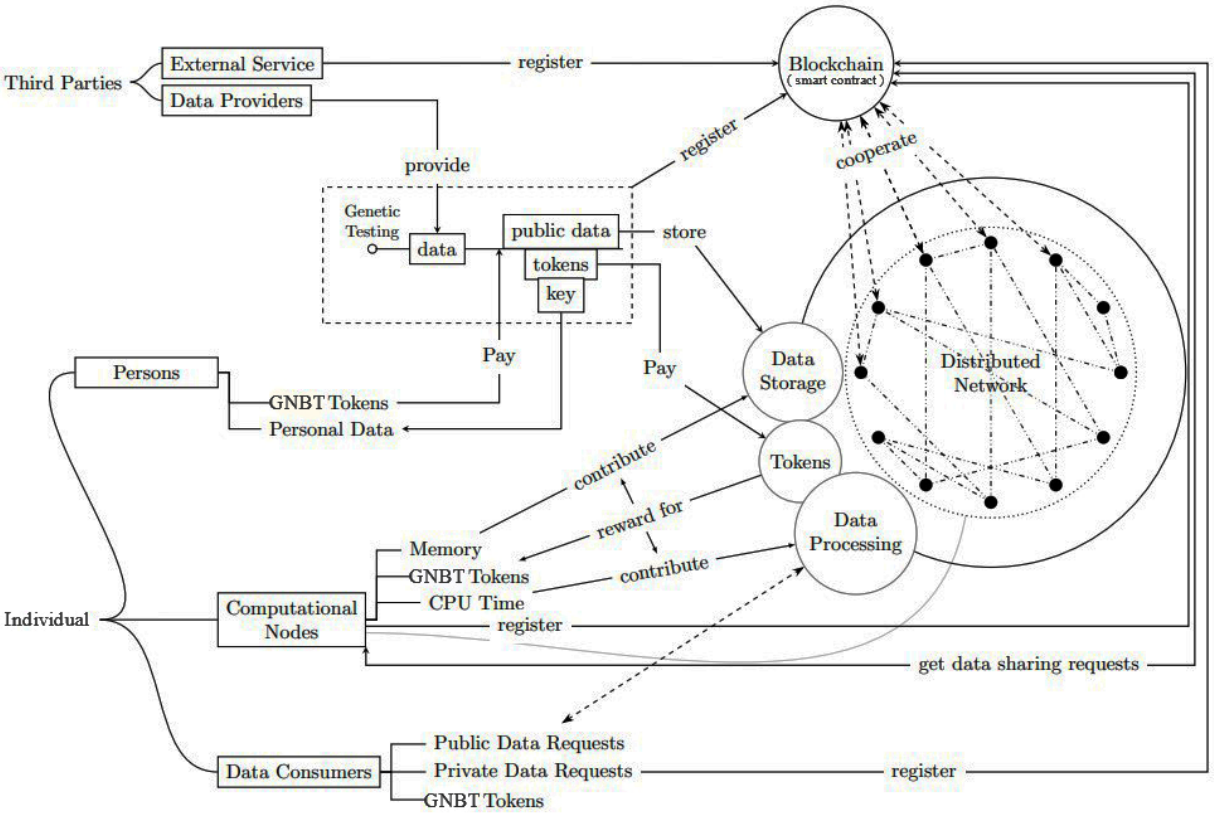
All of these systems represent complex and always changing technical infrastructure. In order to demonstrate continued ability to effectively manage technical support infrastructure for GENEBANK's platform, and the future functionality of the Tokens the company will need to continue to upgrade and improve its data systems and other operational systems.

These upgrades and improvements will require a dedication of resources and are likely to be complex and increasingly rely on hosted computer services from third parties that the Company does not or will not control.

6.7 Consensus Algorithm

GENEBANK has developed a dedicated compression algorithm for digital Partial or Full Genome Sequences. The idea is based on the conversion of 4 Genetic Code letters into a 2-bit code, which can then represent any of the 4 letters; C, G, T, and A. The current working algorithm can compress any sequence to approximately 25% of its size.

All the DNA sequences that are being uploaded into the system aim to be converted to the compressed form in order to save space and make processing faster.



The financial technology and cryptocurrency industries in which GENEBANK competes have grown rapidly over the past few years and continue to evolve in response to new technological advances. In addition, the always-changing business models, shifting regulations, and other factors.

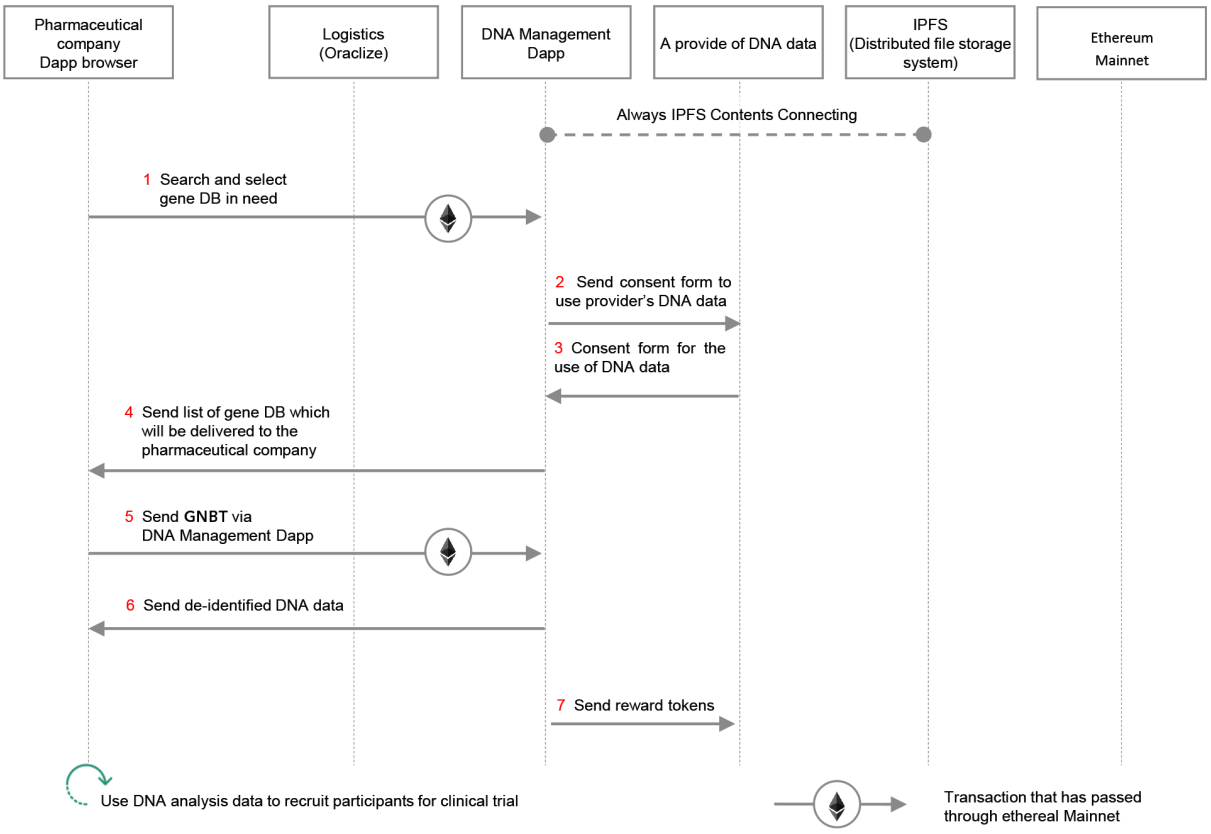
As a result of this constantly changing environment, GENEBANK may face operational difficulties in adjusting to the changes, and the sustainability will depend on its ability to manage its operations. Moreover, to ensure that it hires qualified and competent employees, and provides proper training for its personnel.

7. Use Cases

7.1 Pharmaceutical Company

For a pharmaceutical company, the use cases are divided into two.

1. A pharmaceutical company's purchase service of an individual's gene information.



- Pharmaceutical companies search and choose DNA databases from DNA Management dApp.
- DNA Management dApp sends a consent form for the use of genetic data to a provider.
- DNA suppliers agree to use their DNA data.
- DNA Management dApp sends a list of DNA data to be sent to pharmaceutical companies.

- The pharmaceutical company sends tokens to the DNA Management dApp.
- DNA Management dApp is a pharmaceutical company that \ transmits de-identified gene information.
- DNA Management dApp sends tokens to the provider of DNA in compensation for the use of genetic databases.

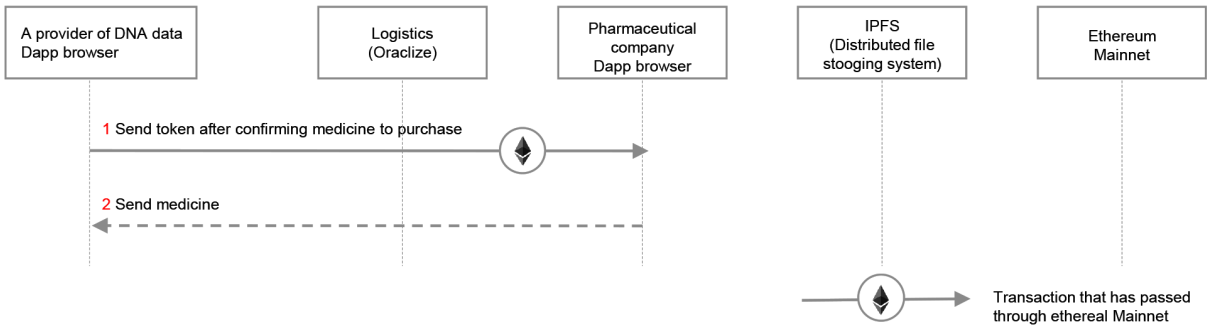
2. A drug purchase service of DNA provider information
   - DNA DB provider accesses pharmaceutical company's dApp, pays tokens, and buys pharmaceuticals.
   - Pharmaceutical companies ship medicines to DNA providers.

7.2 Healthcare/ Beauty Company

The use cases of a beauty or healthcare company are:

1. A gene data purchase service from a health/beauty care company.
   - Beauty care companies look up and select genetic databases required by DNA Management dApp.
   - DNA Management dApp sends a message to the DNA provider asking if you agree to use the gene database.
   - DNA suppliers agree to use their gene databases.
   - DNA Management dApp sends a list of gene DBs to be provided as a health/beauty care company.
   - The pharmaceutical company sends the Token to the DNA Management dApp.
   - DNA Management dApp is a health/beauty care company that transmits unidentified gene databases by law.
   - DNA Management dApp sends tokens to DNA suppliers in compensation for gene database utilization.

2. A beauty care enterprise product purchasing service of a gene DB provider.



- A DNA DB provider accesses the dApp of a healthcare/beauty company and purchases medicines with a token.
- Healthcare/beauty companies send healthcare/beauty products to DNA providers.

8. Strategic Partnership for Global (genome) Sequencing

Plan for Establishing Global Sequencing Branches

8.1 Global Sequencing Alliance

GENEBANK aims to have a Gene Information Center (GIC) for the purpose of building global sequencing partnerships. With GIC, it enables everyone across the world to proactively analyze DNA data. We will create a partnership system with the sequencing institutions distributed around the world, so anyone can freely analyze their own DNA information and receive the results. This will be possible with the help of a specialized global agency partnership.

All information that is relevant to management tasks and system works will be carried out by GIC. The detailed planning of building alliance is as follow:

- GENEBANK to establish Gene Information Center (GIC) and gain its legal business license.
- Memorandum of understanding (MOU) to initiate a business alliance with specialized agencies worldwide.
- Building a system for the business alliance with each country's organization by designating DNA Testing Center (DTC) for each continent (Europe, Africa, CIS, Central Asia, North and South America).
- Target set for each DTC organization will be classified by its size (number of base sequence analysis that can be processed at one time). The purpose is solely for each continent to respond to more than 5000 information requests at the same time.

Process	Plan
Establish	Establish a Gene Information Center.
Research	Organize information of DNA Testing Centers worldwide.
Propose	Suggest the vision of the GNBT platform and recommend the partnership.

Negotiate	Negotiate share rates for sequencing cost and distribution rates for tokens based upon ratings per institution. Then sign up for MOU.
Market	Promoting the GNBT platform for the sequencing work in each country

8.2 Laws and Privacy of Personal DNA Data Distribution

As the global DTC DNA testing industry keeps on developing, a regulatory environment has been established with the revision of associated laws. These regulations are especially in the areas of medicine and genetics in developed countries.

Moreover, under the General Data Protection Regulation (GDPR), Europe regulates natural persons' biometric data to be managed under a list of sensitive information with unique identification numbers. In the United States, the "HIPAA Privacy Regulation" enacted in 2002 elaborates the measures that protect personal genetic information by all organizations dealing with personal medical information. This is particularly by using insurance and health services based on genetic information. In Korea, the "Act on Bioethics and Safety" since 2005 regulates the conduct of inspection and distribution of personal genetic information.

On the other hand, Japan has no specific legislation related to DNA testing and there are no regulations referring to DTC. However, it is recommended to include it in the general rules on the handling and processing of personal information.

GENEBANK closely works with an advisory group that consists of top experts in the field of genetics law to analyze the regulatory world. GNBT also researches the best positions to build a genetic information-sharing platform.

Lastly, GNBT platform will announce details of the base sequence provider from the official website and dApp to be released in the near future. Also, they will announce the details of the archiving and management of the genetic information analysis report.

We, in GNBT, will obtain explicit consent to use the genetic information from the provider, and related tasks will be promoted. Whenever genetic data from a particular individual is circulated to a third party, the information is subjected to anonymizing processing.

9. GENEBANK Token Economy

9.1 Token Specification

GENEBANK will rely principally on its native token (GNBT) to keep its economy. GNBT will be available for direct use on the GENEBANK platform when the tokens are made. The maximum supply of GENEBANK tokens will be issued in its genesis block and limited to 10,000,000,000 GNBT. These will be made available via token listings on exchanges. Any user or company who wants to use GENEBANK for payment on the platform will do so even without a good understanding of blockchain technology and cryptocurrency.

Since GENEBANK will be available for use on the platform, users can also trade on exchanges and benefit from it. It will maintain and increase the market value of the token.

9.2 GENEBANK Token (GNBT)

GNBT is the primary utility of the GENEBANK economy. It will serve as a means of payment and transfer for all the transactions within the platform while working as the network's fuel. In short, within the GENEBANK platform, users will find a payment gateway – with all its subordinate services. Users can buy GNBT tokens to access various services available in the GENEBANK platform and save more money.

Initially, GENEBANK will follow the ERC-20 token standard. This is for easy compatibility with other ERC20 tokens and the cryptocurrency wallets that provide support for them. Given that GENEBANK aims to get fast and seamless adoption of its token, the team has decided to create the token through Ethereum smart contracts, and it will be available for purchase with ETH.

At GENEBANK, we are trying to drive large-scale human genome sequencing to advance knowledge or awareness of the causes of diseases. As a result, GENEBANK users are rewarded with GNBT tokens according to the level of demand for specific DNA data. The higher the request, the higher the rewards will be.

9.2.1 Token Allocation

GENEBANK has a total supply of 10,000,000,000 GNBT that will be allocated for different uses on the platform.

9.2.2 Ecosystem Reserves

This is to make sure GENEBANK will have reserves for the ecosystem to establish increased global adoption of its GNBT token. Moreover, this it to help sustain its token circulation in GENEBANK platform. The reserve is also allocated for the use of DNA Research and building of legal advisory consultancy.

9.2.3 Development

With the idea of being transparent, some GENEBANK tokens will be kept in reserve for security and the platform development. The funds will be kept to maintain the GENEBANK ecosystem running even if there are changes in the market.

9.2.4 Marketing and Events

As marketing is a special tool, without which it is pretty challenging to succeed, the GENEBANK team will allocate a percentage of the tokens for marketing campaigns and events. This will help attract new investors to the GENEBANK platform, making new partnerships with other companies and its platforms. This way we can enhance the use case of GENEBANK and make it available on a global basis.

9.2.5 Team

A small percentage of the tokens shall be allocated to the company for its operations and management purposes. The developers of the platforms will also be given a fair reward for making sure the creation of the overall project is successful and feasible. Owners, Shareholders, and Partners on the other hand will receive some portion for their support.

10. Roadmap

GENEBANK has started mobilizing its team to encourage seamless blockchain-based genome sequencing information sharing.

2020

Q3

Introduce GENEBANK Token

Launch GENEBANK website and social media
Publish GENEBANK whitepaper

Q4

Promote GENEBANK

Promote the project to related companies
Establish strategic partnerships

2021

Q1

Create GENEBANK Token

Mint GENEBANK as ERC20 token
List GENEBANK on partner crypto exchanges

Q2

Expand GENEBANK Team

Build and expand GENEBANK Token team
Start developing GENEBANK Token blockchain

Q3

Launch DNA R&D System

Launch DNA Research and Development (R&D) System
Build legal advisory consultancy

Q4

GENEBANK App Development

Mobilize team for DApp creation
Start GENEBANK Token App development

2022

Q1

Launch GENEBANK App

Start soft launching of GENEBANK Token App;
GENEBANK platform marketing campaign

11. Disclaimers

11.1 Regulatory Permits and Approvals Not Guaranteed in All Rights

GENEBANK Token intends to receive the needful licenses and approvals and to handle complete compliance with regulatory laws and requirements. GENEBANK Token project cannot assure potential investors that regulatory licenses or approvals will be received, which means that the initiatives implemented in this Whitepaper may not be available in specific markets. Neither the progress nor the establishment of the Market is ensured.

11.2 No Representations and Guarantees

GENEBANK Token does not make or purport to make. It thus disclaims any representation, warranty, or undertaking in any structure whatsoever to any substance or individual, including any design, warranty, or undertaking comparable to the truth, accuracy, and completeness of any of the data set out in this Whitepaper.

11.3 Purchase Restrictions

The distribution and utilization of this Whitepaper, including any notice or other contribution material, might be confined by law in specific jurisdictions. Potential buyers ought to illuminate themselves about those laws and notice any such limitations. People into whose possession this Whitepaper must illustrate themselves about and see any such limitations.

If you come into ownership of the Whitepaper right outside the nation, you should look for guidance and notice any limitations. If you ignore consent to such restrictions, that failure may establish a violation of relevant law.

An individual may not offer for the purchase or issue an encouragement to buy GENEBANK Token or separate or distribute this Whitepaper or

some other showcasing material or promotion identifying with GENEBANK Token, aside from if the offeror greeting, or circulation or distribution, complies with all applicable guidelines, and mandates.

11.4 Third-Party Information and No Consent of Other Persons

This Whitepaper includes data got from different third-party sources ("Third Party Information"). None of the Third Party Information distributors has consented to the incorporation of Third Party Information. In this Whitepaper, and is therefore not at risk for Third Party Information. While the GENEBANK Token has made sensible move to guarantee that the Third Party Information has been added for their legitimate structure and setting, neither the GENEBANK Token nor its directors, executive officers, and workers following up on its behalf, has freely verified the precision, unwavering quality, completeness of the contents, or determined any applicable underlying suspicion, of the applicable Third Party Information.

Consequently, neither the GENEBANK Token nor its directors, executive officers, and workers following up on their behalf make any representation or guarantee concerning the accuracy, reliability, or culmination of such data and will not be obliged to provide any updates on the equivalent.

11.5 Authorized Language of this Whitepaper

This Whitepaper and associated materials are given in English exclusively. Any version for reference purposes only and isn't certified by the GENEBANK Token or some other individual. No affirmation can be made concerning the exactness or culmination of any translation. If there is any irregularity between a translation and this English form of the Whitepaper, this English variant prevails.

11.6 Terms Used

To encourage a better understanding of the GENEBANK Token being offered to buy by certain specialized terms and contractions, only in certain instances, their representation has been utilized in this Whitepaper. These depictions and assigned meanings should not be treated as conclusive of their implications and may not relate to standard industry implications or utilization. Words bringing in the singular shall, where relevant, incorporate the plural and the other way around.

11.7 Graphics

All designs added in this Whitepaper are for illustrative reasons only. Precisely, graphics with value references don't convert into actual pricing data.

11.8 Distribution and Selling Restriction

The distribution or scattering of this Whitepaper or any part thereof might be denied or restricted by the laws, administrative necessities, and rules of any jurisdiction. For the situation where any r e s t r i c t i o n applies, you are to illuminate yourself about and to observe any limitations which are appropriate to your ownership of this Whitepaper or such part thereof at your own expense and without liability to GENEBANK Token.

People to whom a duplicate of this Whitepaper has been appropriated or dispersed gave admittance to, or who otherwise have the Whitepaper in their own will not circle it to some other people, replicate or in any case disseminate this Whitepaper or any data contained herein for any reason whatsoever nor grant or cause the same to happen.

11.9 No Advice

No data in this Whitepaper ought to be viewed as a business, lawful, monetary, or charge exhortation considering the GENEBANK Token as implied in this Whitepaper. You ought to counsel your own legal, budgetary, charge, or another expert counselor concerning the GENEBANK Token referred to in the Whitepaper. You should be mindful that you might be needed to shoulder the financial risk of any buy of GENEBANK Token for an inconclusive timeframe.

11.10 No Further Information or Update

No individual has been authorized to give any data or representation not contained in this Whitepaper regarding the GENEBANK Token platform. Whenever given, such data or portrayal must not be relied upon as having been authorized by or on behalf of GENEBANK Token.

The GENEBANK sale will not, under any conditions, comprise a proceeding representation or create any recommendation or suggestion that there has been no change or development reasonably liable to include a material change in the undertakings, conditions, and prospects of the GENEBANK Token or any assertion of actuality or data contained in this Whitepaper since the date hereof.

11.11 No Registration

No regulatory authority has investigated or affirmed any of the data set out in this Whitepaper. No such activity has been or will be taken under the laws, administrative prerequisites, or rules of any jurisdiction. The publication, distribution, or spread of this Whitepaper doesn't suggest that any such relevant laws, administrative necessities, or regulations have been complied with

11.12 Risks and Doubts

Prospective purchasers of GENEBANK Token ought to painstakingly consider and assess all dangers and vulnerabilities related to the GENEBANK Token and their separate organizations and tasks. All information is set out in this Whitepaper and the T&Cs before any purchase of GENEBANK Token.

If any of such dangers and vulnerabilities form into genuine functions, the business, financial condition, results of operations, and possibilities of the GENEBANK Token could be substantially and adversely influenced. In such cases, you may lose all or part of the estimation of the GENEBANK.

11.13 Forward-Looking Information

All statements, estimates, and budgetary data contained in the White-paper, on the Website, in any public comments or any spot open by the general population, and oral proclamations that might be made by GENEBANK Token that are not statements of recorded fact establish "forward-looking explanations".

A portion of these assertions can be distinguished by forward-looking terms, for example, "aim", "target", "envision", "accept", "could", "estimate", "expect", "if", "intend", "may", "plan", "conceivable", "plausible", "venture", "should", "would", "will", or other comparative terms. In any case, these terms are not restrictive methods for distinguishing forward-looking statements. All statements for GENEBANK's Token and Platform Operator's monetary position, business techniques, plans and prospects, and the future possibilities of the business are forward-looking statements.

These forward-looking statements, including yet not restricted to proclamations as to income and productivity, possibilities, likely arrangements, other expected industry patterns, and different issues

examined in the Whitepaper with respect to GENEBANK Token or potentially Platform Operator, are matters that are not recorded realities, but rather just forecasts.

Such forward-looking explanations include known and obscure dangers, vulnerabilities, and different elements that may cause objective functions or results, execution, or achievements to contrast physically from the appraisals or the outcomes suggested or communicated in such forward-looking statements.

These elements incorporate, among others: changes in political, social, financial, and stock or digital money economic situations, and the administrative climate in the nations where the GENEBANK Token conducts its organizations and activities; the danger that the GENEBANK Token might be not able or execute or actualize their particular business methodologies and plans; changes in financing costs and exchange rates of fiat monetary standards and digital forms of money; changes in the foreseen development techniques and anticipated inside development of the GENEBANK Token; changes in the accessibility and expenses payable to the GENEBANK Token regarding their separate organizations and activities.

GENEBANK Token renounces any obligation to update any of those forward-looking statements or openly declare any modifications to those forward-looking statements to reflect future turns of events, functions, or conditions, regardless of whether new data opens up or different parts happen in the future.

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