



White Paper

Ver1.0

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1. Introduction of HeFi project

1.1 The Global Population Is Aging

Population aging is a great concern in most countries in the world except Africa. In particular, South Korea, China, and Japan, three Northeast Asian countries, are experiencing rapid population aging. Population aging in South Korea is following the case of Japan, and China is rapidly entering an aging society as fast as it has achieved super-fast economic growth. It is the time when the right services and solutions are needed to prepare for this global megatrend. This is how the Hefi project began.

What is Population aging?

Population aging is an increasing median age in a population because of declining fertility rates and rising life expectancy. Due to the improvement of the level of medical service, people all over the world are getting more interested in health and the mortality rate and longevity trend. This accelerates population aging and brings about a great change in the population distribution.

Rapid aging in South Korea, China and Japan.

The population of three countries of Northeast Asia, South Korea, China, and Japan, is 1.6 billion in 2022 and it accounts for 22% of the world's population, and the elderly population over 65 years old in those countries is 140 million which accounts for 28% of elderly population all around the world.

It is predicted that by 2035, 3 out of 10 elderly people in the world will live in those three Northeast Asian countries. This rapid aging issue in those particular countries is drawing considerable attention worldwide. Among them, South Korea is experiencing the population aging at an unprecedentedly rapid rate in the world, but the preparation of local people and the country for the aging issue still has a long way to go.

Aging in Korean Society and Single-person Households

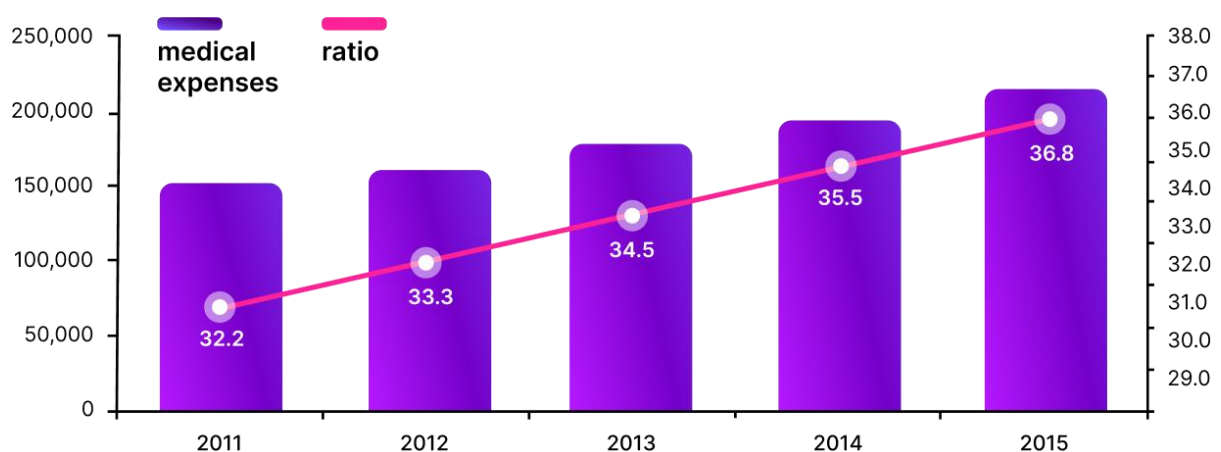
According to the National Statistical Office's Population and Housing Census, as of November 2022, 9,046,000 Koreans aged 65 or older, of which 21.8% or 1,973,000 make up a single-person household, reaching an all-time high in the number and proportion of the elderly.

Moreover, according to the 2021 Survey on the Status of the Elderly, 58% of the elderly want to continue living in their homes, that is, in the community, even if they are unable to move. In particular, the average number of chronic diseases owned by the elderly over 65 years of age is 2.7, and those over 72 years of age have 5.2 chronic diseases, which is twice as many.

Medical costs are rapidly increasing due to aging

Due to aging, the outbreak of chronic disease is also increasing. Among those aged 65 and older, 20.7% had 2 or more chronic diseases, and 60.5% had 3 or more chronic diseases. According to dementia research, the prevalence rate of dementia in 2012 is 9.18%, and the number of patients is expected to double every 20 years. The number of patients was about 540,000 in 2012, but it will be about 1.27 million in 2030 and 2.71 million in 2050.(Korea Ministry of Health and Welfare, 2013).

It's hard for elderly people to keep homeostasis. Therefore, they are much more exposed to health risks and it causes medical costs to increase. According to the health insurance cost statistics, in 2015, the medical expenses of the elderly aged 65 or older in South Korea amounted to KRW 21,361.5 billion, it accounts for 36.8% of the total medical expenses.



[material] Status of senior medical expenses & component ratio by year (Unit: KRW 100 million, %) - Health Insurance Review of Korea(2016)

1.2 Healthy Aging

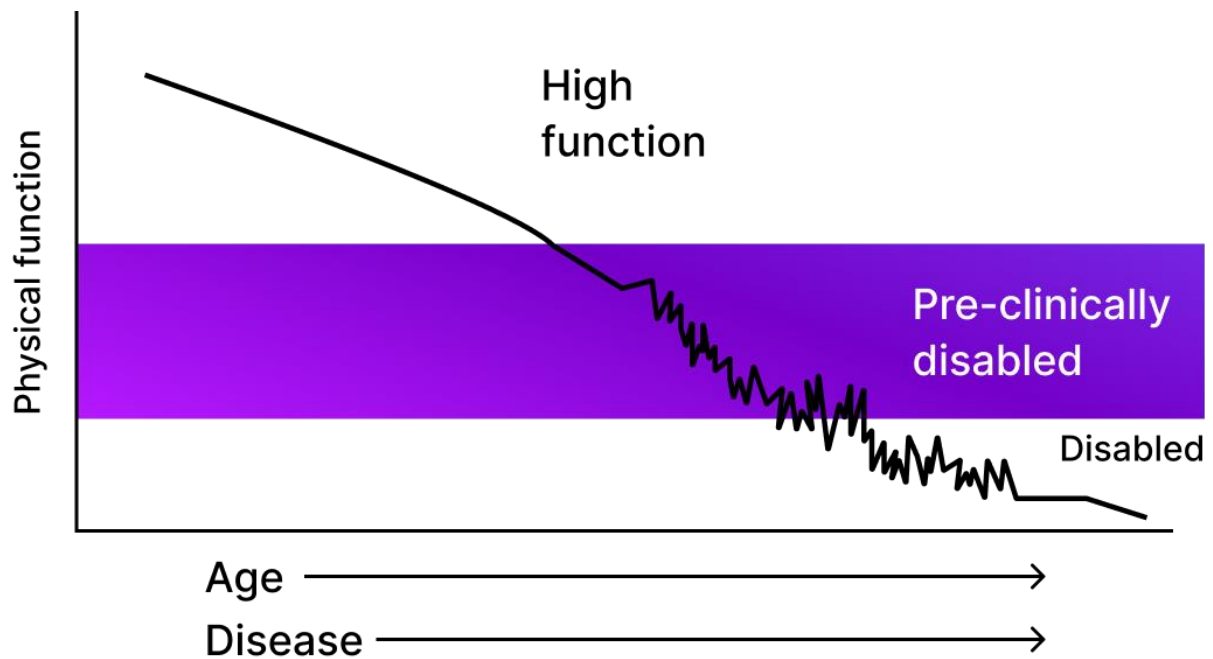
Healthy aging means not only to live a longlife for the elderly, but also to manage a healthy and happy life. Interest in such healthy aging is becoming more important as the elderly population increases.

The Relationship between Healthy Aging and Frailty

The important thing for the elderly in an aging society is not simply to live a long life, but to live a healthy and happy life by delaying aging as much as possible. Aging is a physiological change process that everyone goes through as they grow older. On the other hand, frailty is the result of accumulated physical damage due to aging or disease. Physical damage such as organ function decline, the main feature of frailty, varies from person to person. This is what makes frailty different from the aging that everyone goes through. Accordingly, the World Health Organization (WHO) defined healthy aging as follows.

"The process of developing and keeping functional abilities that enable the elderly to develop their wellbeing"

While experiencing the aging process, the internal capacity and functional ability of individual elderly people draw a certain trajectory. Broadly, it can be divided into a step in which function is good enough to enable independent living, a step in which physical and mental functions are weakened, and a stage in which physical and mental functions are significantly impaired.



[material] Changes in physical function with age(Manini, T(2011))

Frailty stands for being vulnerable and the body cannot properly face stress due to the decrease in physical capacity and the increase in chronic diseases in an aging process.

In the elderly over 80 years of age, activity restrictions increase due to weakness and disease, and the demand for Healthcare services and care services increases. As such, elderly people who have entered frailty status have difficulty living independently, and the risk of physical disability, hospitalization, and death increases. In the treatment of pneumonia or fractures, the hospitalization period and medical expenses increase depending on the degree of frailty.

According to a study, It is estimated that a 10% reduction in prevalence of sarcopenia would save \$1.1 billion in health-related costs.

Frailty management required to achieve healthy aging

Frailty management services are needed to achieve healthy aging. When the elderly have a good physical function, they have to maintain their physical capacity and prevent frailty, and when it's before frailty status, the reduced physical function must be restored and the incidence of falls and strokes must be prevented. In cases where the physical capacity of the elderly has been significantly impaired and has

become frail, services that can supplement and maintain the lost functions have to be provided.

The Need for New Platform Technologies

In preparation for the rapidly progressing aging society, a platform is needed that allows individuals to safely use services that minimize medical expenses and support healthy aging. In particular, it's getting more important to have a platform capable of providing and managing services customized to each individual's health status and needs.

Based on this background, the HeFi project aims to build a platform that provides personalized health aging services and effectively manages medical expenses. To this end, the HeFi project seeks to provide user-centered services by actively utilizing the latest technologies such as AI, blockchain, and digital healthcare.

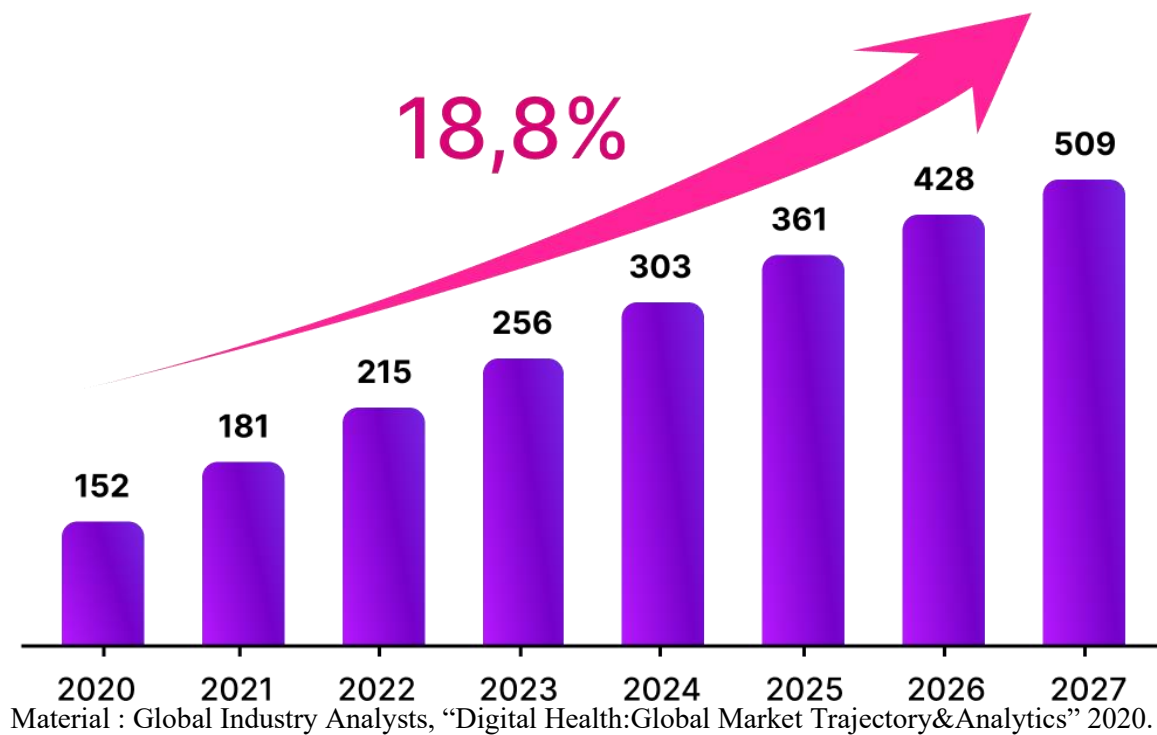
1.3 Digital Healthcare

Rapid growth of the digital healthcare market

Digital healthcare refers to intelligent medical services that monitor individual health status and enable customized treatment through the convergence of digital technologies such as big data, artificial intelligence (AI), Internet of Things (IoT), and cloud computing.

Although human lifespan has increased due to the development of medical technology, the importance of lifestyle and health management is gradually increasing due to the increase in chronic diseases. As a result, the paradigm of Healthcare is shifting from treatment-oriented services in the past to customized healthcare such as disease prevention and health management. In particular, through the spread of smart devices and the utilization of big data, digital healthcare technology is developing to a high level and its scale is getting bigger.

Global Digital Healthcare Market Forecasts and Trends (Units: \$1 Billion)



According to a report by Global Industry Analysts (GIA), the global digital healthcare market is expected to grow from \$152.5 billion in 2020 to \$508.8 billion in 2027 at a compound annual growth rate of 18.8%. Globally, the digital healthcare market has entered a growth phase along with smartphones and IoT-based wearable devices. This growth is being accelerated due to the entry of various companies from medical device companies, global ICT companies, and startups to the market.

Healthcare and Wearable

Digital healthcare and wearables are an inseparable relationship. With the development of technology, the wearable market is growing rapidly, and the demand for fitness bands and smartwatches with functions that directly check and manage one's health status through smart devices are also continuously increasing. A 'smart wearable device' is a device that can even perform Healthcare through linkage with a smartphone, enabling health checks to be detailed by linking with a smartphone along with the device's own functions. For instance, smartwatches can even collect biometric information such as electrocardiogram, blood pressure, blood oxygen saturation, basal metabolic

rate, and body fat mass, which previously had to be measured with specialized medical devices.

Currently, wearable devices are being released in various forms that can be attached to the body, such as glasses, bracelets, watches, and wireless sensors. According to a recent report by IDC, a global market research institute, 444.68 million units of wearable devices were shipped out in 2021, an increase of 28.4% compared to 2020, and 12.76 million units were shipped out in 2021 in South Korea, an increase of 50% compared to 2020. Unit shipments of wearable devices have been continuously increasing since 2014, and are predicted to reach 526.8 million units in 2024.

Disease Management Using Big Data

Digital healthcare is also making remarkable progress in terms of disease diagnosis and management. With the development of technology, the utilization of big data in Healthcare is increasing, and research using data is being actively conducted compared to the past.

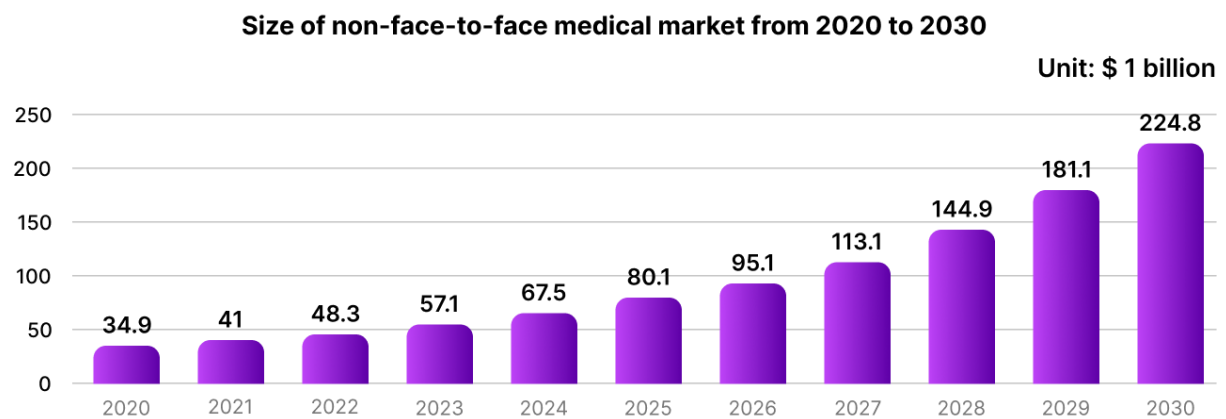
In fact, the Korean government offers a variety of customized policies like establishing chronic disease treatment and prevention programs by utilizing high-quality health and medical data updated daily, such as epidemiological survey data from the Korea Centers for Disease Control and Prevention, national health examination data from the National Health Insurance Service, and insurance claims data, and is establishing chronic disease management and prevention programs for special population groups.

Advancement into Telemedicine

Digital healthcare is also developing rapidly in the telemedicine industry. Technologies of telemedicines are using various network technologies and platforms to convert communication between medical staff and patients from offline to online.

Looking at the non-face-to-face medical sector among international medical trends, major OECD countries are encouraging non-face-to-face medical care to reduce the risk of infection to their citizens such as the recent pandemic, and related

demand is on the rise. Out of 38 OECD countries, 32 countries have already introduced non-face-to-face medical care, excluding countries that did not respond, such as Chile, the Czech Republic, Estonia, Switzerland, and Turkey.



Sources: Precedence Research, Telehealth Market - Global Industry Analysis, Size, Share, Growth, Trends, Regional Outlook, and Forecast 2022- 2030,2021.

If telemedicine becomes more common and its field expands, the efficiency of the medical system can be dramatically increased. Considering that the biggest reason patients visit a hospital is to have a meeting with a medical staff, telemedicine can save time and resources for patients as well as medical staff. As patients don't have to visit hospitals and save time, every patient can easily get medical services. Many people in remote areas can get medical benefits without any difficulties. Therefore, we can anticipate easy-prevention of diseases in advance. Moreover, the efficiency of the medical system can be increased by exponentially increasing the number of patients that can be treated per medical staff.

Using AI, ChatGPT and Robots

Digital healthcare, AI, ChatGPT, and robot technology are bringing about innovative changes in the modern medical and senior welfare fields. The combination of these technologies can have a positive impact on the quality of life and Healthcare of the elderly.

Especially in Northeast Asian countries with population decline and rapid aging, Altechnology and robot technology can be used to help prevent the elderly from lonely death. These technologies can be used to improve the quality of life and provide social support for the elderly.

Personal Information Protection

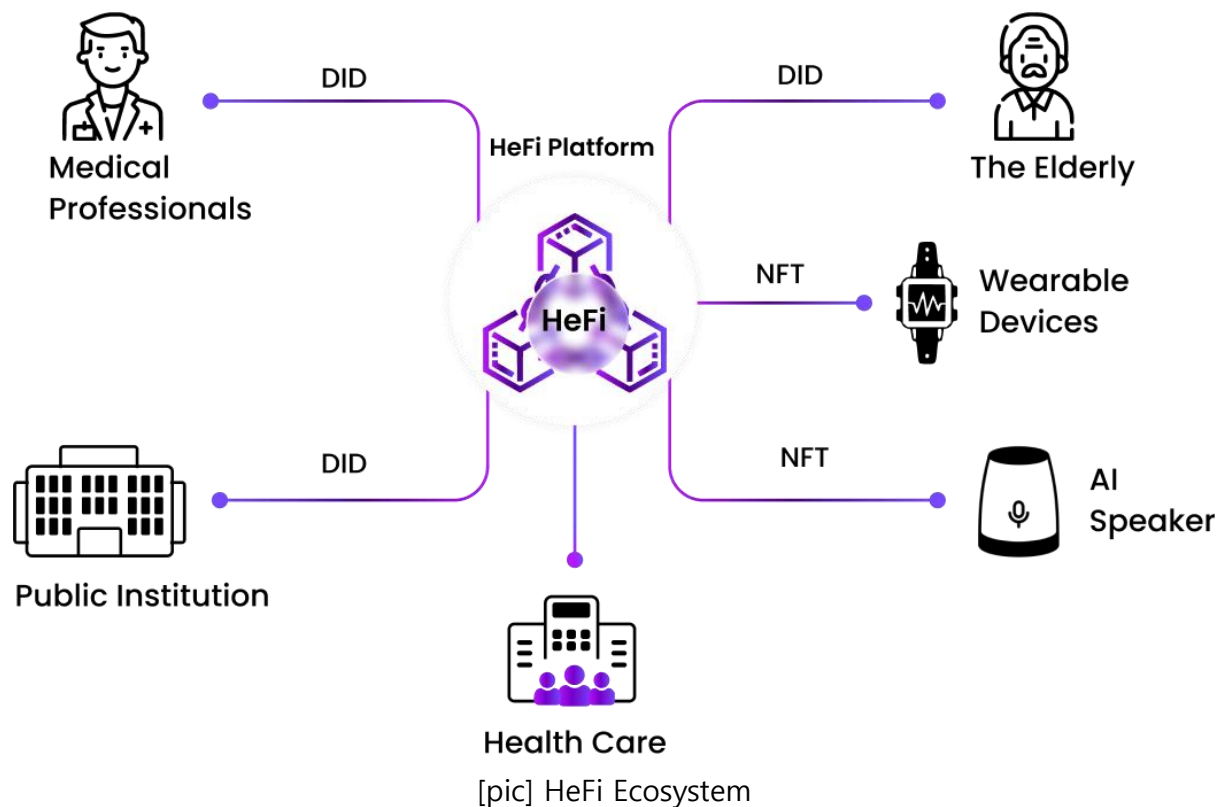
Digital healthcare provides many benefits such as personal health management and improvement of treatment efficiency, but at the same time, there are problems related to personal information as below.

- Risk of leakage of sensitive information: In digital healthcare, highly sensitive information such as personal health data, medical records, and genetic information is collected and stored. When such information is leaked by hacking or an insider, there is a risk of personal privacy invasions as well as a financial loss and damage to credit reputation.
- Illegal use of data: Personal health data can be used in various fields such as insurance, medical care, advertising, and research. However, when such information is sold or used to other organizations or individuals without permission, privacy issues arise.
- Data sharing without consent: When using digital healthcare services, health data may be shared with other organizations or individuals without obtaining user consent. To prevent this, the user's consent must be clearly obtained and the personal information processing policy must be disclosed transparently.

The HeFi project aims to solve the problem of personal information protection in digital healthcare by using blockchain technology, and to ensure that the data accumulated in digital healthcare service can be used stably with the consent of the provider.

2. HeFi Project

2.1 HeFi Ecosystem



A Digital Platform For Aging in Place maintaining Health Aging

Aging in place (AIP) is a value of welfare practice for the elderly which finds it desirable for the elderly to spend their old age in where they have lived, and it is a viewpoint that reflects the psychological characteristics that all humans have in the policy direction. The perspective of continuing living in the place of the elderly(AIP) is presented as the direction of welfare for the elderly with successful aging and active aging. In particular, AIP has recently been presented as an alternative for the possibility of social sustainable development due to aging, not only in terms of the happiness and quality of life of the elderly, but also in the social and national aspects.

However, in the concept of AIP, wanting to continue living in the community should be one's own autonomous and independent choice, and it should also be a means for dignified old age. That is, If AIP does not accompany continuity of roles, relationships, and lifestyles, it may not guarantee quality of life in old age. Moreover, to keep living in the place can bring them a feeling of freedom, but it may cause pain such as loneliness, helplessness, and boredom at the same time. HeFi platform combines blockchain, digital, wearable, AI and chat GPT, and robot technology to help the elderly maintain their healthy aging and continue to live in the community (Aging in Place).

A sustainable platform that delivers economic benefits to participants

Government support is a very important factor in the digital platform that maintains healthy aging promoted by the HeFi project. But relying solely on government support does not mean it's always sustainable. In order for the blockchain-based HeFi platform to develop sustainably, the participation and cooperation of various stakeholders in addition to government support are essential.

The HeFi platform enables operators who provide various services for the elderly to develop various profit models according to the economic activity model of participants participating in the HeFi platform and to gain economic benefits from it. As economic activities in these

HeFi platforms become more active and profit models develop, they will grow into a sustainable HeFi platform on their own.

Models of Participants' Economic Activities

- Buying Products and Services: When elderly people with financial leeway purchase the products and services they need on the HeFi platform, tokens from those transactions are circulated within the platform.
- Providing Activity Data : Recording activity data for the elderly on HeFi platform enables companies to use it to conduct target marketing, and senior citizens can receive tokens as compensation for data provision.
- Sponsorship and donation: to support the elderly who cannot afford it, a sponsorship and donation system using tokens can be introduced. This allows the elderly to receive the necessary services and support.

The Profit Model of Operators

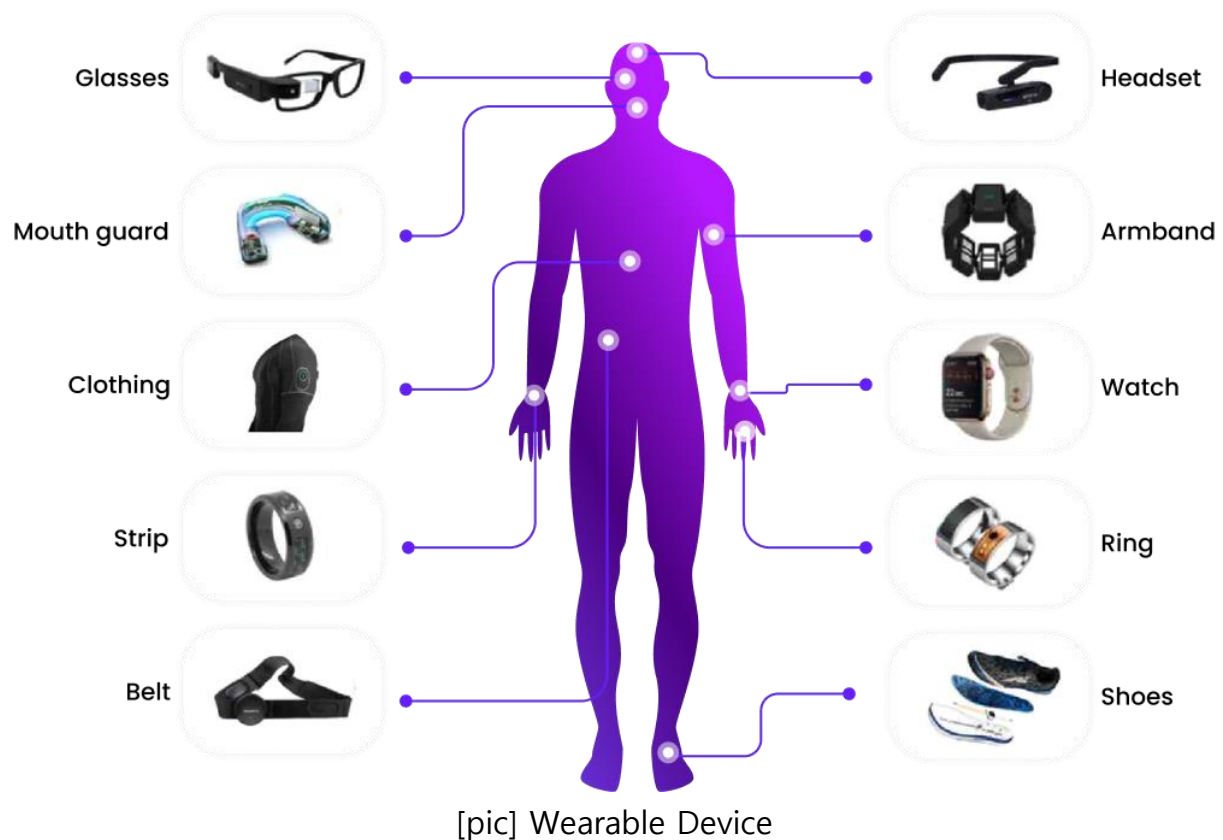
- Platform Fees: Operators selling products and services on HeFi platforms pay a certain percentage of platform fees. This is one of the sources of revenue for the HeFi platform.
- Data analysis and target marketing: analyzes and shares the activity data of the elderly collected on the HeFi platform with sellers, and provides target marketing services using them. Companies that use this service pay a service fee to the HeFi platform.

- Token Issuance and Management: HeFi platform uses blockchain technology to issue and manage tokens. The value of the platform operator's stake may also increase due to the increase in token value.

2.2 Digital Healthcare Platform

Healthcare and Preventive Medical Care Using Wearable Technology

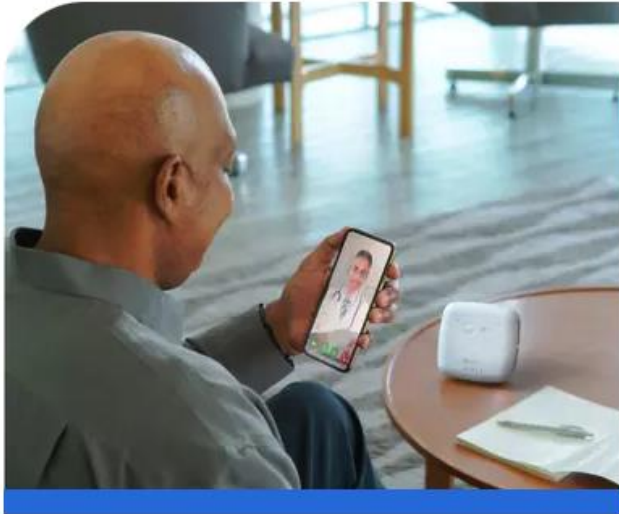
Wearable medical devices refer to products that combine digital technologies such as big data, artificial intelligence, and the cloud in the healthcare industry so that it can monitor and manage an individual's health status in real time. Since healthcare wearable devices are easy to measure the user's biometric and movement signals by wearing a part of their bodies, products made to monitor the user's health status or activity information account for the largest proportion. It is divided into wellness wearable devices for healthcare services and medical wearable devices for medical purposes according to the purpose of use of the device. In order to reduce the rapidly increasing medical expenses from an aging society, various countries and private medical insurance companies are trying to change the existing treatment-oriented medical paradigm into a prevention or value-oriented medical paradigm. The value-oriented medical paradigm refers to a healthcare and medical model that seeks to reduce medical costs by preemptively responding to diseases through Healthcare and prevention. Therefore, healthcare wearable devices are expected to play a key role in the new medical paradigm as they can easily collect individual biometric data, that is, patient-generated health data, and can effectively use the information on their own or by medical personnel. Furthermore, It can also analyze lifestyle and surroundings by processing location and activity information collected from wearable devices, thereby expanding to the implementation of precision medicine that provides effective prevention and treatment customized.



Health status monitoring using Vision AI technology

For the elderly, regular (daily) monitoring of basic biosignals including heart rate is required from the viewpoint of preventive medical care, but in the case of health status monitoring using a wearable device, contact with the device is prerequisite, so there may be inconvenience in daily life. In addition, there is a problem in that services that can be provided with wearables are limited to the elderly with impaired mobility.

In order to solve the problems of acquiring wearable-based biometric data and providing basic services, the development of devices that measure biosignals in a non-contact manner using Vision AI (image and signal analysis) is being accelerated. Among various non-contact measurement devices, the device developed by Norberhealth can measure vital signs such as heart rate, respiratory rate, body temperature, blood pressure and saturation with medical-grade precision by converging cameras and various sensors. It is possible to monitor the patient's health in real time, free from the patient's exercise capacity constraints.



[pic]The non-contact biometric signal scan and measurement

[source: NORBERTHEALTH.COM]

Vision AI-based technology can provide useful services to patients because it supports non-contact biometric data collection and real-time identification of patients visually. For example, by detecting changes in a patient's vital signs based on visual data, a health care provider can be alerted to the patient's condition in real time to intervene in a timely manner. In addition, a patient's visual analysis data can be integrated into an electronic health record to provide clinicians with a more comprehensive view of a patient's health status. Additionally, Vision AI's image analysis services can help clinicians make more accurate diagnoses and develop personalized treatment plans, and provide insight into patient data to aid clinical decision-making.

In conclusion, the non-contact bio-signal measurement device using Vision AI has the potential to revolutionize remote health management services, and Vision AI technology, when integrated into medical services, realizes the provision of personalized and customized medical services and improves the provision of medical services. It can contribute to the universalization of high-level medical services by improving efficiency.

Prevention of Lonely Death by Using AI and Chat GPT

The lonely death of the elderly living alone is emerging as a big social issue. Services that combine artificial intelligence-based technologies such as AI speakers

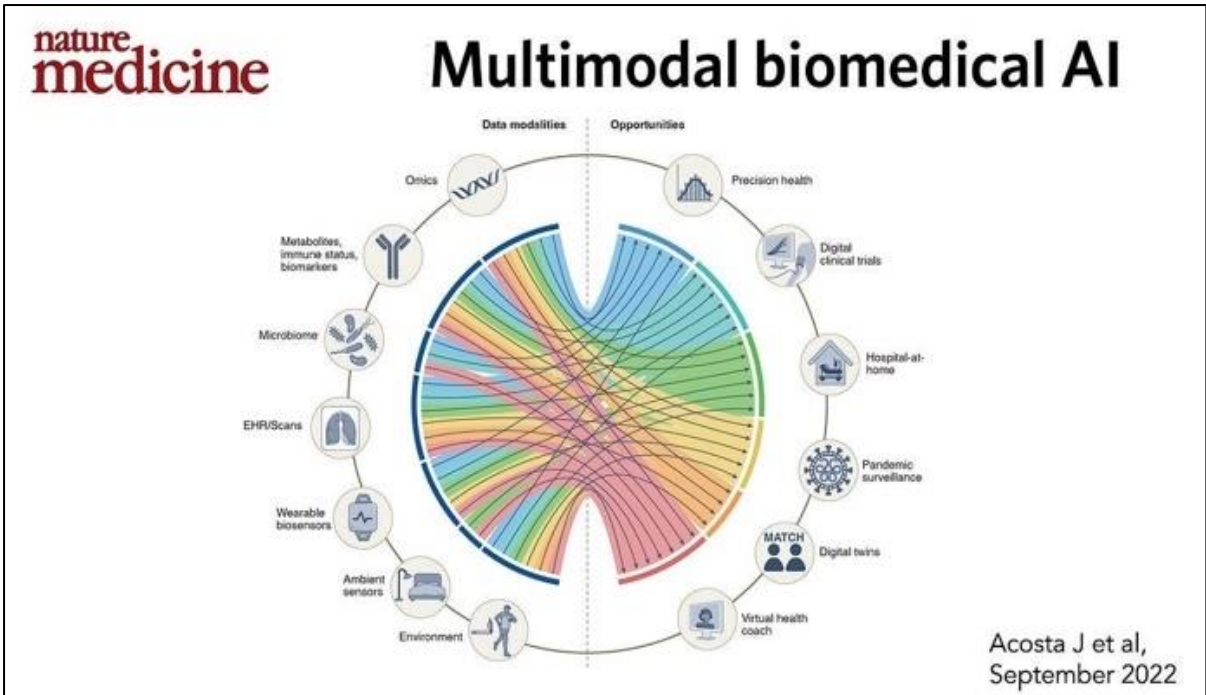
can prevent this matter. HeFi platform will help prevent lonely deaths by those ways below with AI speakers using large language models such as ChatGPT.

- Communication and being friends: AI speakers help reduce psychological loneliness by allowing conversations with elderly people living alone. You can play a friend-like role by communicating with the elderly living alone on various topics such as daily conversations, news introductions, weather information, and hobby-related conversations.
- Healthcare: AI speakers can help check and manage the health of elderly people living alone. It can take care of the health of the elderly by providing health-related information such as medication notification, exercise recommendation, and meal management.
- Emergency Response: AI speakers can detect emergency situations for elderly people living alone and respond immediately. When an elderly person is in an emergency situation such as a fall accident, the AI speaker recognizes it and immediately contacts family, acquaintances, or emergency rescue services to enable a quick response.
- Life support services: AI speakers make it easy for elderly people to enjoy daily support services. For example, food delivery, cleaning services, and transportation services can be booked and managed through AI speakers.
- Social participation and information provision: AI speakers can help elderly people living alone participate in society. It helps the elderly actively participate in society by providing various information such as local community activities, cultural events, and educational programs. Through this, the elderly living alone can maintain a connection with the local community and be away from social isolation.
- Emotional Support: AI speakers offer the elderly emotional support by providing a variety of content, including music, audiobooks, and radio programs. Through this, the elderly can enjoy hobbies or refresh themselves, and get psychological stability.
- Connection with family and acquaintances: AI speakers help seniors living alone to easily contact their family and acquaintances. Through AI speakers, they can connect with others in many ways, such as phone calls and video calls, which helps shorten the distance with family and friends.

Accordingly, AI speakers using large language models such as ChatGPT provided by HeFi platform can play an important role in preventing the elderly living alone from lonely death. As these services spread, it will be possible to alleviate the loneliness and social isolation problems of the elderly living alone and support a safer and happier retirement life.

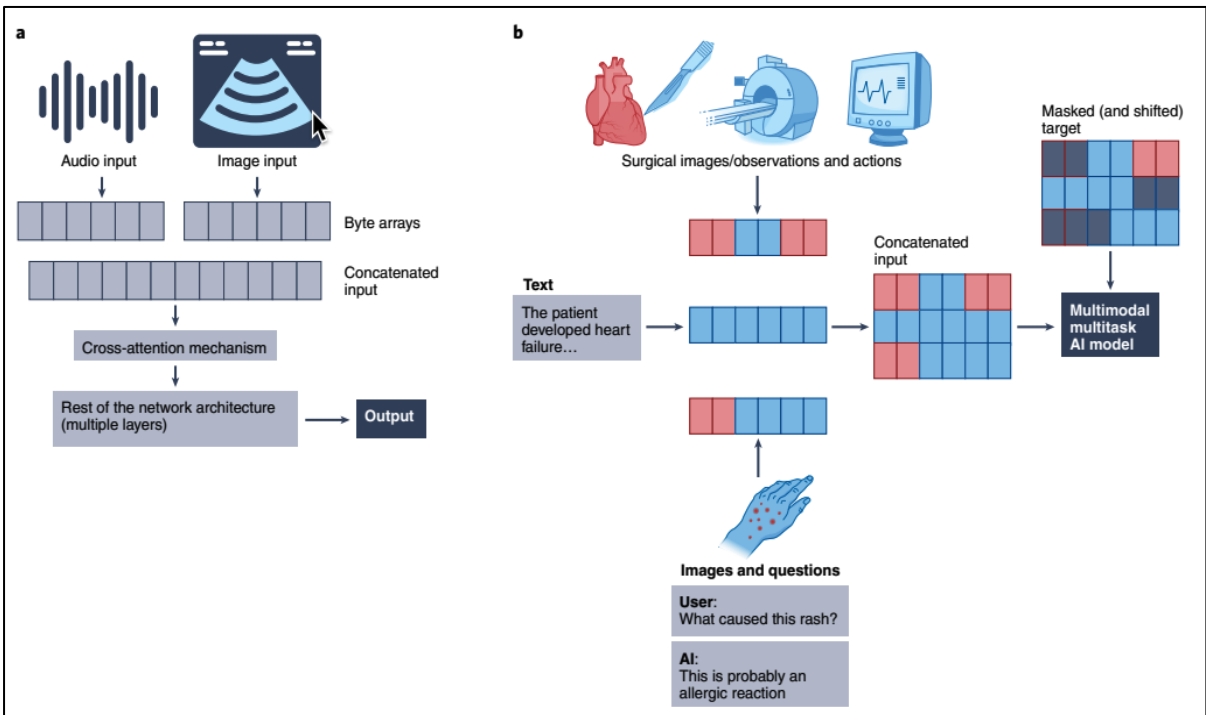
The potential for multimodal AI in medical field

Recently in Nature Medicine, the potential for multimodal AI in the medical field was reviewed. It said "Multimodal AI can collect and process many different types of data from many sources, including multiple serial biosensors, biological hierarchies, environments and medical records. Current AI in healthcare is image-centric and integration trials with text and voice input have been limited. However, with the advent of large-scale language models (LLMs), data such as images and voices can be transformed into understandable language. Therefore, the possibility of multimodal AI that can interpret by combining various types of input data (image, voice, related description, etc.) is being proved. In the medical field, the potential of Multimodal AI can be also seen in DeepMind's AlphaFold, which accurately predicts 3D protein structures from amino acid sequences. In the future, it is expected that multimodal models in the medical field will be developed due to technological advances such as the development of generative AI such as GPT-4 that supports multimodal, providing opportunities for virtual health coaching, home hospitals, and medical digital twin infrastructure.



[pic] Medical data source and Multimodal AI

[source: <https://joaquimcardoso.blog/multimodal-ai-for-medicine-simplified-enabled-by-large-language-models-llms/>]



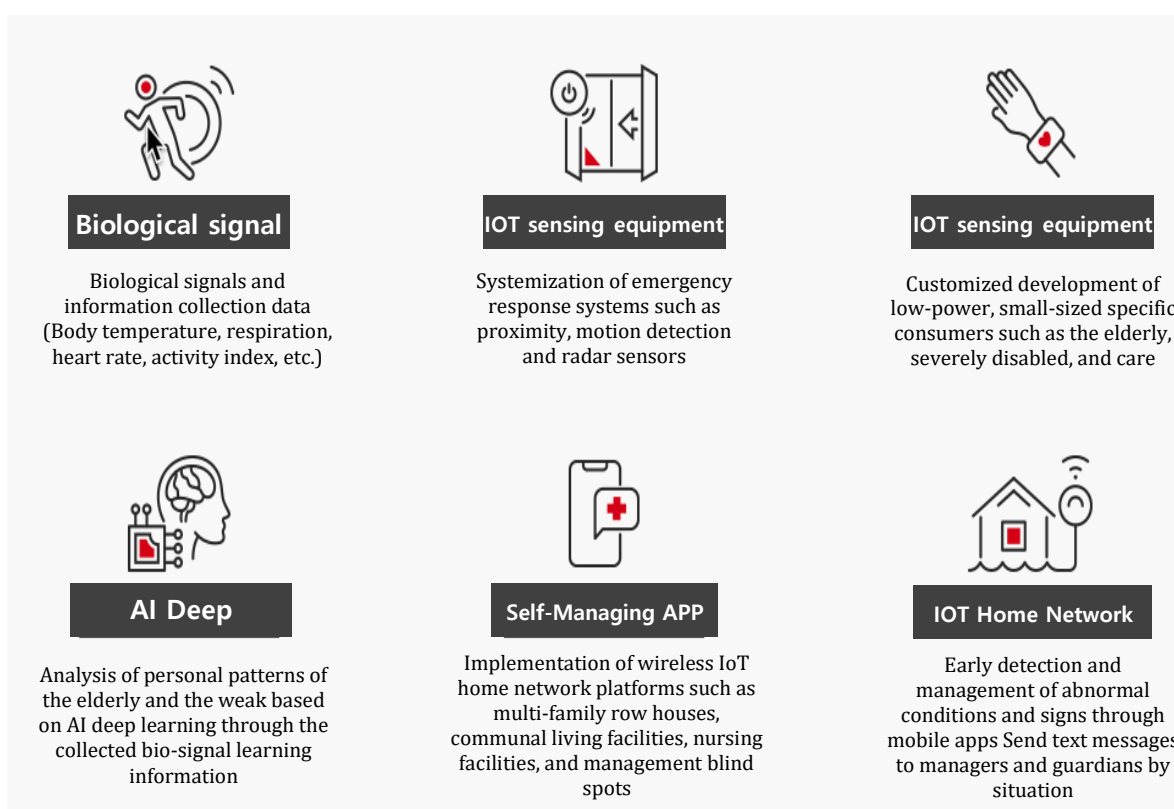
[pic] Simplified application concept of Multimodal AI

[source: <https://www.nature.com/articles/s41591-022-01981-2>]

Comprehensive Smart Elderly Care Services

Since the proportion of elderly households living alone and elderly families is expected to increase significantly, there will be a need for dedicated services to care for them in the public aspect, and this need is expected to increase continuously as years go by. To this end, the HeFi platform provides Smart Elderly Care Services, and the service is based on Vision AI technology and Multimodal AI technology. The service is provided as follows

- By converging Vision AI technology analyzing visual data and by collecting non-contact biometric data with IoT devices, detecting anomaly and crisis situations of the elderly and the environment in which they live is possible.
- Through Vision AI deep learning technology, AI continuously learns a person's life patterns and spatial situation conditions. Therefore, dedicated care services can be provided such as activity recognition, life pattern recognition, risk detection and prevention.
- In addition, through integrated analysis of visual biometric data with text, voice, and individual health records, real-time care services are realized with services such as advance prediction of abnormal symptoms and help center notification based on advance prediction.





IoT Based Wearable Device

Sending data collected through physical activity and bio-signal recognition to the server



BigData Server

Data collection, storage, processing and analysis
Platform operation and security



AI Server

Construction learning frame & algorithm
Application of data diagnosis model



Sensor Device and Gateway

Various IoT-linked sensing data and ICT-based terminal devices such as pc and mobile



Integrated Control and Monitoring System

Integrated data visualization, r-analysis statistics, bio-signal anomaly prediction and monitoring

2.3 Blockchain Network Considering Digital Healthcare Characteristics

Blockchain technology has great potential for personal data protection in the digital healthcare field. Blockchain is a distributed ledger technology that allows multiple participants to share and store data in a way that cannot be modified. Thanks to these features, blockchain can help solve several problems related to privacy in digital healthcare.

However, the current blockchain technology is difficult for elderly users, the main user of HeFi, to access. It is necessary to provide a solution to make it easy to use. In addition, digital healthcare platforms continuously generate a lot of data. Existing blockchain networks actually have difficulty processing large-scale data. This is mainly due to the following characteristics of the blockchain network.

- Scalability Limits: Existing blockchain networks have limited block size and generation speed, limiting the volume of transactions that can be processed at once. As a result, the processing speed of the network may be slow, and transaction costs may increase.
- Data storage problems: Blockchain networks store all transaction data in blocks, which should be maintained by network participants. In an environment that generates a large amount of data, such as digital healthcare, the storage space requirements of blockchain can increase rapidly.

Security-enhanced Healthcare System Using Blockchain Technology

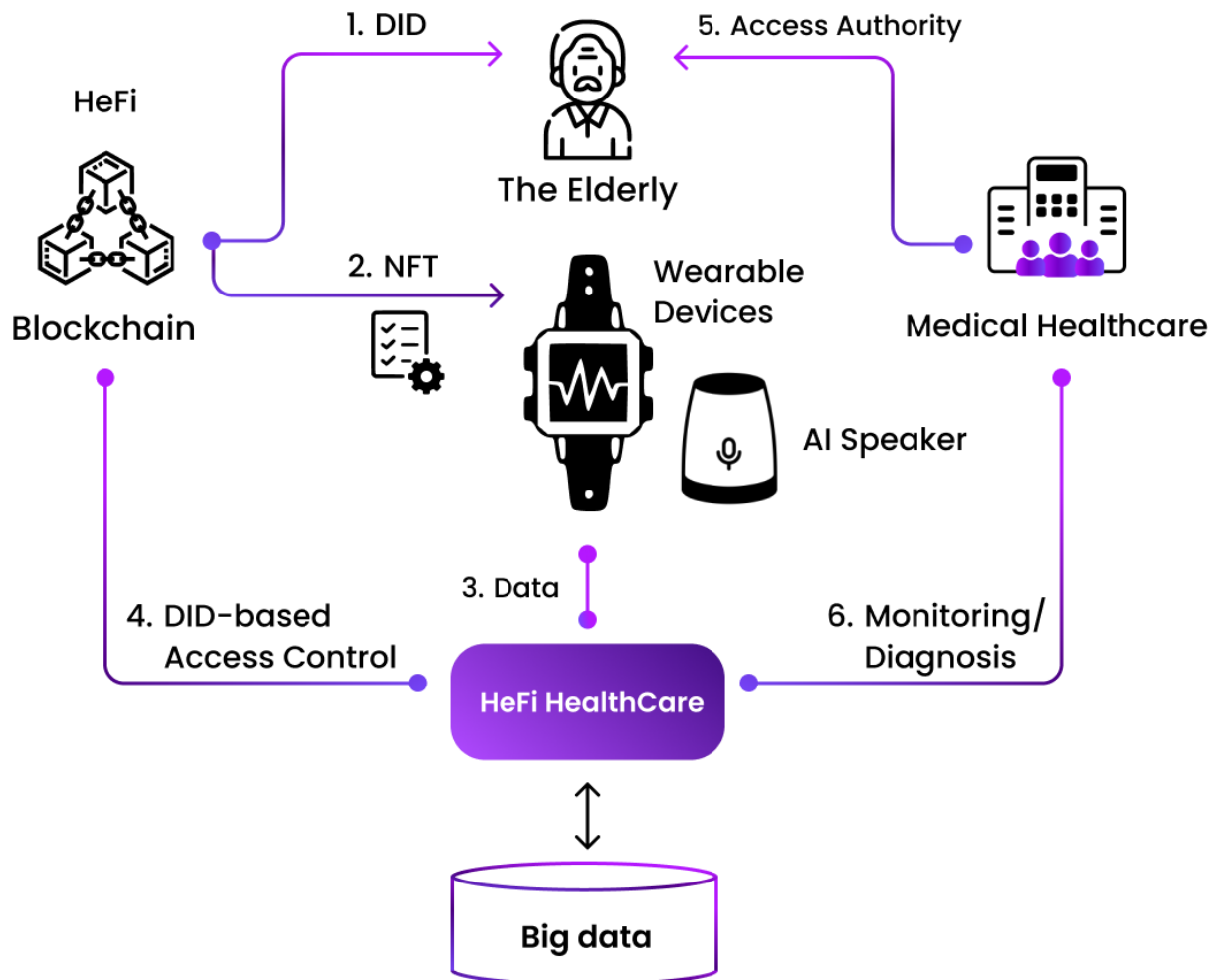
There is no platform for integrating and managing healthcare data distributed to individuals. In addition, healthcare data still has security vulnerabilities, making it difficult to expand customized or precision medical care.

However, HeFi builds a HealthCare data system by combining blockchain's Decentralized Identifier (DID) and NFT technology. The best feature of DID is that it can verify one's identity without exposing personal information when it requires personal authentication to be done. Specifically, DIDs can store VCs (Verifiable Credentials) issued by certification agencies on an individual's smartphone and select and submit only the information they want if identification or credentials are required. In addition, because it is based on blockchain technology, the risk of data forgery and alteration is low, and the data is stored encrypted in a secure area that

can be controlled by individuals, making it safe from security threats such as hacking. This technology can strengthen data sovereignty by allowing users to selectively provide only the information necessary for service providers.

HeFi is built according to the DID standard standardized by W3C (World Wide Web Consortium). All users participating in HeFi platform are issued DID. The elderly participating in Healthcare via HeFi platform are also issued DID For user authentication. NFTs are issued to wearable devices or AI speaker digital healthcare devices, and the ownership relationship of NFTs is connected with DID to verify the relationship between digital healthcare device ownership and data generated by the device. Using blockchain technology in this way, ownership relationships can be clearly confirmed while ensuring anonymity.

In addition, if monitoring or diagnosis of data generated by the device is required, the elderly, who is the owner of the device, can directly access HeFi Blockchain platform on mobile and give the DID of the institution to perform monitoring and diagnosis.



[pic] HeFi HealthCare Data System

User-friendly UI and UX

The HeFi platform constantly updates to provide user-friendly UI and UX to lower barriers to enter and remove inconvenience.

However, for users to use DApp or blockchain, it requires complex procedures such as installation and authentication of user wallets, backup of private keys, and registration of address of wallet. This complex procedure comes as a high barrier to entry for HeFi users to use DApp.

However, for user-friendly UI and UX, it is also problematic to minimize the essential security requirements required by the blockchain. Accordingly, HeFi project provides users not only with user-friendly UI and UX, but with solutions to meet the security requirements of the blockchain.

Real-time Data Processing Produced in Large Quantities Over a Long Time

The characteristic of HeFi service is that data generated for a long time by wearables and AI chatbots must be processed in real time. On the other hand, NFT and DeFi services, which have been widely promoted as blockchain projects, differ in that users access them as needed and the frequency of use is set to some extent. The HeFi team uses both Sidechain technology and Off-chain technology to build a blockchain network that fits the characteristics of HeFi services.

Sidechain is an auxiliary blockchain that operates separately from the main blockchain. The side chain can reduce overload on the main chain and improve scalability as it can send and receive data as needed. The HeFi team uses an BNB network for On-chain and builds Sidechain with our own technology.

Off-chain data storage technology is a method of storing only important data in a blockchain and storing the rest of the data in an off-chain storage. This can reduce the storage space requirements of the blockchain. The HeFi team builds a blockchain network that stores off-chain data by combining sidechain and interplanetary file system (IPFS) technologies with each other.

IPFS is a distributed file storage system that can store and retrieve data without relying on a central server by giving each file and every block a unique hash. IPFS can be used in conjunction with blockchain to increase the persistence, integrity, and shareability of data. When sidechain and IPFS are combined, a large amount of data can be efficiently stored and shared in a blockchain network without an overload. In the blockchain, hash values of transactions occurring in the sidechain are stored, and IPFS is in charge of actual storage of the data. Through this, it is possible to solve the scalability problem of the blockchain and safely manage data.

3. HeFi Token Model

3.1 HeFi Ecosystem and HeFi Token

The HeFi project is a platform that provides healthy aging services to solve the problems of aging society. The aging problem has a scale and complexity that are difficult to solve in a short period of time with the capabilities of specific institutions or governments. Therefore, the establishment of a self-sustaining and sustainable ecosystem is essential for the success of the HeFi project.

The center of the HeFi ecosystem, users and data

The HeFi ecosystem is built around users and their data, providing direct benefits to users and contributing to better healthcare services through shared data.

Users can provide their health data and receive personalized health management services based on it. Users can manage their health data and safely share it with medical institutions, insurance companies, and research institutes as needed. In this process, users will be fairly compensated for the value obtained through their health data. HeFi tokens are used as a means of rewarding these activities and can be used for various services or transactions. Additionally, the health data generated by users also serves as the fuel needed to sustain and expand the HeFi ecosystem. As users' health data accumulates, the HeFi ecosystem can attract more service providers and partners, which further promotes the growth and diversity of the ecosystem. Through this process, users receive appropriate compensation for their health data and directly contribute to their health management.

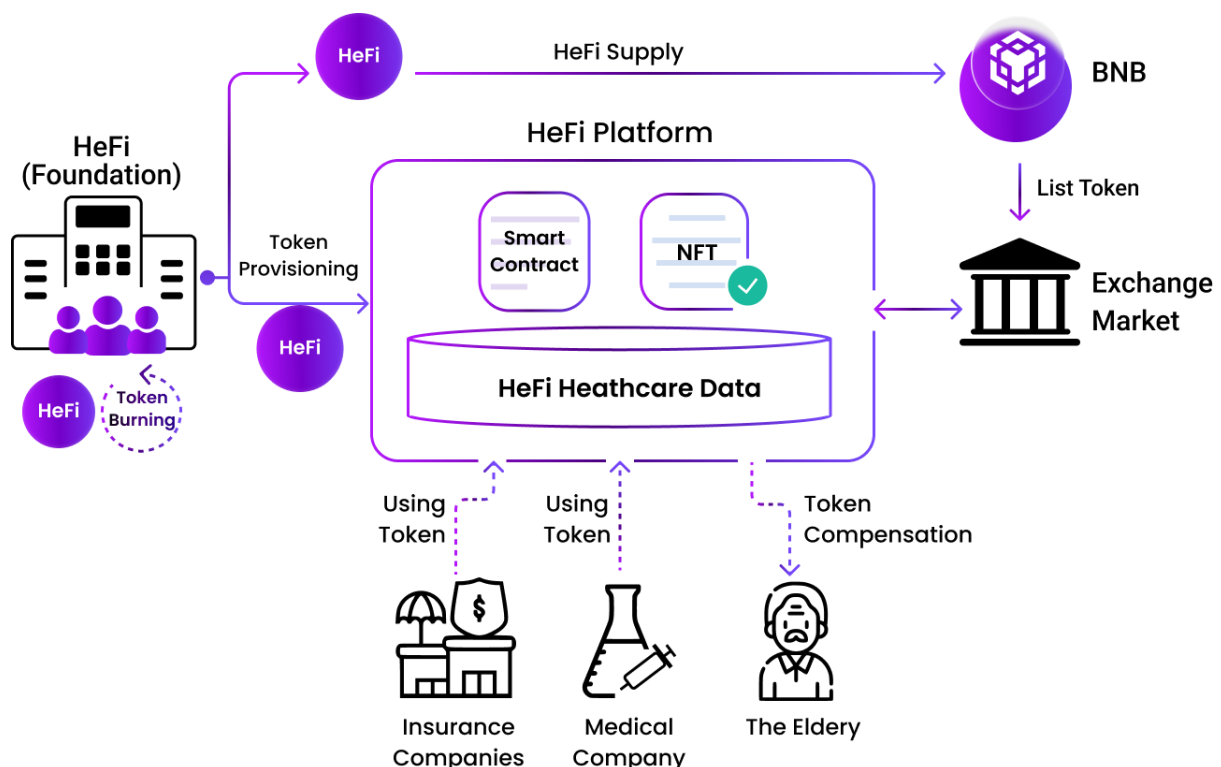
Mutual Value Creation of Silver Industry and HeFi Ecosystem

The elderly population in South Korea accounts for 16.5% of the total population, and the silver industry is showing a steady growth trend. It is expected to grow from 72 trillion won in 2020 to 168 trillion won in 2030, and the silver market in the Asia-Pacific region is expected to grow to \$4.6 trillion by 2025. Silver industry includes not only healthcare products but also various industries such as housing, food, leisure and tourism, and transportation.

Through the health data collected in the HeFi ecosystem, the silver industry can provide more detailed and personalized services and products. For example, gymnastics or yoga classes operated by Silver Industries can adjust the program according to each individual's physical condition and needs based on health data collected by HeFi.

Health data generated in the HeFi ecosystem can greatly contribute to product development and service improvement in the silver industry. For example, insurance companies can develop more realistic and effective silver insurance products based on data collected by HeFi. In addition, medical institutions can use this data to find more effective treatment methods or to establish preventive measures.

HeFi tokens serve as a means for users to be rewarded for providing health data and utilizing it. This encourages users to participate more actively in the HeFi ecosystem, resulting in a stronger and more flexible ecosystem. This ecosystem can provide a wider range of users to the silver industry and create new business opportunities.



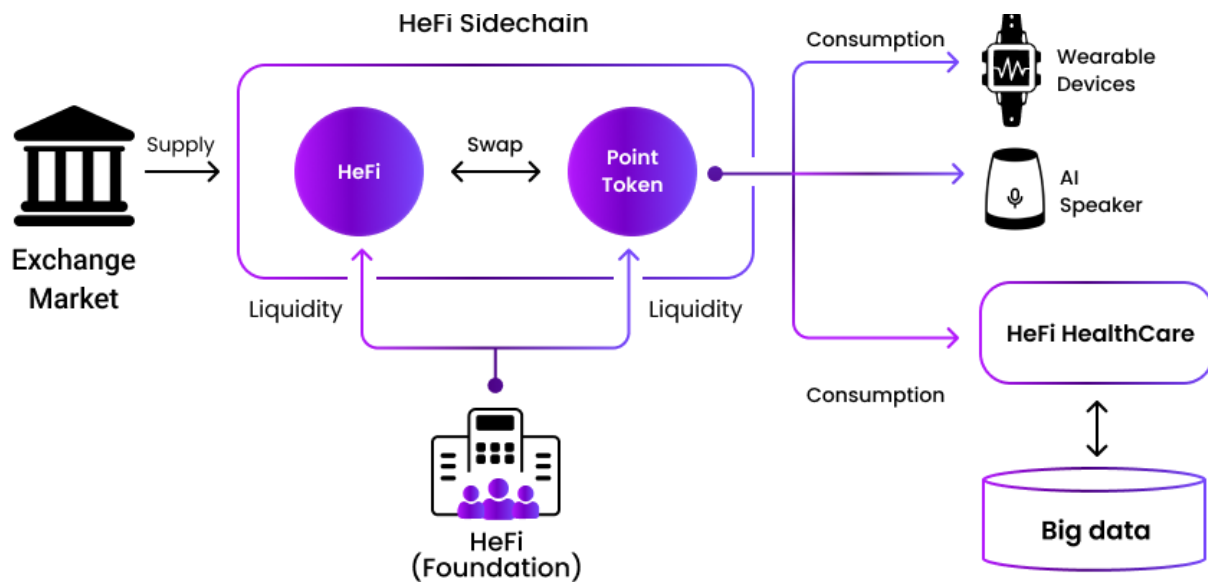
[pic] :HeFi ecosystem and HeFi token

3.2 HeFi Token Configuration

HeFi Token and Point Token

HeFi is an BEP20 token based on the BNB blockchain network. HeFi token also holds the role of a governance token that ultimately allows communities on the HeFi platform to determine key issues. HeFi token is also a functional utility token that can be exchanged for Point Token, which can be used on the HeFi platform.

HeFi's basic token Economy consists of fees for using the HeFi platform and commission income generated when executing DApp on the Side Chain Network. Fees for using the platform, such as services provided by HeFi platform, DID, NFT, Server Wallet, wearable, and data storage generated by AI Speaker, are used as payment methods by swapping HeFi token with a Point token.



[pic] :HeFi Token Model

HeFi Token is the top-level Token of HeFi platform

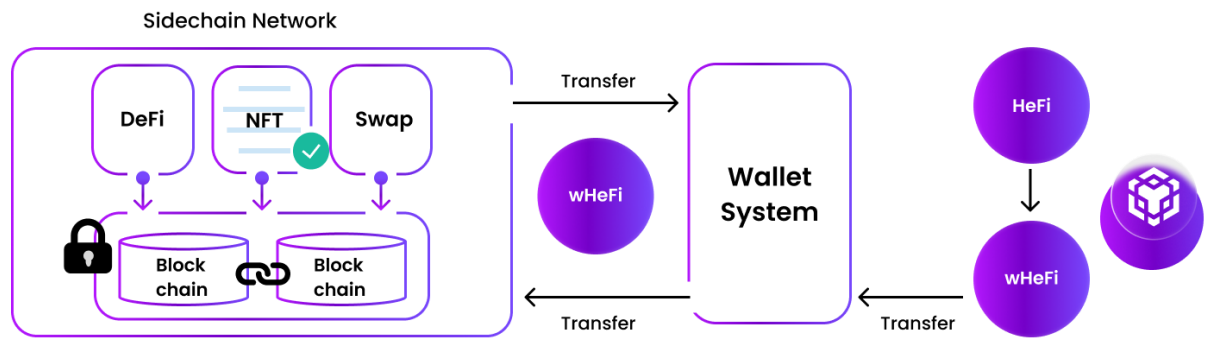
HeFi tokens are issued to the top-level BEP20 of HeFi token Economy. HeFi ecosystem participants or partners send HeFi tokens to HeFi SideChain to use HeFi platform, and the transmitted HeFi tokens are exchanged through the Point Token and Swap of the SideChain and charged on HeFi platform.

HeFi platform is designed to provide tokens economics that can accommodate various types of businesses. Token Economy in HeFi can be designed independently according to digital healthcare services or business models. There is a significant difference in the amount of Transaction that occurs in the Blockchain Network, such as the development investment cost of wearable devices and the system usage used by wearable devices. Therefore, the token economy within the HeFi platform is bound to vary depending on the characteristics of the content or business model.

HeFi Token Liquidity Supply via BNB Bridge Network

If BNB sends HeFi to the address generated by Sidechain, as much as the amount BNB sends, HeFi tokens are transmitted to the mapping address to supply HeFi liquidity.

HeFi liquidity supply to Sidechain through the bridge network has the effect of Staking HeFi tokens to Sidechain. This acts as a factor that increases the demand for HeFi, which has a positive effect on the increase in the value of HeFi.



User	BNB Address	Sidechain Address	HeFi Amount	Debit	Credit
A	0x12345	0x12345	1,580	1,071	100
B	0x32345	0x32345	1,214	901	100
C	0x42345	0x42345	1,532	1,056	112

[pic] : HeFi Token Liquidity Supply

HeFi Establishes P2X Token Economy

HeFi aims to establish a P2X token Economy based on HeFi (HeFi Token) that can provide more specific and strong rewards to participants in HeFi by applying NFT, cryptocurrency, and blockchain technology. Whenever users of wearable devices or AI Speakers achieve missions with activities which have elements of game playing, they can be rewarded with HeFi tokens, and they can also get them by sharing data generated by wearable and AI Speaker. HeFi token obtained by those ways can be exchanged for other cryptocurrencies or legal currencies on the exchange where HeFi token is listed and can be used for various purposes.

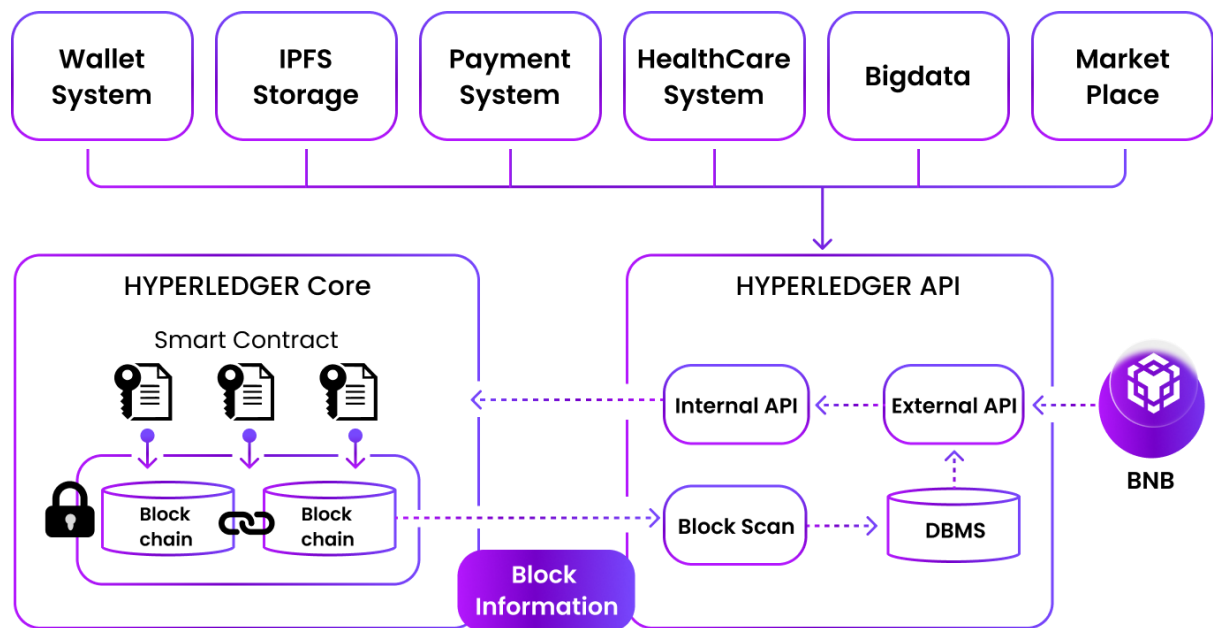
4. HeFi Platform

4.1 HeFi Platform Components

Components of HeFi Platform

The HeFi platform consists of a Blockchain Network part, which is the core of the platform, and an independent system part that provides independent functions in conjunction with the Blockchain Network.

The independent system part expands with the expansion of the HeFi platform. Wallet systems, IPFS Storage, payment systems, digital healthcare systems, Big Data analysis systems, and marketplaces are important independent systems.



[pic] Components of HeFi Platform

4.2 HeFi Blockchain Network

In order to combine digital healthcare service and blockchain technology, some matters need to be solved such as a low performance of public blockchain and high fees when running. BNB is trying to convert them to Layer 2 technologies such as BNB, opBNB, and zkBNB to solve these matters, but it seems that it will

take a lot of time to complete the development. Even if the network is successfully expanded with BNB, opBNB, and zkBNB, There are more negative factors than positive factors in terms of its structure which directly links services that continuously generate large amounts of transactions like digital healthcare services to Public Blockchain.

Solving Problems By Applying Private Blockchain Technology

The HeFi team is trying to apply Private Blockchain technology to solve this problem. Since public blockchain cannot be free from performance and fees, it is difficult to apply it to digital healthcare services where large amounts of transactions occur. On the contrary, Private Blockchain can process large amounts of transactions with fast speed and flexible fees. There are two main ways for applying Private Blockchain. First one is to configure a separate Blockchain Network that is not related to the Public Blockchain and is called OffChain. For example, if you configure a private blockchain network based on Hyperledger Fabric, it becomes an independent network that has no relation to public blockchains such as BNB.

Application of SideChain Technology Connected to Public Blockchain

Another method is SideChain, which is a private blockchain that has a relationship with public blockchain. SideChain has the compatibility to run DApp of public blockchain on SideChain, which is a private blockchain.

Therefore, SideChain can apply DApps of business models that are difficult to apply directly to Public Blockchain to SideChain. In addition, it is possible to flexibly respond to business models by separating DApps running on SideChain and DApps running on Public Blockchain. In addition, it can be continuously updated to apply SideChain most effectively in line with changes in Public Blockchain, so it can effectively respond to changes in Public Blockchain.

Development of SideChain That Connects to Ether

The HeFi team issues HeFi tokens based on Ether's ERC20. Therefore, the the HeFi team develops a SideChain that is connected to Ether and establishes a HeFi Blockchain Network in which DApps deployed on Ether and DApps deployed on HeFi SideChain are connected to each other to quickly and smoothly process large amounts of transactions occurring on the HeFi platform.

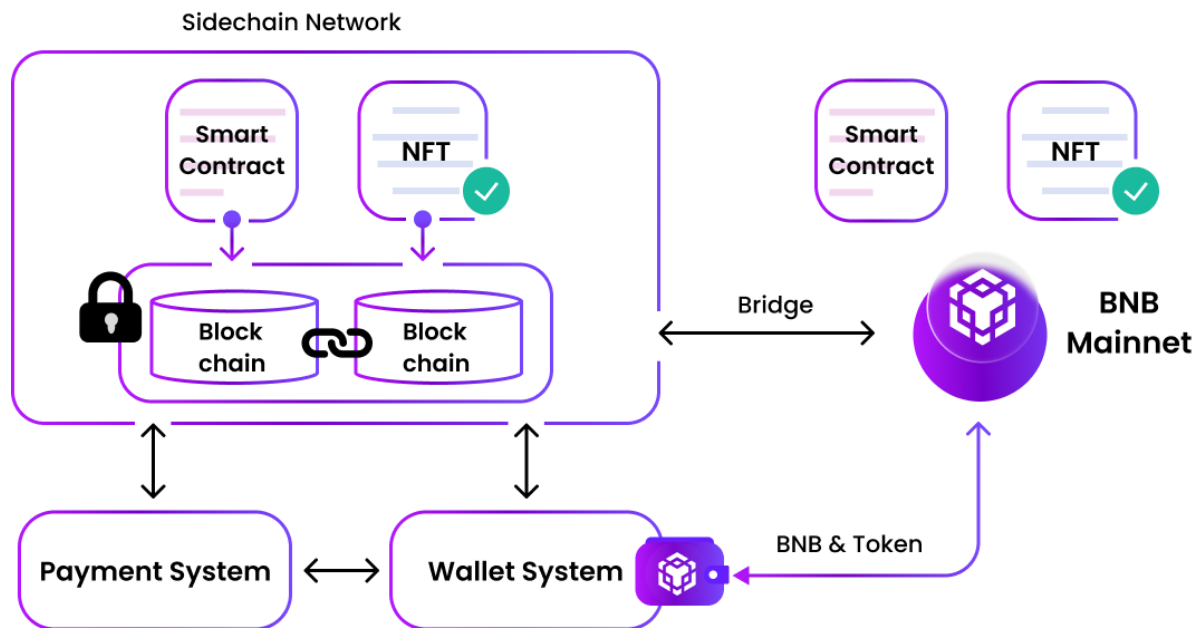
DID(Decentralized Identity) System

HeFi's DID (Decentralized Identity) complies with the W3C DID standard, and the registry is implemented according to Ethereum's ERC1056 Spec. ERC1056 can register and manage identity information by combining on-chain and off-chain, thereby improving reliability while reducing the overload on the Blockchain Network. HeFi DID System also provides a UX that even LMTLS participants without blockchain knowledge can use easily. In conjunction with the Server Wallet, it provides a UX similar to the UX that registers and manages ID generation and personal information in general web services, so that it can be used without any additional DID knowledge. However, HeFi's DID System can manage your identity information and credentials only with the signature of your own server wallet. Therefore, even if a convenient UX is provided, the self-sovereign identity model, which is the fundamental difference between DID and existing digital identities, always stays secure.

HeFi API For Digital Healthcare Service And Wearable Developers

It takes a long time and is difficult for developers of digital healthcare services, wearables, and AI speakers who do not have Blockchain-related experience or knowledge to understand the principles of Blockchain and use it accurately. For example, in the blockchain network, a transaction is generated by executing a blockchain DApp, and the finality of the transaction is not guaranteed. Transaction finality is completed only when the generated transaction is recorded in the block of a specific node and this block is delivered to other nodes to reach the point where the transaction cannot be forged. For digital healthcare service and wearable developers, the process of understanding the working principles of these Blockchains will be a huge burden. In addition, digital healthcare services developed

by misunderstanding the blockchain principle can harm not only digital healthcare service developers but also HeFi users and everyone participating in the HeFi ecosystem. Accordingly, the HeFi team provides an intuitive API (Application Programming Interface) for developers. With this API, developers can easily connect digital healthcare services and wearable devices with Blockchain through HeFi API as easily as they use API provided by general Internet services.



[pic] HeFi Blockchain Network

4.3 Server Wallet & API

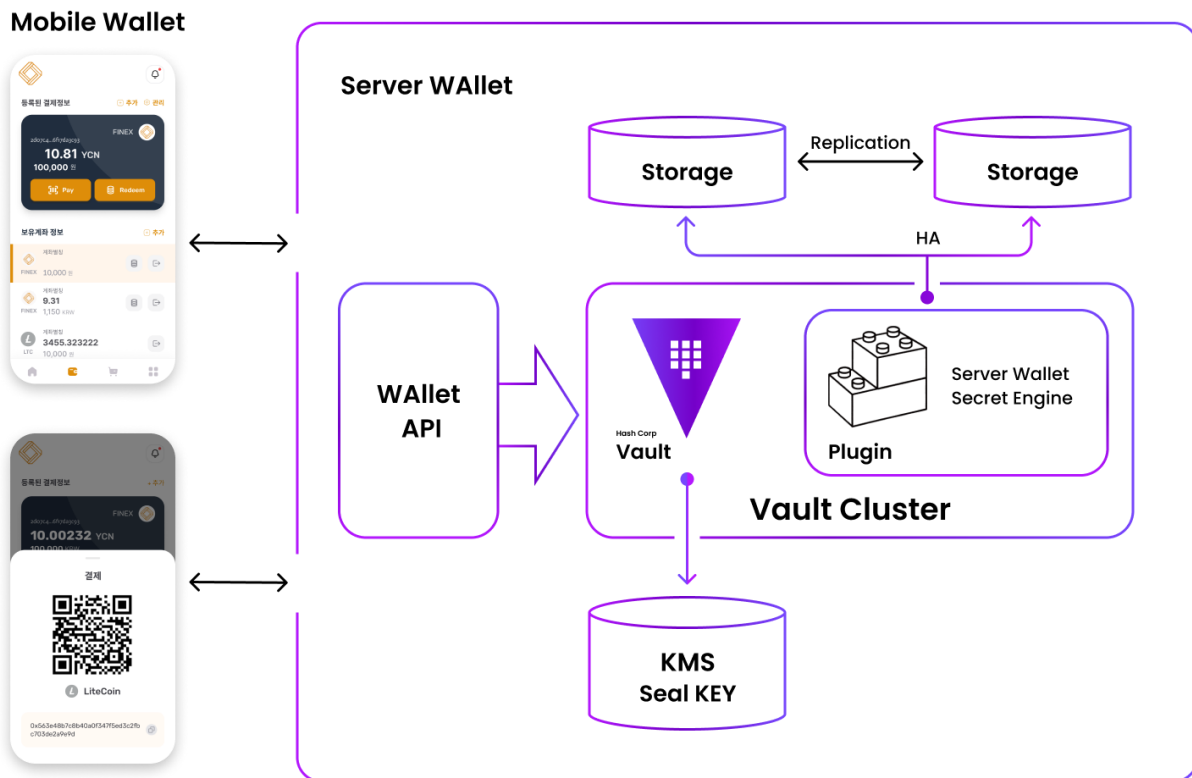
Blockchain's High Barrier to Entry

The Users have to overcome the high barrier to entry of the Wallet feature, if they access blockchain-based services for the first time. They have to install wallets like MetaMask or Scatter, get backups for security, and also need to activate their accounts. Even if they pass this procedure, there is another challenge of purchasing cryptocurrencies through DeFi or cryptocurrency exchanges which is needed on the Hefi platform.

Providing Same User Experience as Existing Internet Services Via Server Wallet

The HeFi team develops Server Wallet for users to access services easily. The same level of user experience as existing Internet services or mobile APPs can be provided through

Server Wallet. By developing a wallet with a customized UX applied to all participants in the HeFi ecosystem, including HeFi users, HeFi developers, and HeFi investors, even participants without blockchain or wallet experience can easily access the HeFi platform. The convenience of using a wallet is important, but security is also an important factor at the same time. The HeFi team provides Server Wallet service with excellent security by applying Vault technology proven in the Blockchain field.



[pic] : HeFi Wallet System

Server Wallet saves the user's Key safely by storing it in the Barrier area of Vault, which is a Secret management service. To prevent the user's key from loss due to system problems, it's stored on clustered High Availability. The seal key for storage access is managed through KMS (Key Management Service).

By installing a Secret Engine for Server Wallet to Vault which was In-house developed, the whole access to key values by applications or users is fundamentally blocked.

Wallet SDK & Wallet APP

We provide Wallet SDK that can be used when linking Server Wallet in applications such as mobile wallet APP. We develop and provide a mobile wallet APP based on Wallet SDK so that users can easily use HeFi tokens. Users can use the functions

needed for token management, such as address generation, payment, reward, remittance, NFT transaction, and transaction history check, through the mobile Wallet APP.

Wallet and Identity verification

The addresses of Wallet generated by the HeFi platform can be divided into user wallet addresses and NFT addresses. Basically, all of these addresses are created and operated in the Server Wallet. However, different functions and privileges can be granted according to the difference in roles in the HeFi platform. Depending on the granted function and authority, the required reliability and authentication strength vary. Therefore, by applying different authentication procedures and strengths for each wallet address, the inconvenience of general participants is reduced while increasing security.

4.4 Other Independent Systems

IPFS Storage System

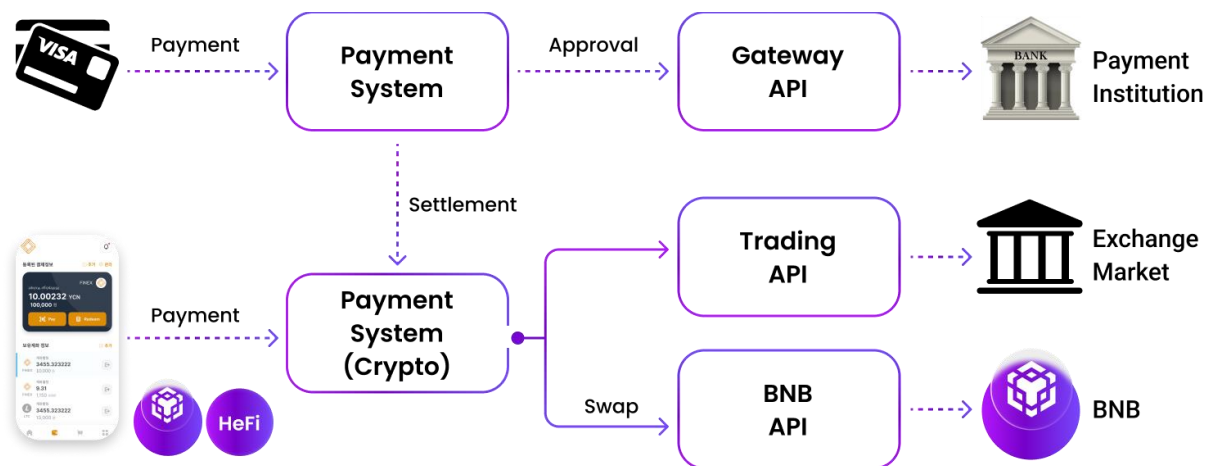
All Data generated from wearables is protected by issuing NFTs. It is not desirable for the blockchain to record the wearable data itself. Therefore, the HeFi platform encrypts the data using a public key (address) in a form that can only be decrypted by the user, and then stores it in the HeFi IPFS (InterPlanetary File System) Storage and stores IPFS CID(Content Identifiers) for that data on the blockchain.

HeFi IPFS Storage uses public cloud storage based on IPFS (Distributed File System) technology to build and use Private IPFS Storage Network. In order to effectively utilize data stored in IPFS, a function to search for data is required. Accordingly, HeFi Platform builds and provides its own search engine. If the wearable owners do not want the data created by the wearable to be searched, he or she can control whether or not to allow the data to be searched through owners' wallets at any time.

Payment System

The payment system not only provides payment services for general payment methods for card payments and mobile simple payments, but also provides payment services for HeFi tokens as payment methods.

The Point token received as a reward may be used as a payment method for various services provided by the HeFi platform. The Point token used as a payment method is settled by converting from the HeFi token and the liquidity pool of the Point token to the HeFi token.



[pic] : Payment System of HeFi

5. HeFi Supply And Policy

5.1 HeFi Supply

Name of The Coin : HeFi(Ticker : HEFI)

Base : BEP-20

Total Supply : 1,000,000,000 HEFI

5.2 HeFi Token Economy

Community Reward	: 30%	[300,000,000 HEFI]
ECO	: 5%	[50,000,000 HEFI]
R&D	: 10%	[100,000,000 HEFI]
Operation	: 10%	[100,000,000 HEFI]
Marketing	: 5%	[50,000,000 HEFI]
Team	: 5%	[50,000,000 HEFI]
Advisor	: 10%	[100,000,000 HEFI]
Partnership	: 15%	[150,000,000 HEFI]
Investors	: 5%	[50,000,000 HEFI]
Liquidity Fund	: 5%	[50,000,000 HEFI]
	100%	[1,000,000,000 HEFI]

6. Roadmap

Q4 2022 ~ Q3 2023

- HeFi Project Planning
- HeFi Platform Development Initiation
- HeFi White Paper Issue
- Organizing HeFi Team and Advisors
- HeFi Project with Affiliated Partner in Japan
- HeFi Test Blockchain System Establishment

Q4 2023

- HeFi Token Supply
- HeFi Smart Watch APP Development
- HeFi AI Speaker System Development
- HeFi Wallet APP Development and Server Wallet Establishment

Q1 2024

- HeFi Smart Watch APP Close Beta Service
- HeFi AI Speaker Close Beta Service
- HeFi Vision AI Camera Hardware Development
- HeFi Vision AI Activity Monitoring System Development

Q2 2024

- HeFi Smart Watch APP Open Beta Service
- HeFi AI Speaker Open Beta Service
- HeFi Vision AI Camera Hardware Development Completion
- HeFi Vision AI Activity Monitoring System Close Beta Service
- Create HeFi healthcare service scenarios (personal service scenario, nursing home service scenario)

Q3 2024

- HeFi Vision AI Activity Monitoring System Open Beta Service
- HeFi Smart Watch APP Commercial Service

- HeFi AI Speaker Commercial Service
- Applying the HeFi Healthcare Service Scenario (Personal Service Scenario)
- HeFi Platform Japanese System Establishment
- HeFi Smart Watch APP Japanese Service Developing
- HeFi AI Speaker Japanese Service Developing

Q4 2024

- HeFi Vision AI Activity Monitoring System Commercial Service
- Applying the HeFi Healthcare Service Scenario (Nursing Home Service Scenario)
- HeFi Smart Watch APP Japanese Close Beta Service
- HeFi AI Speaker Japanese Close Beta Service

Q1 2025

- HeFi Smart Watch APP Japanese Open Beta Service
- HeFi AI Speaker Japanese Open Beta Service
- HeFi Healthcare Study case management system design (healthcare and medical research organization partnership)

Q2 2025

- HeFi Smart Watch APP Japanese Commercial Service
- HeFi AI Speaker Japanese Commercial Service
- HeFi Healthcare Study case management system development

7.Team



Chaeseung Lee(Chairman)
Former) Worked at Kwangju Bank
Currently, CEO of A&S Co., Ltd



Ju hwan Yu
(Graduation) University of Montreal, Department
of International Studies



Jwahoon Kim
(Graduation) Mechanical and Aeronautical
Engineering, Seoul National University



Jin Yoon
Core Engine Development Leader
AI Research Scientist
Master of Electronics at Yonsei University



Jae Seung Lim
Chief researcher
Deep Learning Engineer
Seoul National University Ph.D. program



Seung Min Jeon
senior researcher

Research Planning Engineer
Master of Science at KAIST



Jae Min Jeon
senior researcher

Deep Learning Engineer
Master of Handong University



Hyung Wook Choi
senior researcher

Data Engineer
Master of Kyung Hee University



Hee Jae Lee
senior researcher

Deep Learning Engineer
Master of Seoul National University

8. Advisor



Myung ho Yu

- Graduated from Seoul National University, majoring in electronic engineering
- Doctor of Engineering, KEIO University, Japan
- Former) Chief of Samsung Advanced Institute of Technology, Managing Director of Samsung Techwin
- CEO of SNUAILAB



Jong-geun Na

- Doctor of Computer Science, Seoul National University
- Director of SNUAILAB Research Institute



Sang-beom Han

- Doctor of Computer Science, Korea University
- Director, SNUAILAB Platform Research Center



Ja-chun Gu

- Doctor of Electronic Engineering, POSTECH
- Director of Strategic Business Division of SNUALAB



Gwi-bo Shim

- Doctor of Electronic Engineering, Tokyo University, Japan
- Former) Professor of Electronics at Chung-Ang University
- Director of SNUALAB Overseas Business Division

9.Partner



- Joint venture company specializing in Vision AI field
- Seoul National University's official subsidiary established with the participation of a technology holding company and professors



- Company specialized in Voice AI
- KOSDAQ-listed Company

**Tokyo Internal
Medicine Dental Clinic**

- Internal Medicine/Dental Hospital
- 5F, Yotsuya 1-chome 20-ace Building,
Shinjuku Ward, Tokyo



- Blockchain Solution & Service Company in Kazakhstan
- Providing Sidechain Network, Wallet Solution, Payment Service

10. Indemnification Provision

- This white paper was written for the purpose of explaining the HeFi project, and may be reviewed and modified due to the project schedule and progress and other factors.
- The version of this white paper was written based on the date indicated at the top of the document, and the contents explains only the contents of the project promotion direction and progress update to that date, and may be changed at any time after the date of writing.
- This white paper was not written for the purpose of raising or receiving funds, and investment proposals or investor recruitment cannot be made due to any geographical or environmental factors.
- HeFi-related distribution is made through a separate contract from this white paper, and the contract details follow that contract. If the content of the white paper and the content of the contract do not match or conflict, the content of the contract takes precedence.
- No one other than the HeFi team can arbitrarily modify the contents of this white paper, and it must not be distributed in illegally defined countries or regions. In addition, if you invest after recognizing the contents of the white paper and invest, you must bear the risk of such investment.
- HeFi as defined in this white paper cannot be interpreted as a financial investment product such as bonds, stocks, securities, derivatives, etc., and cannot claim its rights under any circumstances. HeFi does not guarantee income and profits such as financial interest under any circumstances, and the purchaser should not under any circumstances interpret the purchase activity as investment or profit generation.

- This white paper does not guarantee the integrity of the business promoted by the HeFi team, and the contracting parties of the HeFi platform can receive the services provided. Errors and schedule delays that may occur in the development process and service provision may occur, and the HeFi team cannot be held responsible for them.
- The contents of this white paper cannot be used as legal, financial, accounting, tax, etc. counsel under any circumstances, and in the process of purchasing and using HeFi, it may be disposed of in accordance with national and regional policies and laws. Buyers or users may need separate counsel on this, and the HeFi team is not responsible for these matters.
- Due to force majeure reasons such as system hacking attacks and natural disasters, the creation of the ecosystem may be delayed or tangible and intangible losses may occur.
- The HeFi team is not responsible for any risks caused by loss or leakage of the buyer's wallet private key.
- Development of the HeFi platform is concerned with the decline in coin value, changes in the market environment, political risks, and it's not free from all risks, including competition. From this, Service directions and plans may change and may cause development to be stopped.
- The HeFi platform is a technology under development, and changes in technology that may occur during the development process can be also added to the platform.
- The HeFi team does not delegate or hand over all decisions, including the operating policy of the platform ecosystem, to others and all decisions are made by the HeFi team.