



Whitepaper

A decentralized and incentivized
platform for personal health data.

Whitepaper v1.0

April 13, 2018

Table of Content

Background	1
Astera Explained	3
Aster Token Explained	4
Astera B	5
Astera K	7
Astera Compensation System	10
Astera ICO	14
Market & Customer Needs	18
Astera Network Features	21
Anti-Fraud System	23
Astera Team	24
Disclaimer	25

Background

Data is the currency that counts today and will count in the future, and this is not just in the monetary sense. No matter which industry one may draw, most industries now collect, process and analyze large amounts of data before making important decisions. It comes as no surprise to learn that the data is the fourth largest resource on the planet and over 260 billion dollars a year is spent on data collection. By 2022, the data is expected to be the most important resource on the planet.

Among the sea of data being collected nowadays, the information that human body produces is considered more valuable as it directly relates to the quality of one's life. Health data makes it possible to accurately monitor the health status of a person and thus lower the risk for diseases in the future.

However, it is very difficult to daily collect, process, and analyze personal health data at a reasonable price.

In order to understand the vast majority of health data, it is necessary to use expensive measuring instruments from hospitals and health institutions. Though this data should be collected over the course of time in order to have a meaningful results, most people go to hospitals or health care facilities a very few times a year and are unaware of their latest data. Personal health data is rarely measured, but it is distributed across multiple different places and platforms, making it extremely difficult to gather data into one standardized database.

There exist devices to measure simple health data at home, but these devices are often too expensive to be widely used across the norm. It is also very difficult for people to understand and analyze the true meaning of measured data through these devices at home.

In addition, the current system does not compensate people for generating and

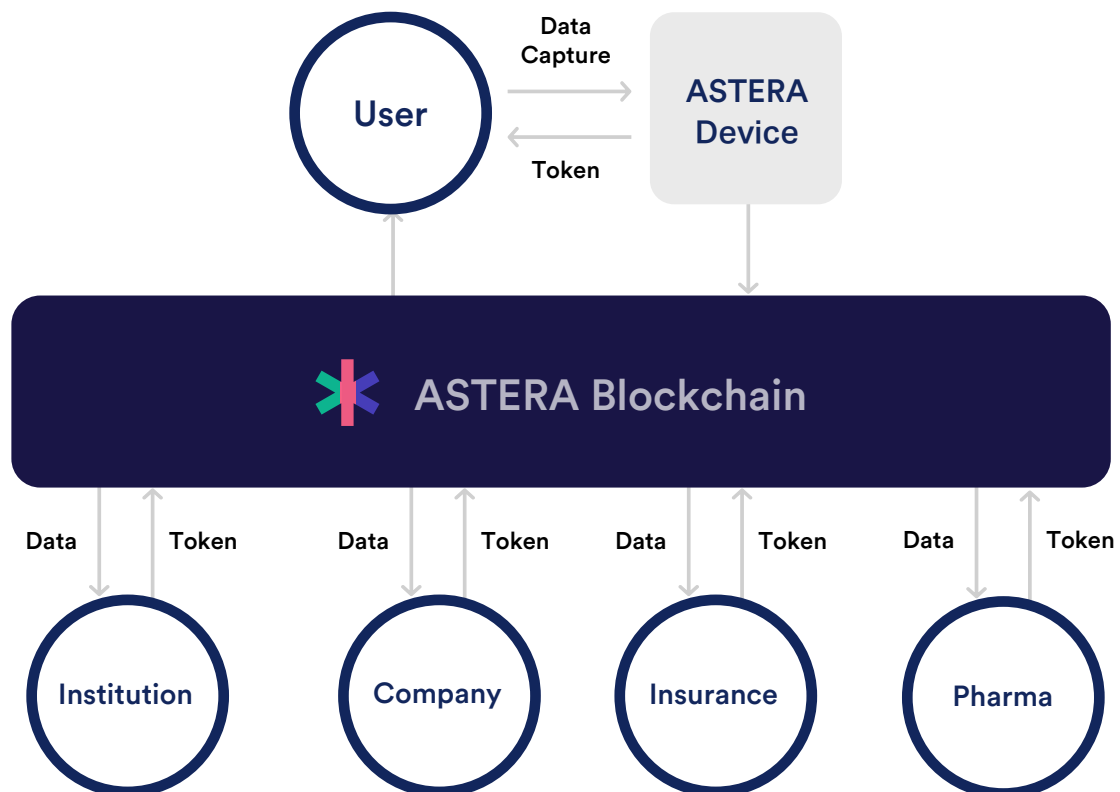
providing their health data to others. Companies in need of population health data often purchase information from data brokerages and institutions. However, users are not included in the data value chain, nor they are financially reimbursed for the data they create.

The aforementioned problems exist due to the lack of marketplace that connects data consumers with suppliers without intermediaries. It is very difficult for data consumers to obtain specific population health data they want. On the other hand, data suppliers have difficulty measuring, collecting, and claiming ownership over their own health data.

Astera seeks to solve these problems via decentralized and incentivized personal health data platform.

Astera Explained

Astera is a blockchain that enables people to store and manage their own health data, while providing a method for institutions and companies to easily find and purchase data they seek for. By securely saving, managing, and analyzing users' health data on the blockchain, Astera aims to create a data market that directly connects data consumers (institutions, companies) to data suppliers (users).



Why Blockchain?

The Astera platform has been built with blockchain technology for three reasons:

1 Security

Blockchain can provide direct transfer and access to health data upon multi-signature approvals between users and data-seeking entities. This eliminates the need for brokerage, and thus provides commission free transactions between the two parties.

2 Micropayments

Blockchain grants health researchers access to certain personal health information, and enables the use of micropayments for automatically

transferring compensation to users for participation. In the event of conducting studies that involve a large amount of people's data, the method of compensation could be complicated. This can be solved using smart contracts on blockchain.

3 Incentive

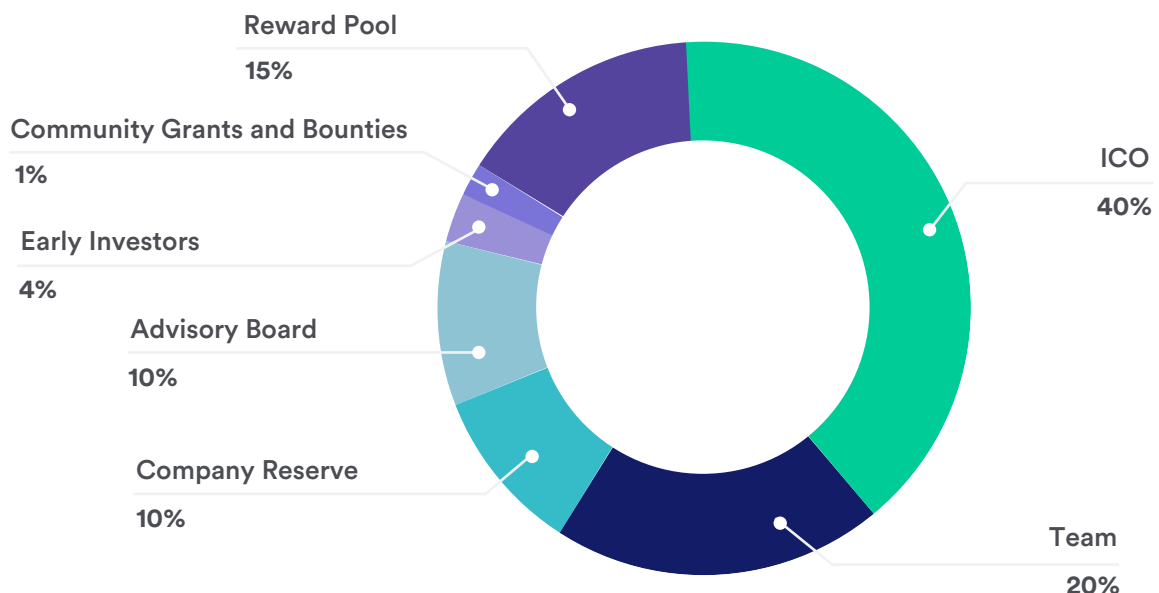
Blockchain can track users' health related actions and data through Astera devices, and automatically generate rewards in token based on specific milestones.

Aster Token Explained

Astera blockchain issues Aster tokens (AST) for all transactions occurring on the blockchain. AST will be mainly used in three ways: 1) for data transactions between data consumers(institutions, companies) and data suppliers(users), 2) for compensating users in exchange for providing nodes and collecting data, 3) for purchasing Astera devices and paying for Astera affiliated services.

Initial Token Distribution

Total Aster Supply : 300,000,000 AST



ICO: 40%

Team: 20%

Reward Pool: 15%

Company Reserve: 10%

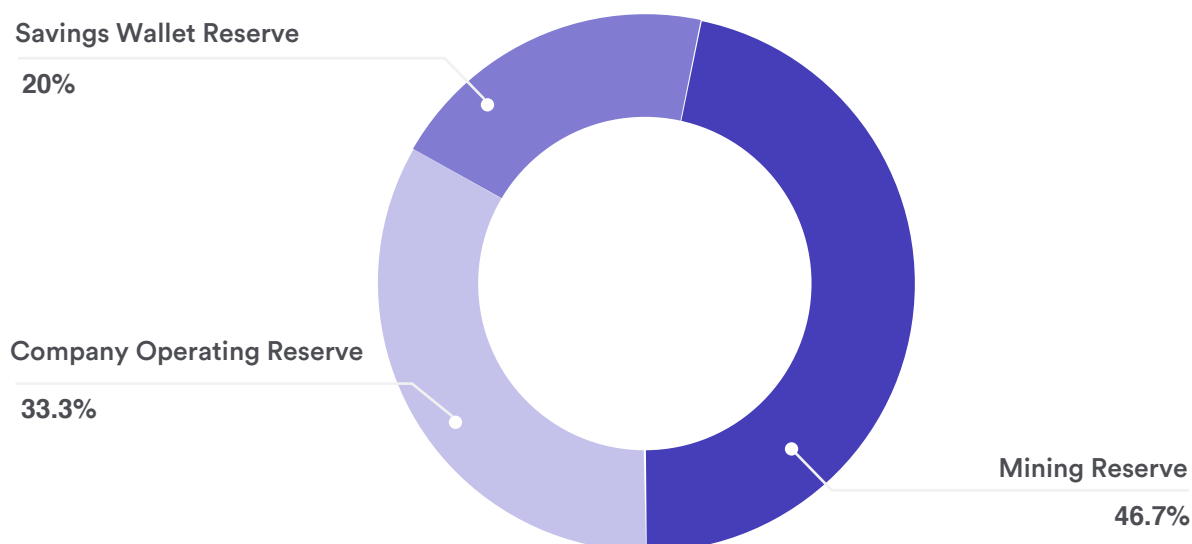
Advisory Board: 10%

Early Investors: 4%

Community Grants and Bounties: 1%

Reward Pool

Astera blockchain issues 15% of new AST every year to be used for mining reserve, savings wallet interest reserve, and company's operating expenses. Details of the newly issued AST are as follows:



Mining Reserve: 46.7% of Reward Pool

Savings Wallet Reserve: 20% of Reward Pool

Company Operating Reserve: 33.3% of Reward Pool

* The volume of yearly issuing AST for Mining Reserve decreases over time by 0.75% per year for 20 years. After 20 years when the newly issuing AST for Mining Reserve becomes 1%, it no longer decreases.

Astera B (Astera Body Checker)

Astera B is a health tracking IoT device that captures 8 fundamental health data values of a human body. It can also acts as a mining tool that plays a role as a node in the Astera network. With Astera B, users can easily measure and store their health data at home on daily basis in return for Aster tokens, which



Details on the 8 fundamental health data values captured by Astera B are as follows:

1 Body Temperature

Standard temperature for normal and healthy body is 36.5 degrees celsius. Even though body temperature can vary due to external environmental factors, the amount of body temperature change can be used as a basic indicator of the physical condition.

2 Weight

Body weight is the most basic data of a human body that can also be used to create other data such as obesity index and body composition index. Based on the results of the derived data, it is possible to determine the risk for weight related diseases such as obesity and diabetes.

3 Heart Rate

The number of beats per minute in the resting state of the body can also indicate numerous condition of the body. Measured heart rate constantly falling outside the normal BPM range could possibly indicate thyroid dysfunction, anemia, hypoxia, or arrhythmia.

4 Blood Pressure

Blood pressure is the pressure of circulating blood on the walls of blood vessels. Hypertension, also known as high blood pressure, increases the risk of heart disease, such as stroke, myocardial infarction and heart failure. Hypotension, also known as low blood pressure, increases the risk of chronic anemia and dizziness.

5 Body Mass Index (BMI)

BMI is used as an index of human obesity. High BMI indicates high risk of adult diseases such as diabetes and hyperlipidemia due to obesity. Since BMI only uses the mass and height of an individual, when measured together with body fat percent and skeletal muscle mass, it can lead to a more accurate assessment of the physical condition.

6 Skeletal Muscle Mass

Human body has three major muscle types: cardiac, smooth, and skeletal. Skeletal muscle is the only type of muscle that can actively grow and develop through proper exercise and nutrition.

7 Body Fat Percentage

BFP is total mass of fat divided by total body mass times 100. It is the only body measurement which directly calculates a person's relative body composition without regard to height and weight.

8 ECG (Electrocardiogram)

ECG is a method of measuring normal/abnormal rhythm of cardiac activity by recording the electrical activity of the heart within a period of time. ECG is used to detect potential myocardial infarction.

Astera K (Astera Kit)

Hair, saliva, and urine contain additional data that cannot be captured through Astera B. With Astera K, users can easily perform hair test, saliva test, and urine test at home without having to visit hospital or institution.

1 Hair Tissue Analysis

Hair testing analyzes heavy metal and mineral level in one's hair to detect or predict many diseases such as nerve damage, cancer, hair loss, adult diseases, memory loss, and senile diseases.

2 Saliva Analysis

Most hormones in the blood are also present in saliva. Analyzing saliva can determine one's fatigue level, stress level, depression level, weight changes, libido level and hair loss.

3 Urine Analysis

Measurement of organic acids in urine can be used to discover abnormality in body condition that can lead to metabolic disorders, brain, respiratory, liver and kidney diseases.

Astera S (Astera Sleep)

Astera S is a sleep IoT device that analyzes user's sleeping state and automates environmental control. By collecting various data within the bedroom, Astera S improves user's quality of sleep.

1 Sleeping Environment Monitor

Astera S analyzes the quality of the sleeping environment through its built-in temperature, light, sound and humidity sensor.

2 Sleep Pattern Analysis

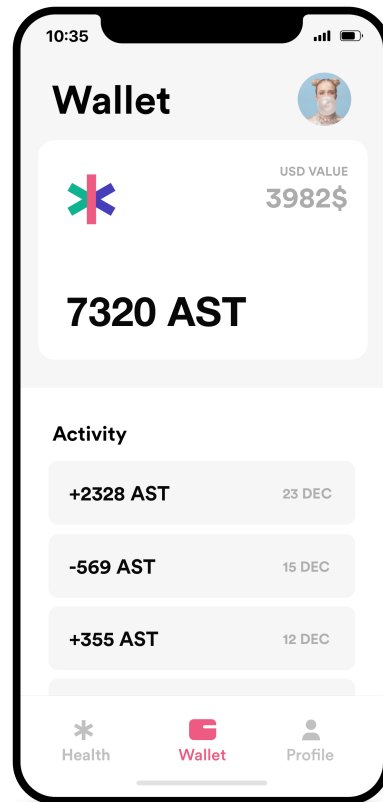
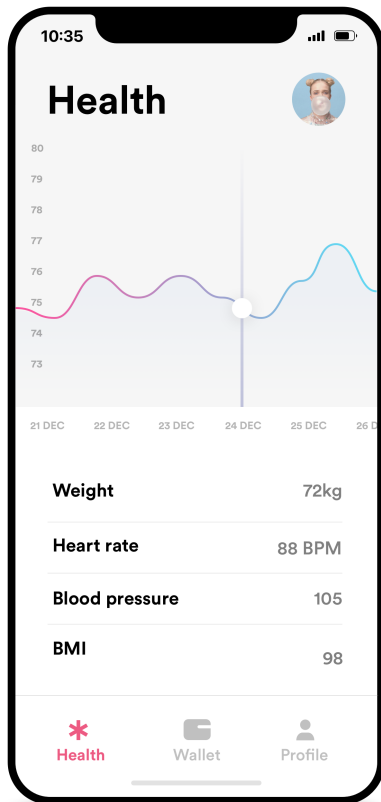
Astera S analyzes user's sleep pattern through its on-bed device.

Accelerometer, microphone, temperature and heart rate sensors are used to analyze how much movement a user makes during sleep. In addition, the built-in microphone is used to detect various sleep disorders, such as snoring, bruxism, and apnea.

Astera Mobile App

All data captured by Aster B is analyzed and displayed on user's mobile app.

Through mobile app, users can view their recorded health data over time, manage tokens, and conduct data transaction with data consumers.



Astera Compensation System

The primary purpose of Astera B is to collect user's everyday health data. However, it can also act as a mining device by being a node of the Astera network. Astera network has several compensation methods to incentivize users to a) collect health data regularly, b) hold onto AST tokens to prevent price fluctuation, and c) maintain Astera B as a node on the network.

Incentivizing Data Collection

Every time a user captures his or her health data on Astera B, the network issues AST tokens as compensation for data production.

$$\text{daily token reward} = \frac{\text{daily mining pool}}{\text{number of daily miners}}$$

Example

If the total number of miners are 10,000, the daily token reward user A receives is as follows:

$$\text{mining pool} = 3,000,000,000 * 15\%(\text{reserve pool}) * 46.7\%(\text{mining reserve}) = 210,150,000 \text{ AST}$$

$$\text{daily mining pool} = 210,150,000 \text{ AST} / 365(\text{days in a year}) = 575,753.42 \text{ AST}$$

$$\text{daily token reward} = 575,753.42 \text{ AST} / 10,000(\text{daily miners}) = 57.575 \text{ AST}$$

The above formula can be used to calculate the exact number of tokens one can mine from capturing data every day. Since the size of the daily mining pool is fixed, the number of tokens to be compensated to users each day depends on how many users measure health data on that day.

Incentivizing Token Hold

A) Savings Wallet

Astera platform wants to bring interest to long term investors. In order to prevent unnecessary price fluctuation in the market, Astera provides interest for all AST deposited in savings wallet and encourages long term investment.

All users will be given with an option to transfer their AST to the savings wallet at anytime. AST deposited in savings wallet will not be transferable for 12 weeks, but is subject to receiving interest. 20% of newly issued AST per year will be rewarded to users with AST in savings wallet, number being proportional to the amount of AST they keep in savings wallet.

$$\text{daily interest} = \frac{\text{AST in savings wallet}}{\text{total AST in savings wallet}} \times \frac{\text{interest reserve}}{365}$$

$$\text{daily interest reward} = \min(\text{daily interest}, 5\% \times \text{AST in savings wallet})$$

Example

If the total number of AST stored in the savings wallet is 600,000,000 AST, and user A has 100,000 AST in his or her savings wallet, the daily and annual interest rates are as follows:

$$\text{interest reserve} = 3,000,000,000 * 15\%(\text{reserve pool}) * 20\%(\text{savings reserve}) = 90,000,000 \text{ AST}$$

$$\text{daily interest pool} = 90,000,000 \text{ AST} / 365(\text{days in a year}) = 246,575.34 \text{ AST}$$

$$\text{daily interest} = (100,000 \text{ AST} / 600,000,000 \text{ AST}) * 246,575.34 = 41.1 \text{ AST}$$

$$\text{daily interest reward} = \min(5,000 \text{ AST}, 41.1 \text{ AST}) = 41.1 \text{ AST}$$

$$\text{daily interest rate} = 41.1 \text{ AST} / 100,000 \text{ AST} = 0.0411\%$$

$$\text{expected annual compounding interest rate} = (1.000411)^{365} = 16.18\%$$

- Daily savings interest cannot exceed 5% of user's AST token in savings wallet.
- Depending on the total number of AST stored in the savings wallet, daily interest rate changes.

B) Mining Bonus

In addition, to encourage collecting data and not just profit out of savings wallet, the number of AST mined from Astera B each day becomes bigger with more AST deposited in savings wallet. The number of bonus AST being rewarded depends on the amount of AST kept in savings wallet.

$$\text{mining bonus} = \frac{\text{AST in savings wallet}}{\text{total AST in savings wallet}} \times \frac{\# \text{ of savings wallet users}}{10}$$

$$\text{mining bonus multiplier} = \min(1000\%, \text{mining bonus})$$

Example

If the total number of AST stored in the savings wallet is 600,000,000 AST, and user A has 100,000 AST in his or her savings wallet, and total of 10,000 people mine on the same day, the daily mining bonus of user A is as follows:

$$\text{mining bonus} = (100,000 \text{ AST} / 600,000,000 \text{ AST}) * (10,000 / 10) = 0.166 = 16.66\%$$

$$\text{mining bonus multiplier} = \min(1000\%, 16.66\%) = 16.66\%$$

User A can earn **16.66% more AST** from mining bonus.

$$\text{mining bonus reward} = 1.1666x(\text{user A}) + 9,999x(\text{miners}) = 575,753.42 \text{ AST [daily mining pool]}$$

Each miners earn 57.57AST, whereas user A earns 67.17 AST per day.

- Daily mining bonus cannot exceed 1000%.
- Depending on the total number of AST stored in the savings wallet, daily interest rate changes.

C) Continuation Combo Bonus

To encourage capturing data regularly, continuous measurement of health data rewards in a mining bonus. The bonus multiplier is maintained if and only if user captures data for more than 4 days in a week. The multiplier is reset to 1 when the

Week 1 : Data recorded for more than 4 days in a week → Lv,1 = **Multiplier 1.1x**

Week 2 : Data recorded for more than 4 days in a week → Lv,2 = **Multiplier 1.2x**

Week 3 : Data recorded for more than 4 days in a week → Lv,3 = **Multiplier 1.3x**

- After Week 3, the multiplier remains at 1.3x. If the condition of capturing data for more than 4 days in a week is not met, then the multiplier is reset to 1.

Example

If the total number of AST stored in the savings wallet is 600,000,000 AST, and user A has 100,000 AST in his or her savings wallet, total of 10,000 people mine on the same day, and user A has been capturing data for more than 3 weeks straight, the continuation combo bonus is as follows:

mining bonus =
16.66% (as calculated in the previous page)

continuation combo bonus multiplier =
1.3x (in percent, 30%)

total bonus(mining & combo) =
 *$1.166 * 1.3 = 1.5166$ (in percent, 51.66%)*

User A can earn **51.66% more AST** from continuation combo bonus and mining bonus combined.

total bonus reward =
 $1.5166x[user\ A] + 9,999x[miners] = 575,753.42\ AST$ [daily mining pool]

Each miners earn 57.57AST, whereas user A earns 87.31 AST per day.

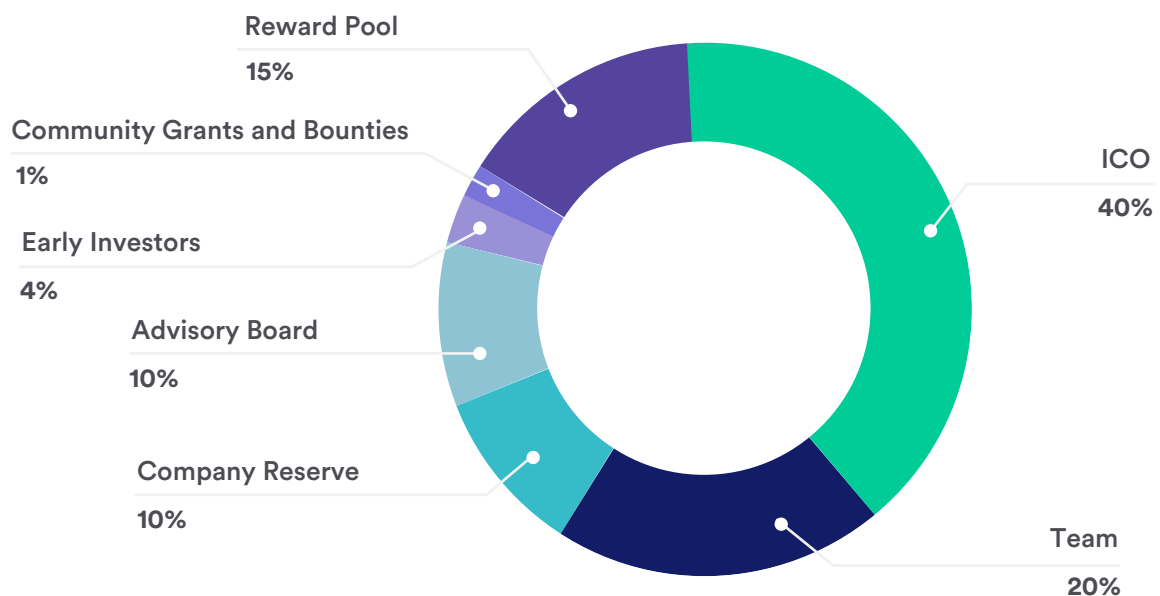
- Continuation combo bonus is multiplied after the mining bonus multiplier.

Astera ICO

Token Details

Token Name	Aster, AST
Total Supply	3,000,000,000 AST
ICO Supply	1,200,000,000 AST (40% of Total Supply)
Protocol	ERC-20
Purchase Method	Ether (ETH)
Price	\$0.025

Token Distribution



ICO Token Price Details

Private Sale

Contribution	Bonus	Vesting Period	Rate
50 ETH - 100 ETH	40%	2 Month	\$0.015
100 ETH - 300 ETH	45%	3 Month	\$0.01375
300 ETH - 1000 ETH	50%	4 Month	\$0.0125

Presale

Contribution	Bonus	Vesting Period	Rate
0.1 ETH - 20 ETH	20%	1 Month	\$0.02
20 ETH - 50 ETH	25%	1 Month	\$0.01875
50 ETH - 100 ETH	30%	2 Month	\$0.0175
100 ETH - 300 ETH	35%	2 Month	\$0.01625
100 ETH - 300 ETH	40%	3 Month	\$0.015

Public Sale

Time Frame	Bonus	Vesting Period	Rate
First 24 Hours	15%	1 Month	\$0.02
Week 1	10%	1 Month	\$0.01875
Week 2	5%	2 Month	\$0.0175
Week 3	2.5%	2 Month	\$0.01625
Week 4	0%	3 Month	\$0.015

Funding Details

Aster Token Public Sale will commence on July 1st 2018

Private presale will take place to accredited investors only.

Public Presale and Public Sale will be open to everyone with KYC.

Token Sale Soft Cap: \$4,000,000

Token Sale Hard Cap: \$30,000,000

Max Coin Distribution: 120,000,000 AST

ICO Fund Breakdown

Funds from our token sale will help the development of Astera. The following is a tentative breakdown of how we are planning to use funds for development.

Core Development (40%)

The largest portion of funds will go to completing the development of the entire Astera network as described in this paper. This includes Astera blockchain, node network, Astera devices, smart contract system, smartphone mobile app, etc.

Security (20%)

The next major portion of the funds will be going towards developing network is extremely solid security.

Operations (20%)

Operations cost includes hosting, infrastructure, staffing, outsourcing, management, and other related expenses.

Marketing (15%)

Marketing budget will be used for strategic partnerships and directly marketing to consumers.

Legal (5%)

This includes legal advice and consultation for complying with the industry's numerous regulations.

Development Roadmap

Before Token Sale (ETA June 2018)

Complete a proof of concept prototype of Astera B ready with smart contract v1.0 developed for the initial coin offering. Also, test out whether using Astera B as a node for decentralized CDN is feasible.

Development Goals

- Astera B PoC Prototype
- Smart Contracts v1.0
- Decentralized CDN PoC

Phase 1 (ETA November 2018)

Launch the core system architecture of Astera system. Ship the first batch of Astera B for capturing user's health data. Deploy the smart contract that issues AST tokens to miners and savings wallet holders. Have Astera B to act as a node for decentralized CDN network.

Development Goals

- Astera B (first batch)
- Astera Mobile App
- Smart Contracts v2.0
- Decentralized CDN

Phase 2 (ETA February 2019)

Along with the shipment of second batch of Astera B, include Astera K to the line up for more detailed data capture. Start Astera S development.

Development Goals

- Astera B (second batch)
- Astera K
- Astera S PoC

Phase 3 (ETA December 2019)

Start shipping Astera S. Finish development of Astera main net protocol and deploy the network through hard forking.

Development Goals

- Astera S
- Astera Protocol

Market & Customer Needs

Astera enters into two major existing markets: 1) health scale market for data suppliers, and 2) health data market for data consumers.

Health Scale Market (for Data Suppliers)

Weight management is one of the biggest concerns for modern people. While weight management involves various efforts, one integral piece is to check one's weight periodically.

More and more analog scales that measure weight only are turning into electronic smart scale that measures weight and other body composition metrics. The major advantage of these scales is that the users don't have to record their weight manually as these scales have the capability to sync with various health apps which enables them to track their weight over time. Smart scales are one of the fastest popularity gaining device in the current sports and health industry. A continuous rise in the demand for body fat analyzers is one of the key factors which is expected to drive the smart scales market.

Moreover, a rapid growth in the aging population is likely to lead to augmented sales in the very market. Rising cases of hypertension, diabetes, and cardiovascular disease is fostering the adoption of advanced weight management strategies among consumers as well.

Electronic smart scale normally costs within the range between \$100 to \$200, much more expensive than the traditional analog scale. However, the market size accounts to \$4.3B as of 2017, with the number growing 5% each year to reach \$6.3B by 2025.

There are several big players in the market that creates and sell smart scales. Details of these companies are as follow:

Yunmai

Yunmai is a Chinese company founded in 2015 that manufactures healthcare products including smart scales. Their products are being sold in 7 different countries throughout the world, with over 9 million devices sold as of 2017.

Inbody

Inbody is a Korean company with over 80 patents and certifications related to body composition analysis. They have six subsidiaries overseas, and exports products to more than 60 countries around the world. In 2016 Inbody's annual revenue was around \$80M and they are currently listed on Korean stock exchange, KOSDAQ.

Existing healthcare product manufacturers like Withings and Garmin also partake a big portion in the smart scale market.

Health Data Market (for Data Consumers)

Data accumulated over a long period of time is valuable, because it can be used in many different cases. Insurance providers, research institutions, or other big data firms constantly collect population health data to be used on their business.

Health Analytics (\$9B USD as of 2017)

Health analytics can help aforementioned companies conduct much more effective business in the market. Health plans could invest in more effective outreach and personalized care management solutions. Health systems could make care decision with more certainty. Pharmaceutical companies could deliver life-saving therapeutics with more speed and clarity. Institutions could discover new therapeutic pathways, fueling diagnostic and drug innovation. The health analytics market size is \$9B as of 2017, but this number is growing so fast that it is expected to reach \$30B by 2022.

Astera wants to create and provide a search engine that can be used for finding specific cluster of population by health type. This could be used by numerous type of business firms in healthcare market to dramatically reduce the cost of obtaining health related data.

Population Health Management / Preventative Care (\$42.5B USD by 2021)

Currently, chronic disease affects nearly 3 out of 4 adults, and is responsible for more deaths than infectious disease. The management of these conditions also accounts for more than 85% of health care costs in the United States. Diabetes affect 9.5% of the population, with an additional 32% prediabetic patients, who have significant risk of progressing to diabetes. Employers pay approximately \$10,000 more per year for diabetic patients due to lost productivity and higher medical costs.

Studies show that diabetes prevention programs, DPPs, and behavior-change programs are more effective than pharmaceutical intervention for prediabetics. Weight loss is also a clinically accepted proxy measure for reducing the risk of developing diabetes. As a result, many companies started to work with DPP providers to seek out prediabetic employees and treat them to prevent development into type 2 diabetes.

The ROI for employer is pretty clear. A person with Type 2 Diabetes typically costs at least \$10,000 a year, but just a 5 percent weight loss reduces the risk of getting the disease by 70%. Through preventative care, companies can save much costs coming from employee's potential chronic disease.

Astera wants to partner up with organizations, such as firms, institutions, and clinics, to help them identify which of their employees or patients are at the tipping point stage where they are at risk of diabetes or heart disease. These employees or patients will then go through intensive behavior counseling program that includes capturing everyday health data. Using Astera, organizations will be able to create a comprehensive, meaningful and consolidated records, which can be used to quantifying and acting on clinical risk of their employees or patients, as well as quantifying and predicting financial risk.

Astera Network Features

Astera Network offers various add-on features in order to support a) users to easily measure and record data, b) data consumers to discover data more effectively, and c) Astera devices to become more useful nodes in the network.

Health Challenge

Astera offers a health promotion game in which users bet AST tokens to play with friends in achieving weight loss or health improvement. Through competing with friends, users can motivate themselves to regularly measure their health data and improve health condition as well.

Recommendation

Astera Network can estimate the user's physique, body type, and body condition based on health data collected with Astera devices. Upon user's will, Astera can recommend food, clothes, treatments or supplements that fit user's health and body condition.

Custom Research Creation

Data consumers who want to find users with specific data can search and contact the user pools of the desired conditions using the Custom Research Creation feature. By using the Astera Network's search engine, data consumers can easily find specific user pools to offer participation on tests with reasonable AST rewards to motivate participation.

For instance, if an organization that studies obesity wants to find data of a group of women in the age of 20s who have experienced dramatic weight gain in recent years, the organization just simply has to search for users with the above condition on Astera Network and purchase data direct from the users using AST.

Pharmaceutical companies can search their desired research targets for demonstrating the efficacy of drugs they want to test. They can quickly and easily recruit their research targets by setting up rewards for their participants and providing free medicines during the study period.

Premium Posting

Premium Posting is a marketing feature that can be used by data consumers to advertise their custom research and clinical trial recruitment announcements. All posts uploaded by data consumers are shown to users through smartphone app, and the order of posts on the app page decided through how much AST has been used to promote. AST tokens used for Premium Posting feature are permanently incinerated to help AST price to rise.

DDoS Protection

More than \$150B USD is being spent on DDoS protection every year by enterprises around the world. As Astera B acts as a node in Astera Network, the network becomes a decentralized CDN that can be used to prevent DDoS attacks. By using Astera B's remaining network bandwidth, local companies can use Astera CDN network to filter out malicious network connection requests to their website.

Anti-Fraud System

Some Astera users may attempt to exploit the compensation system of the Astera Network to obtain unrightful mining rewards. Fraudulent mining can potentially extort others' mining rewards, and ultimately damage the entire Astera Network. To minimize this risk, Astera is equipped with several mechanisms that detect abnormal malicious behaviors.

Reward Once Per Day Per Account

Compensation is made only once a day at UTC 00:00, and only accounts that went through the KYC process are eligible to receive rewards. Astera Network rewards users only once per day per account in order to create fair mining system.

Footprint Authentication



Astera B has a biometric sensor that can read user's footprint for authentication. Biometric sensor can prevent fraud data uploads, and help device to identify users when there are more than one person using the device in a household.

Detecting Abnormal Body Changes

In a case where user's health data changes significantly over a very short period of time, Astera Network flags user for abnormal body change. Information such as weight, BMI, BFM, SMM are used to determine whether the person is attempting to fraud the system.

Meet Astera Team



Kevin
CEO



Jay
CEO



Lex
CTO



Emin
CDO



Anton
Engineer



SY
Marketing

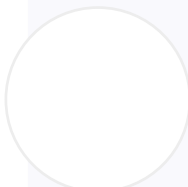
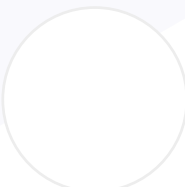
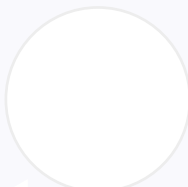
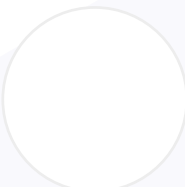


Bart
Engineer



Walter
Designer

Advisors



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No Token should be construed, interpreted, classified or treated as enabling, or according any opportunity to, purchasers to participate in or receive profits, income, or other payments or returns arising from or in connection with the Astera or the Tokens or the proceeds of the Token Sale, or to receive sums paid out of such profits, income, or other payments or returns.

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