SYMPHONY

WHITE PAPER

Version 2.1

Table of Contents:

1. EXECUTIVE SUMMARY

The global market for personal data is sizable, estimated to be over $1 Trillion USD in value. The global data economy has fueled explosive growth of numerous large tech companies, who rely on the collection and mining of personal data to target advertising and to create new business models.

However, the global data economy is flawed in that the majority of profit pools are accrued to platform owners, while the individual users and data originators are receiving a negligible amount of the value created. Individual users are not granted the full agency to control, govern and reap monetary rewards of their own data.

The introduction of Blockchain technology represents an important step forward in the data economy. Blockchain allows for the creation for new platforms that enable advanced data mining techniques and better allow for the conversion of data to value.

It is the belief of SYMPHONY that there is space for multiple new business models that allow individual users to monetize and control their personal data, and more strongly participate in the value sharing agreement. Blockchain technology allows for new ways for data platforms to evolve towards a more decentralized model.

SYMPHONY is a next-generation Blockchain-based protocol to empower a data-driven economy.

Committed to data of the people, by the people, for the people, SYMPHONY has a vision to create an ecosystem that unlocks personal data for fairer value redistribution and smarter data intelligence. The origins of SYMPHONY come from both a belief in rewarding individual users, backed by deep experience in advanced data mining techniques and a solid technical design.

This white paper will outline the background, business model, technical and commercial plans to make SYMPHONY a reality. Further, this white paper will introduce the concept of SAGE, which will launch as the 1st native DApp of SYMPHONY.

2. BACKGROUND

The market for personal data has grown to be enormously large. This market has given rise to a wave of tech companies whose primary business model is the collection, mining and reselling of data to advertisers through marketing services. "Data is the new oil" is the adage that is being splashed across magazine covers, becoming the internal mantra from Chief Marketing Officers to Chief Information Officers.

Let's examine, for a moment, several enabling factors that have contributed to this enormously sizable and profitable market:

GROWING ONLINE POPULATION:

The global population has become increasingly connected, and the global internet population has grown to 4 Billion users[1]

INCREASE IN CONNECTED DEVICES:

Related to this, the number of connected devices is growing, expected to increase from 15Billion in 2015 to 50 Billion in 2020[2]. With the explosion in smart devices (smart phones as well as IoT devices), individual digital footprints and volumes are exploding.

INCREASE IN DATA VOLUMES:

All of this has created vast reserves of data, due to increased activity on an exploding number of connected devices. There is virtually no activity on a smart device that doesn't leave a digital footprint. Global digital data is expected to increase by more than 40x in 2020 vs 2009, to 40,000 Exabytes[3]. We are moving towards a "Web of the world" in which mobile communications, social technologies and sensors are connecting people, the Internet and the physical world into one interconnected network.

EXPLOSION OF DATA ECONOMY:

The result has been the creation of a highly valuable market for personal data. The total personal data economy is valued at over $1 Trillion, and we can cite several estimates:
- One US-based study on Data Driven Market Economics, estimated the 'Individual Level Consumer Data' market to be $156 Billion in USA alone[4]

---

[1] We are Social: Digital in 2018
[2] Report by Ericsson, Intel
[3] World Economic Forum report on global data
[4] Study on Data Driven Market Economics, published by Data Driven Marketing Institute

- A Boston Consulting Group conducted a study in 2012, estimating that the value created by collection of personal data would make up 8% of GDP of European Union countries by 2020[5]. Given forecasts, this yields a market size of €330 Billion in 2020 in EU alone.
- There are a number of tech giants that have built businesses that operate largely on the data (collection, analysis, and reselling or retargeting of consumers by advertisers). These are asset light, data rich tech giants who are further evidence. Market capitalization:
    - Alphabet Inc (Google): $700B USD
    - Facebook: $500B USD
    - Tencent: $500B USD
    - Baidu: $80B USD

---

[5] Unleashing the Value of Personal Data by Boston Consulting Group

3. PROBLEM STATEMENT

It has been well established that in economic value, the size of the global data economy is very large. However, an underlying premise of SYMPHONY is that the current value allocation model for data is broken. Profit pools have largely accrued to tech platform owners, who rely on network effects to facilitate the creation of data monopolies. The data is collected by tech platform owners, stored centrally, and is largely inaccessible to external parties. In turn, these data monopolies extract enormous revenues in ad sales, commissions and marketing services.

The current data model is flawed in 3 distinguishable ways:

Problem #1: USER NOT FAIRLY REWARDED FOR SUPPLYING DATA:

The individual user is largely left out of this value equation. The user lacks economic participation, aside from free use of the service supplied by the "freemium" model. The current allocation of value of Personal data is currently tilted overwhelmingly towards platform owners and tech companies, who have built very profitable businesses that rely largely on collection, mining & commercial use of data for advertising purposes.

A recent study revealed that the majority of people between 18 and 34 would be willing to allow insurance companies access to their digital data from social media to health devices, if it lowered their premiums, a survey shows. 62% responded they are okay with giving insurers access to third-party data from the likes of Facebook, fitness apps and smart-home devices to lower prices[6].

Problem #2: USERS LACK AGENCY OR CONTROL:

One can look no further than recent media headlines to understand the scale of the issues as it relates to lack of user empowerment or control of their data. The fury of Facebook users over the Cambridge Analytica data scandal likely made an important signpost in the implied and direct contract that users have with tech platforms they interact with.

Individual users lack "agency" as it relates to their data, and they are not given transparency nor control. The terms of the relationship between the individual user and the tech platform owner are set entirely by the platform owner, and the choices is binary. Users are not informed about what data is collected in a readily understandable way, and users have no way to opt-out of data collected. Therefore, the user has 2 choices[7]:
1) Subscribe to the platform and accept Terms of Service (with little control over data privacy)
2) Leave the platform, and forfeit the convenience and connectivity large-scale social media brings

---

[6] Survey of more than 8,000 consumers globally by Salesforce.com Inc's MuleSoft Inc
[7] Quartz: A FAIR PRICE You should be paid for your Facebook data

SYMPHONY proposes a 3rd option: Allow users to become active participants and brokers in the data market. Each user may decide which of their own data they would like to share, and what commercial partners they are willing to share with.

Problem #3: FRAGMENTED STATE OF DATA MARKET DOESN'T ACCOMMODATE RECENT ADVANCES IN DATA MINING:

Data sets representing different spheres of users lives (social, media, financial, transactional, leisure, health, etc) reside in many different source and systems. The data is fragmented and cordoned off from other data sets. There have been many advances in modern data mining and business insights techniques that can be applied to these data sets, thereby increasing the usability of the data by generating stronger insights. These insights can be used to provide stronger targeting and design products to improve people's lives.

4. HOW BLOCKCHAIN CAN HELP

Blockchain is a powerful emerging technology, and we are still in the early stages of witnessing its true potential and application. Blockchain offers a way to align what users are looking for with what the features that can be built into the technology.

SYMPHONY believes that users are seeking 4 qualities from tech platforms:

VALUE:

Users seek services that offer some convenience or benefit to their everyday life, and want to receive appropriate sharing in the financial rewards.

TRANSPARENCY:

Global netizens are evolving their expectations of tech companies to offer more transparency in what data is collected, how it is used, and what partners are able to access that information. The Facebook & Cambridge Analytica data scandal was a watershed moment in the contract between users and tech owner. A segment of users will increasingly and actively seek to interact with tech companies that offer transparency in the type of data collected, with whom the data is shared and how the data is used.

CONTROL:

In this evolving relationship between tech platform and its users, the bid to have some agency and control in level and nature of data collection and sharing. In a data marketplace, this comes in the form of asking users to "opt in" rather than requiring them to "opt out."

PRIVACY:

A sequence of high-profile data breaches has resurfaced concerns around consumer privacy protections, and the vulnerability of personal data. Users are to be increasing their expectations for privacy, and this is expected to increasingly play a role in the choices and selection of services.

Blockchain offers several important features:

IMMUTABILITY:

One of the key benefits of blockchain is that transactions recorded on the blockchain cannot be changed without that change being visible to others, and without enormous complexity. This is due to the application of hash functions. In effect, blockchain transactions are immutable and cannot be changed.

TRACEABILITY:

The nature of blockchains is that they offer a distributed ledger, upon which multiple entities are able to view the history of previous transactions on the chain. This offers traceability in transactions recorded on the blockchain, and therefore a full record of transactions between parties, or of a given asset.

SMART CONTRACT:

The decentralized nature of the blockchain allows for the ability to create self-executing smart contracts. In this format, contracts can be converted to computer code, stored and replicated in the system, which allow for governance and supervision by network of computers running the blockchain rather than by an intermediary.

DISTRIBUTED STORAGE:

Traditional centralized storage of data can be problematic, where data stored in central servers that can be vulnerable to attack. Blockchain offers a feature for decentralized, distributed storage. Decentralized storage works by distributing the data across a network of nodes. Any attack or outage at a single point will not have a devastating effect because other nodes in other locations will continue to function. The distributed nature of these nodes offers the advantages of making decentralized storage highly scalable, as customers can easily access a marketplace of storage vendors, and high performing, as the power of the network provides better uptime.

ANONYMITY:

Blockchain allows for transactions or data exchanges to take place anonymously. Within SYMPHONY, there will be no way to link individual identity of the users with the personal data that they supply. This offers a measure of privacy. Further privacy measures are built into the technical design that will ensure compliance with the European Union's General Data Protection Regulation (GDPR), further outlined in Section 6 under Technical plans.

5. VISION FOR SYMPHONY

Designed as a next-generation Blockchain-based protocol to empower a data-driven economy, SYMPHONY has a clear Vision statement to serve:

To create an ecosystem that unlocks personal data for fairer value redistribution & smarter data intelligence.

This Vision will be achieved by technical development of SYMPHONY as a value-data execution multi-level chain architecture and advanced user modeling algorithms. SYMPHONY will be powered by machine learning and collective intelligence, that seeks to bring together individual users, businesses and service partners in a synergetic closed data loop to unleash the full potential of personal data.

Further, this white paper will outline the plans for SAGE, which will serve as the 1st native DApp that is built on SYMPHONY. SAGE users will rely on the underlying protocol of SYMPHONY to interact within the ecosystem.

6.SYMPHONY PROJECT: WHAT IT OFFERS & TECHNICAL CONSIDERATIONS

TECHNICAL CONSIDERATIONS:

As an infrastructure blockchain platform tailored for data applications, SYMPHONY put priorities on the following aspects in its design:

1) Data Privacy:

Protection of personal data privacy has gained increasing attention from around the world, as manifested by the growing series of laws and regulations in recent years, including most notably the Personal Data Protection Act (PDPA) of Singapore and the General Data Protection Regulation (GDPR) of Europe.

SYMPHONY implements end-to-end data privacy protection for user data with the highest standard in the industry based on proprietary blockchain technologies:

Data Authorization:

SYMPHONY's blockchain platform offers users unprecedented control over how their data will be used, down to the granularity of a particular piece of data to be made accessible to a particular data consumer in a mutually-agreed manner.

Data Deletion:

SYMPHONY implements cryptographically secure user data locking system to guarantee that each piece of user data is only made accessible to any data consumer with user permission. Users' termination of permission at any given time would result in immediate locking and subsequent automatic deletion of the corresponding data from the platform.

Identity De-coupling:

SYMPHONY de-couples user identity from user profile such that no user personal identity information will be accessed in data mining and user profiling computation. It is only when the target user segment has been identified will the channel between the data consumer and data contributor be created by retrieving user identity-profile mapping in a secure manner. Furthermore, SYMPHONY's hierarchical data abstraction on user profiling provides additional strong boost to the privacy protection by shielding user raw data from unauthorized access.

2) Data Security:

Separate from data privacy, data security concerns the integrity of data against malicious attacks. SYMPHONY has designed a novel Index-Common-Node subnetwork data storage strategy together with a customized POS-RSDS consensus protocol to enable distributed user data storage with randomized indexing, achieving data security and privacy-preserving data mining without compromising community consensus.

3) Platform Programmability:

A critical feature to ensure broad adoption and sustained growth of a blockchain platform is the programmability of the platform --- how easy and flexible can developers participate and contribute to the ecosystem. In the context of a blockchain platform tailored for data-driven economy, this translates into the standardization of user data format for uniform algorithm access, transparent data interface for hassle-less machine learning model training and modular model stack for flexible and task-oriented algorithm assembling and packaging. These features distinguish SYMPHONY from projects that are primarily trading markets for raw data.

4) Computation Efficiency:

The societal scale of data in a system like SYMPHONY proposes serious challenges to all data mining and machine learning tasks. SYMPHONY incorporates a suite of advanced algorithms and technologies to enable effective and efficient data mining and machine learning in such a large and heterogenous data setting including sampling-based data analysis for sublinear data sketching, probabilistic fusion algorithm for large pattern discovery, constraint-centric sequential and network pattern mining and core-set-based dynamic data analysis and trajectory mining.

SYMPHONY ECOSYSTEM:

ENTITIES:

We refer to an "entity" as any participant within the SYMPHONY ecosystem. An entity could be an individual user, a business, a merchant or a service partner. Each entity in SYMPHONY is assigned a unique identifier.

Depending on their roles in the SYMPHONY ecosystem, we define four types of entities:

1) *DATA CONTRIBUTOR*:

Data contributors are entities who contribute data to SYMPHONY in exchange for reward of SYMPHONY tokens. Data contributors are usually individual users.

2) *DATA CONSUMER*:

Data consumers are entities who pay SYMPHONY tokens to make use of data contributors' data (e.g., to identify target audience, push various programs or conduct market surveys, etc.) with the help of the models developed by developers. Data consumers can be merchants, businesses, government sectors, etc.

3) *DEVELOPERS*:

Developers are entities who contribute computational effort and resources to SYMPHONY so that data contributed by data contributors can be used by data consumers for better data intelligence. In return, they would be rewarded with SYMPHONY tokens.

4) *SERVICE PARTNERS*:

Service partners are entities who provide channels and platforms to connect data contributors and data consumers in SYMPHONY ecosystem. A typical service partner could be a mobile phone APP through which data contributors could upload their data to SYMPHONY. Service partners would also be rewarded with SYMPHONY tokens for the services they provide.

TYPES OF TRANSACTIONS:

DATA CONTRIBUTION TRANSACTION:

A "Data Contribution Transaction" is a record of data which describes a certain property or behavior of the data contributor who uploads it. For example, "user X paid 10 dollars for a cup of coffee" is a data contribution transaction once user X uploads it onto SYMPHONY.

VALUE-ATTESTING TRANSACTION:

A "Value-attesting Transaction" is a record of data which describes how a data consumer uses a data contributor's data. For example, "Business Y paid 10 dollar to push an advertisement to user X" is a value attesting transaction because this transaction attests the value of user X's data.

VALUE OF DATA & TYPES OF DATA:

The mission of SYMPHONY is to unlock personal data for fairer value redistribution and smarter data intelligence. To that end, SYMPHONY must first establish the notion of "value" for any piece of data contributed in the ecosystem.

While data contributors can contribute a great variety of data in SYMPHONY, one important type of data contribution transaction is in the form of a consumer transaction, such as payment. For example, if a consumer transaction data d could be "user X paid 100 dollars for a book". It is important to distinguish two concepts of value for such a piece of consumer transaction data --- (i) the nominal value, and (ii) the derived value:

NOMINAL VALUE:

For a piece of consumer transaction data d, the nominal value of d refers to the actual amount involved in such a transaction. For the example of d being "user X paid 100 dollars for a book", the nominal value of this consumer transaction d is 100 dollars.

DERIVED VALUE:

The derived value of a piece of data refers to the total amount of value-attesting transactions as a result of making use of this piece of data. In this same example of d, if several e-commerce businesses have pushed a total of 50-dollar worth of promotions to this user as a result of analyzing this data d (i.e., this particular transaction of paying 100 dollars for the book), the value of this piece of data is 50 dollars.

Note that a person's value profile is a relatively stable attribute and it does not change drastically with each payment or consumption. While the payment needs instant settlement, the value profile of a user can be updated at a much slower pace. On the other hand, transaction data needs to be analyzed by complicated data mining and machine learning models before it would become useful user profile attributes for targeted marketing.

DESIGN PHILOSOPHY

It follows from these drastically different requirements for handling different data that, overloading a single chain with the hope of accomplishing all these tasks would fail to give optimal performance. SYMPHONY therefore adopts a novel multi-chain architecture to incorporate the following features:

HIERARCHICAL DATA ABSTRACTION

The raw data contributed by a user needs to be processed, integrated, analyzed and modelled through multiple levels to become useful profile attributes. SYMPHONY implements a hierarchical data abstraction framework such that higher-level models only need to access processed attribute data from the most appropriate level without necessarily going down to the raw data level.

The data abstraction is also conducive to privacy protection, as the higher the data abstraction, the lower the chance of exposing users' sensitive uniquely identifiable information. SYMPHONY also employs privacy- preserving data mining algorithms to reach a good trade-off between data privacy and utility.

ASYNCHRONOUS COMPUTATION

The computation criteria at different data abstraction level are by no means the same. For the highest level where data becomes value, the top priority is the security, immutability and accountability of the value-attesting transactions, with a low requirement for real-time high transaction processing speed, which makes a perfect call for consensus algorithms with more weight on robustness rather than efficiency.

On the contrary, at the lowest level where raw data are collected into SYMPHONY ecosystem, the key concern is usually high transaction speed, such as payment settlement scenarios, where little or no data processing and mining are required. Consequently, SYMPHONY's multi-chain structures are designed with asynchronous computation to accommodate the most appropriate efficiency for every data abstraction level. Even at the same level, nodes with different computational capacity are entrusted with different computational tasks and are organized in a master-satellite manner (trusted index node vs common node).

PROTOCOL CUSTOMIZATION

To best accommodate a mixture of varied consensus resolution speed and data processing complexity, SYMPHONY adopts different consensus schemes for different chain levels. The most important and challenging part is the data chain which needs to not only store the user data in standardized format for data integrity, but also run various user profiling models as smart contracts to generate useful user profile features.

A novel Proof-of-Stake with randomized sub-network data storage (POS-RSDS) is proposed for the data chain to simultaneously address the requirements for relatively efficient consensus resolution, privacy-preserving data storage and complex profiling model execution.

THE SYMPHONY ARCHITECTURE
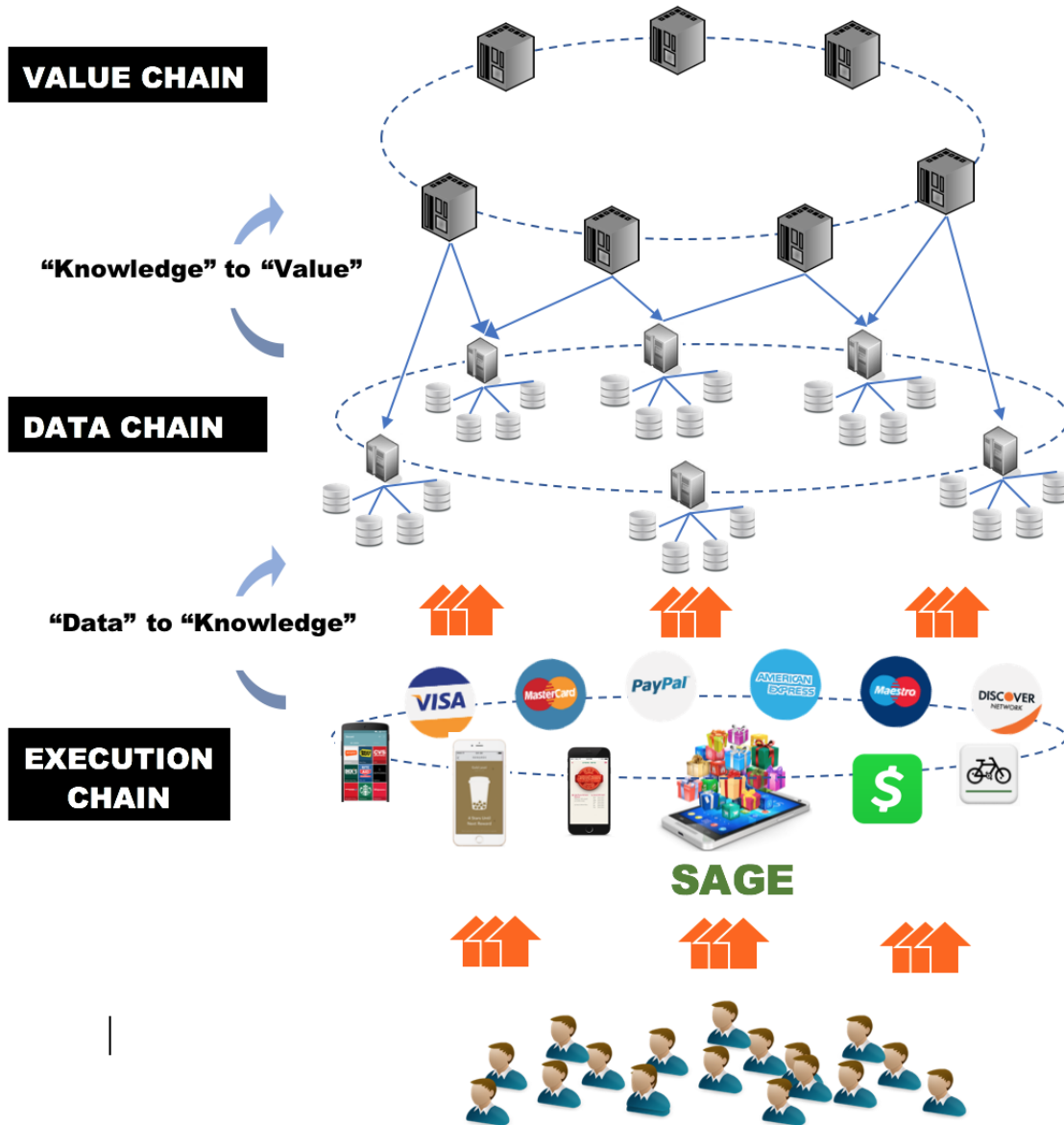
The SYMPHONY architecture is composed of three integrated layers of self-contained chain structures. The three layers of chain structures are (I) Value Chain, (II) Data Chain and (III) Execution Chain.

a. VALUE CHAIN --- WHERE "VALUE" GAINS "MOBILITY"

The value chain is the top chain in the SYMPHONY architecture to substantiate the mobility of the value of data – to make possible the fluid transition, exchange and trading of the value of data.

Value is not an inherent trait of data, but rather an external attribute that can be measured based on transactions manifesting its usage. Two aspects --- frequency and fiat-value-association -- constitute the foundation of valuation of data: (I) The more frequent the usage, the higher the value; (II) The greater the fiat-value associated with the usage, the higher the value.

On the basis of the value of data, the value of an entity can be established. On the value chain, an entity assumes one of two roles: a data contributor or a data consumer. Each entity is associated with a value profile which is computed based on the value chain and stored in the data chain.

Designed and devoted to manage "value", the highest abstraction level of data, the value chain is therefore trusted with a highly decentralized framework to guarantee primarily the immutability, accountability and security of value.   It maintains a decentralized record of all the value-attesting transactions among the data contributors and the data consumers. A typical example of transaction on value chain could be a data consumer X pushes a tailored reward program worth of fiat value W to a targeted data contributor Y.

DATA FORMAT OF VALUE CHAIN:

The transaction data stored on value chain are records of value-attesting transactions. Each record consists of seven attributes:

- Transaction ID:
    - The ID of the transaction created in chronological order.
- Transaction Initiator:
    - The unique address of the data consumer who has initiated the transaction.
- Transaction Receiver:
    - The unique address of the data contributor who has received the transaction.
- Transaction Type:
    - The index ID pointing to the global table of all types of value-attesting transactions in SYMPHONY ecosystem.
- CCY Type:
    - The currency used for this transaction.
- CCY Amount:
    - The amount of value for this transaction.
- Time Stamp:
    - The time stamp when the data consumer initiates this transaction.

Record Example:

Trans. ID	Trans. Initiator	Trans. Initiator	Trans. Type	CCY Type	CCY Amount	Time Stamp
1001	179e…gdeio	9rc…jcndu	R03	F01	20.00	20180108T223621

The value profile of an entity U is dynamically updated in a batch mode, with a frequency Uf defined by the base frequency and momentum of U's transactions. To update the value profile of an entity U, the computation model takes as input the latest value profile of U from the data chain and all the value-attesting transactions associated with U since the last update from the value chain, with a damping factor δ to prioritize transaction recency.

The value of an entity plays a critical role in determining the amount of SYMPHONY tokens the entity would receive for all the transactions and tasks in the SYMPHONY ecosystem. For a data contributor U, the higher the value profile of U, the more SYMPHONY tokens U would receive for contributing data through SYMPHONY's execution chain, and accomplishing targeted tasks launched by data consumers. For a data consumer U, the higher the value profile of U, the less SYMPHONY tokens U would need to pay for launching targeted programs to data contributors.

VALUE CHAIN CONSENSUS

The relative stability of an entity's value profile and the batch update mode means that real-time response is not a top priority for the value chain. Fairness and security are rather the primary considerations for choosing a consensus scheme for the value chain.

Mining on the value chain therefore follows the Proof-of-Work (POW) consensus model as that used in Bitcoin, yet with system improvements including rejecting empty blocks and dynamic block sizes.

The job of a miner with a successful bid consists the following three tasks:

(1) Compile the value-attesting transactions into a new block.

(2) Compute the value profile of entities in the current block if necessary, and update to the data chain.

(3) Append the new block to the value chain.

Miners on the value chain would be rewarded by SYMPHONY tokens

b. DATA CHAIN --- WHERE "DATA" BECOMES "VALUE"

The primary tasks for the data chain is to enable accurate and robust user profiling. The data chain achieves this goal by a weakly-decentralized hierarchical management for users' standardized data together with all the profiling models contributed by developers in the SYMPHONY ecosystem.

DATA FORMAT OF DATA CHAIN

The standardized user data are represented in the following data format. Each record consists OF seven attributes:

- User ID:
  - The unique address of a user
- Dimension ID:
  - The index ID pointing to the table of all dimensions of user profile. This user profile table is maintained for universal access by AI models in SYMPHONY ecosystem. The dimensions are defined by data consumers and model developers to provide a 360o all-around characterization of a user's propensities, which are easily expandable when needed
- Attribute Vector:
  - The vector of values for this dimension of this particular user
- Model ID:
  - The index ID of the model from which this particular attribute vector is computed for this dimension
- CCY Type:
  - The currency type used for value representation
- CCY Amount:
  - The accrued value that this particular record has been used by data consumer
- Time Stamp:
  - The last access time stamp of this record

Record Example:

User ID	Dimension ID	Attribute. Vector	Model. ID	CCY Type	CCY Amount	Time Stamp
179e...gdeio	D00124	9rc...jcndu	R03	F01	20.00	20180108T223621

The data chain manages user data with a two-layered hierarchical structure --- the *common nodes* and the *trusted index nodes*. The base level are all common nodes each with a unique node ID, whose job are to store users' standardized data in a weakly-decentralized network. The trusted index nodes are those validated nodes with stronger computational power and

resources. Each trusted index node is in charge of r common nodes such that the trusted index node stores and manages all the data indices necessary to manage the data records. Common nodes would store data records as assigned by its corresponding trusted index node.

DATA CHAIN CONSENSUS – POS-RSDS

Compared to the value chain, data chain is trusted with higher transaction processing speed, faster decision making and greater mechanism for privacy protection, it therefore implements a Proof-of-Stake consensus scheme with separate Randomized Sub-network Data Storage (POS-RSDS). In such a scheme, when a new block of record is to be created, it would be assigned to one of the trusted index nodes as the creator, based on a randomized algorithm weighted by each node's credibility and stake pledged in this round of bidding.

Different from existing approaches, in SYMPHONY's data chain, the trusted index nodes do not store data records directly, but rather a chain of indices each pointing to the corresponding common node that actually stores the data records. Each trusted index node is responsible for at least k common nodes and would randomly assign each data record to one of the common nodes while maintaining a dynamic load balance among the common nodes.

The benefit of POS-RSDS with the separate storage of data index and record are as follows:

- **BETTER DATA PRIVACY**:

  As compromising either the index node or any common node alone would not give away all the data records of any specified target entity. It reduces the chance of exposure and leakage for a user's whole data profile and therefore offers better privacy protection.

- **RESOURCE-AWARE COMPUTATION ALLOCATION**:

  Index nodes with stronger computational power could execute more challenging user profiling models while common nodes with ordinary configuration are still able to contribute by offering just storage, each rewarded with SYMPHONY tokens proportional to their contribution and capacity.

- **EFFICIENT CONSENSUS FORMATION**:

  As only the index nodes participate in the Proof-of-Stake process of block creation, the consensus could be reached much more efficiently.

PROTOCOL FOR MODEL MANAGEMENT

Developers can participate and earn SYMPHONY tokens by contributing various user profiling models in the form of smart contracts based on the standardized data on the data chain. All models submitted are subject to careful review and voting by the community and delegated

experts. Each model, after successfully passing the review and voting, would be assigned a unique Model ID which is recorded in a global table, and its code in the form of smart contract would be stored in all the index nodes for future SYMPHONY.

The procedure for a model submission and review includes the following steps:

- Submission of executive summary, code and documentation
- Reviewed by testing smart contracts for automatic testing
- Reviewed by expert committee ranked by their contribution scores in this user profiling area
- Voted by the expert committee with a majority as the passing criterion
- Reviewed and commented for one week by the developer community
- Registered into the Model Table and code stored in all index nodes.

A developer's contribution score is calculated based on the data records on the data chain, taking into consideration the number of times a data record with the corresponding Model ID is used, the recency of the usage and the total associated value.

TRUSTED INDEX NODE

Each trusted index node stores the following set of indices:

- *USER INDEX*: pointers to the value profile and all the records of each user as stored in the common nodes administered by this index node.

- *DIMENSION INDEX*: pointers to all records with attribute value of a predefined range for each dimension.

Apart from the indices, each trusted index node also stores the smart contracts of all the qualified profiling models passing the review procedure.

c. EXECUTION CHAIN --- WHERE "BEHAVIOR" BECOMES "DATA"

As the interface between data contributors and SYMPHONY's data chain, Execution Chain is where users' behaviors are recorded and transformed into data. This layer is open for all service partners to connect data contributors into SYMPHONY ecosystem. These service partners could be payment gateways, reward platforms, smart devices and so on. Due to the nature of the services provided to users at this level, execution speed is the key. Consequently, this layer is not required to be implemented in a decentralized framework as the data chain and value chain. It is our belief that speed and decentralization are inherently conflicting notions. At the execution level, the primary task is to collect user behavior data in the most efficient way through various service partners, including our own SYMPHONY App platform.

Developers contribute at the execution chain level by transforming raw user data from the various service partners to the standardized format on SYMPHONY's data chain. The set of tasks typically include data cleaning, integration and transformation. Developers are rewarded by SYMPHONY tokens based on the amount of data they have helped to transform in a crowd-sourcing setting.

7.SYMPHONY TOKEN MECHANICS

SYM utility tokens will be created to support the SYMPHONY platform, for the purpose of creating the economic incentives for individual users to supply data, and to offer data consumers a currency to acquire the data. The creation of SYM tokens, combined with the mechanics, will create a marketplace of data suppliers and data consumers, and will serve as the primary enabler of data and value flow.

The intention is for 10 Billion SYM tokens to be created, with a fixed maximum supply. Following Phase 1 of the crowd sale, 40% of tokens will be released (See Token Allocation chart below). Some of the initial funds from Phase 1 of the crowd sale will be devoted to provide the incentives to contribute initial data to the SYMPHONY ecosystem. This is necessary to incentivize and create the initial data bank.

As outlined in Section 5: Technical, SYMPHONY tokens are circulated in the ecosystem among the following four types of entities:

1) DATA CONTRIBUTOR

Means of Token Collection:
- Contribute data through SYMPHONY App or any other service partners
- Respond to targeted programs
- Accomplish assigned tasks

Means of Token Usage:
- Redeem rewards or win promotions
- Purchase goods or services
- Trade with other crypto-currencies

2) DATA CONSUMER

Means of Token Collection:
- When data contributors redeem rewards or purchase goods and services
- Participate in SYMPHONY ecosystem's programs
- Purchase SYMPHONY tokens

Means of Token Usage:
- Pay to identify target audience to launch program
- Pay for priority of service or ranking in display
- Trade with other crypto-currencies

3) DEVELOPERS

Means of Token Collection:
- Value chain:
  Contribute in Proof-of-Work consensus scheme by creating new value-attesting data block and updating the value profile of data contributors onto the data chain when necessary.
- Data chain:
  Contribute in POS-RSDS consensus scheme by participating either as trusted index nodes or common nodes. Contribute new user profiling models.
- Execution chain:
  Contribute in transforming heterogeneous raw data from various service partners to SYMPHONY's standardized format for data contributor.

Means of Token Usage:
- Redeem rewards or win promotions
- Purchase goods or services
- Trade with other crypto-currencies

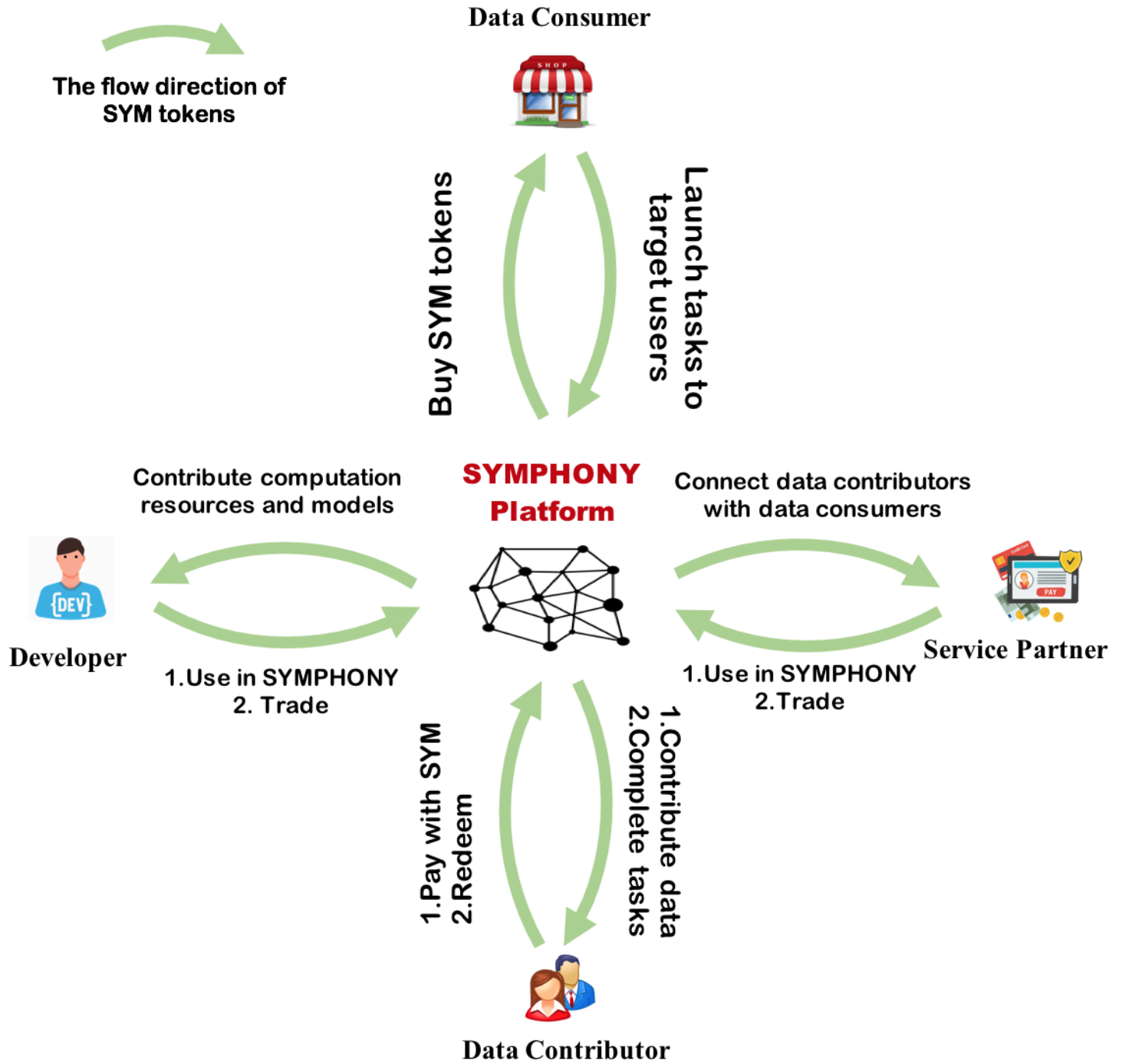### 4) SERVICE PARTNERS

Means of Token Collection:
- When data contributors redeem rewards or purchase goods and services
- Participate in SYMPHONY ecosystem's programs
- Purchase from SYMPHONY

Means of Token Usage:
- Pay to SYMPHONY for priority of service
- Trade with other crypto-currencies

The following chart shows the circulation of SYM tokens within the token economy, and the interaction

Data Consumer

The flow direction of SYM tokens

Buy SYM tokens

Launch tasks to target users

SYMPHONY Platform

Contribute computation resources and models

Connect data contributors with data consumers

Developer

1. Use in SYMPHONY
2. Trade

Service Partner

1. Use in SYMPHONY
2. Trade

1. Pay with SYM
2. Redeem

1. Contribute data
2. Complete tasks

Data Contributor

Mechanics of the Token Economy described in this section are under review by our legal counsel and subject to change.

TOKEN ISSUANCE:

The SYMPHONY token will be named SYM, which will be sold in three phases.

Table 1. SYMPHONY token sale

Stage I TOKEN SALE DETAILS	
Token Sale Start Date	Sep 2018
Soft Cap	$1.5M USD
Hard Cap	40% of all SYM tokens = 8M USD
Investment Mode	ETH, BTC, USDT, FIAT
Initial Token Price	$0.002 USD = 1 SYM (ETH pegged the day before sale)
(I) Cornerstone Investment	1.8M USD
Total Token Supply	9% of all SYM tokens
Investment Bonus	50% of the investment amount
Investment Term	250K USD per investor
Lock-up Term	The 50% bonus part will be locked up for 6 months after Phase I sale ends.
(II) Private Sale I	0.8M USD
Total Token Supply	4% of all SYM tokens
Investment Bonus	20% of the investment amount
Investment Term	200K USD minimum per investor
Lock-up Term	The 20% bonus part will be locked up for 6 months after Phase I sale ends.
(III) Private Sale II	0.8M USD
Total Token Supply	4% of all SYM tokens
Investment Bonus	10% of the investment amount
Investment Term	100K USD minimum per investor
Lock-up Term	The 10% bonus part will be locked up for 6 months after Phase I sale ends.
(IV) Public Sale	0.6M USD+ Oversubscribed
Total Token Supply	3% + Oversubscribed
Who Can Participate for Public Sale	Whitelisting process. No citizens of United States of America, Canada, New Zealand, People's Republic of China and the Republic of Korea, or participants who fail to successfully pass KYC/AML checking

(1) Equity investment is possible for the cornerstone stage equal to 1.8M which is convertible to token after a one year lock up. Token price will be always calculated as 0.002USD for conversion

(2) Dynamic Hard cap is allowing to merge the 3 stages of token sale which is calculated based on the total contribution not exceeding 8M USD. The following diagram shows the procedure of dynamic hard cap calculation.

(3) Unsold tokens at ICO will be divided in next two token sale stages, when the milestone of launching SYMPHONY Test-Net and SYMPHONY Main-Net will be achieved. The price of SYM tokens for these stages will be determined by the respective sale time.

(4) All the bonuses will be lucked for 6 months after ICO closing date

(5) Team and advisors token will be locked for 2 years
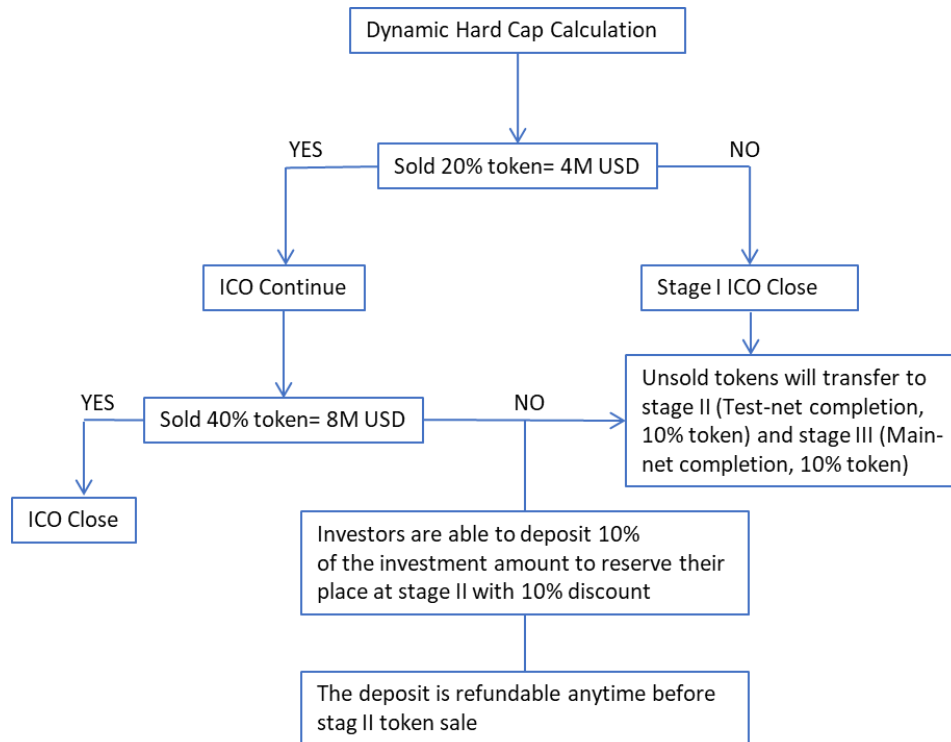
Figure: Dynamic Hard cap calculation for Stage I, SYMPHONY token sale

TOKEN DISTRIBUTION:

40% of SYMPHONY tokens will be distributed in the initial sale, among which 9% will be for cornerstone investment and 31% will be reserved for private placement. 20% will be used for community building. 15% will be used for business development and partnership. 14% will be used for technology advancement and research and 1 % is for bounty. 7% will be rewarded to the founding team and 3% is allocated for advisors.
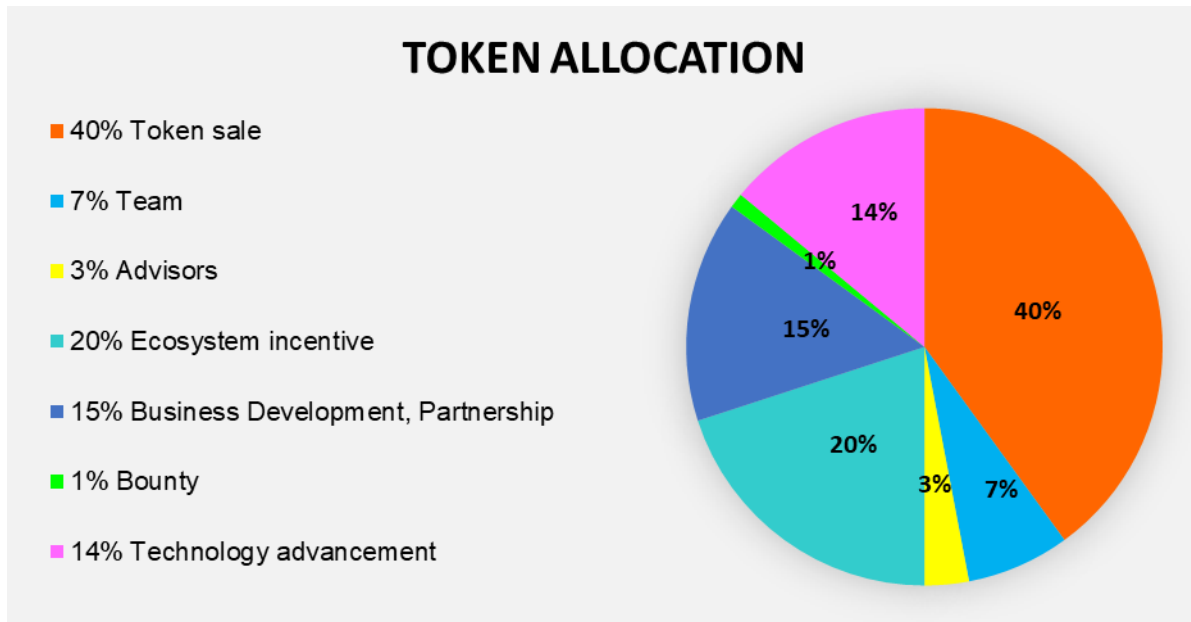
Figure: SYMPHONY token allocation

Fund Distribution:

Fund raised will be used for the following purposes:

30% will be used for blockchain development and technical research to further boost the technical advancement of the SYMPHONY protocol. The technical team will work to extend the functionality and user-friendliness of SYMPHONY eco-system.

10% will be spend on equipment, cloud hosting and operation. 5% of token goes for Dapp ecosystem support.

25% will be used for business development, including expanding the use of SYMPHONY token to new markets and establishing business with more commercial partners.

23% will be spend for team growth including; developers, business developers, project management, community managers and developer relation and admins.

7% of the tokens will be used for community management, marketing and PR campaigns, such as organizing offline activities, branding campaign, publicity of SYMPHONY token across different media channels and various bonus schemes for community members.
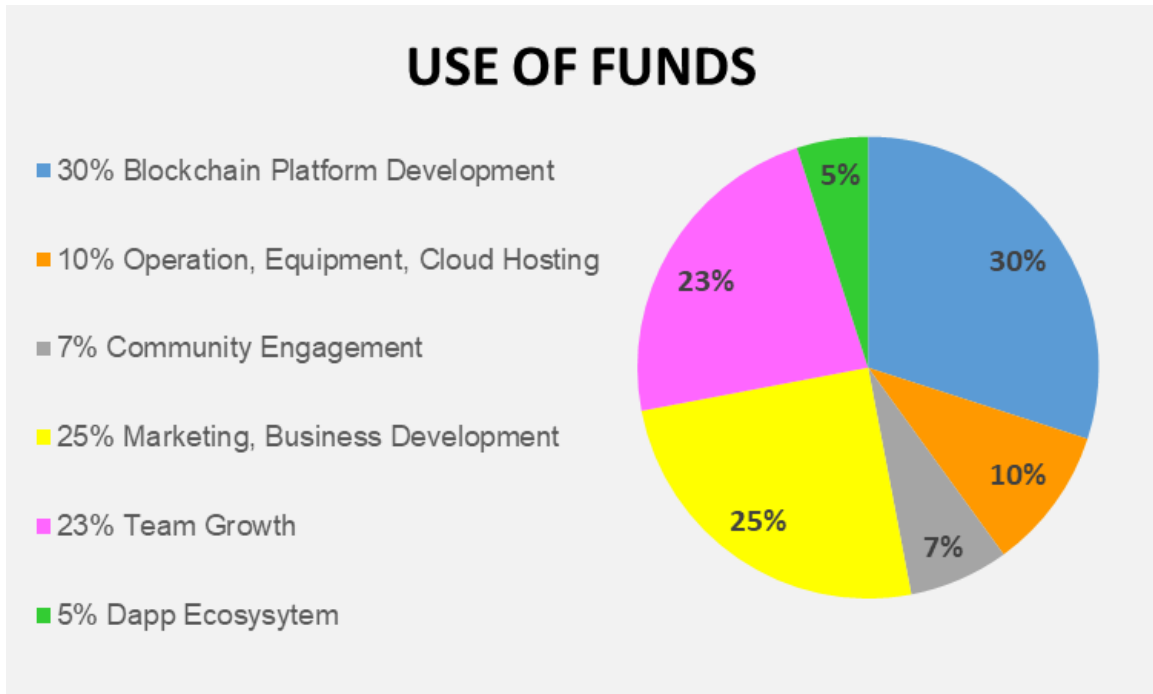
Figure: Distribution of fund

8.1ST NATIVE DAPP ON SYMPHONY: SAGE ECOSYSTEM

Data is both an opportunity and a threat for many customer-facing businesses. There are many industry and companies in which there is a scarcity of data on customers and end users. In other cases, there are pockets of customer data held by businesses, but the data sets are highly fragmented and unable to compare across data source and types. Businesses may be able to track brand affinity and brand evangelism through digital channels, without the ability to

determine the relationship with sales purchasing activity. Executives in winning companies are twice as likely to view advanced analytics as critical to business strategy, relying on an "insights factory."[8]

With high-quality user data at scale, down to individual granularity, SAGE is able to offer unprecedented access of personal data to businesses, consulting agencies, government offices as well as all other data consumers in private and public sectors alike.   The benefits include: Business & Consumer insights for CPG, Retail data (connecting location with sales & other data), Sales funnel (ability to track and determine ROI from Media viewing > Search > Purchase > Post-sales activity).

In particular, SAGE makes possible the following three use cases of personal data. With SAGE, data consumers have the ability to "Zoom-in", "Zoom-out" and "Connect-across" user data for smarter data intelligence.   To name a few, the benefits of SAGE to commercial partners can include:
- Business Insights & Consumer Insights for CPG
- Retail data, for location + transaction
- Sales funnel End-to-End, in the ability to use a common digital identity for an individual user within SAGE to track individual behaviors from media > search or click > purchase > maintain ongoing relationship with the brand or company
- Government sentiment data
- Behavior information for health care companies or research organizations

This translates into several potential business cases:
- Business Case 1: "Zoom out" A CPG company seeks to target consumer comments/ attitudes on hair in China + Public monitoring & issue sentiment
- Business Case 2: "Zoom in" Sales funnel to examine End-to-End consumer journey
- Business Case 3: "Connect" Lapsed customers, Lost leads, Personalized CRM
- Business questions to answer: What is ROI on media spend (how many results in web site traffic or brand inquiry, how many go through to purchase, brand affinity)

9. COMMERCIAL & MARKETING PLAN

Successful execution of the SYMPHONY project will require a comprehensive Commercial plan to kick off the project, and successful execution of the plan. For the purposes of this White paper, a comprehensive Commercial plan has not been shared. However, some of the key commercial considerations are outlined below.

There are 4 primary participants/ stakeholders required for successful implementation of SYMPHONY:

---

[8] Winning in consumer packaged goods through data and analytics, McKinsey Quarterly, 2016

Individual Users:

These will be the individual data contributors who will be downloading the SYMPHONY app, setting up account profile and giving personal consent to turn over data from smart phone or other IoT device to contribute to SYMPHONY ecosystem, in exchange for tokens

Commercial Partner:

The data buyer that will be purchasing anonymized user data sets from the SYMPHONY platform

Redemption Partners:

These partners will offer a way for individual users to redeem their SYMPHONY tokens, through vouchers or in-store rewards

Data Partners:

These are the data or service partners that offer aggregated personal data

PARTICIPANT	DESCRIPTION	BENEFITS TO THEM	ACQUISITION STRATEGIES
INDIVIDUAL USERS	Target User: Millenial, 18-25 years old college student or Young Professional.Urban resident.Tech & social adoption tends to occur first in this segment (Facebook, Uber, etc)	a)Value: Ability to receive tokens in exchange for data b)Control over data shared c)Transparency over data Receive better recommendations, targeting & service from partners	Acquisition Strategies: a)Recruitment events via campus recruitment drive b)Social campaign, with brand ambassadors c)Peer referral (ability to earn SYMPHONY tokens through peer downloads) d)Contextual Recruitment: Recruit e.Metric: Number of Downloads Ongoing User Engagement: a)Promote app "stickiness" & repeat visits by offering new options to get tokens: Surveys, Panel, receive targeted adsb, Contextual marketing, etc b)Metric: % Monthly Active Users
COMMERCIAL PARTNER	Includes: a)Brand owners and FMCG companies (P&G, Unilever, Coca-Cola, F&N) b)Retailers (NTUC, Dairy Farm, Uniqlo) c)F&B (QSR, Fast casual) Market research companies (Nielsen, Kantar, Euromonitor)	a)Targeted Marketing: Publish a Call to Action using detailed inviting user to fulfill offer, complete survey b)Knowledge & Insights via dynamic pool of user data (by cross-analyzing customer profiles, Browser/ search, social & transactional data) c)Performance marketing and assess ROI on marketing activities Offer precision sampling for NPD based on targeting criteria	a)Onboard customers based on data sets & data supply b)Work with commercial partners to develop customized user and data acquisition drive based on specific business objectives Develop dynamic customer segmentation & profiling based on different levels of filtering
REDEMPTION PARTNERS	Develop means of redemption of SYMPHONY tokens through: a) In-app Rewards store (Grab rides, Golden Village movies, Starbucks vouchers), OR b) Redemption at physical locations (Retail, F&B, Lifestyle)	a)Offer incremental sales b)Deepen understanding of customer and loyalty activity	a)No need to acquire Redemption partners b)SYMPHONY will be buying bulk orders of vouchers to redeem tokens Will require technical linkage to convert SYMPHONY tokens to vouchers
SERVICE PARTNERS/ DATA PARTNERS	a)Includes aggregated suppliers such as retailers (NTUC), Payment aggregators (FOMO Pay), SDK intermediaries, location analytics b)Still requires user consent to receive data	a)Commission or transaction fee b)Creates an additional, secondary market for their data	Acquire through demonstrated SYMPHONY Proof of Concept

10. GDPR Implementation & Implications

On May 25, 2018 the General Data Protection Regulation (GDPR) formally went into effect within the European Union[9]. The GDPR is an important piece of data privacy regulation. It serves to codify both the rights of consumers/ users and the practices of businesses that are receiving access to personal data. As SAGE is an ecosystem that relies on data & value layers, GDPR is highly relevant to the project, and to both users and regulators expectations of data privacy and control. This section outlines the key elements of GDPR[10], and shows how SAGE will meet the requirement. SAGE is aiming for full compliance with GDPR.

CATEGORY	KEY PROVISION	HOW SAGE WILL COMPLY
Territorial scope	Scope applies to the processing of data subjects in the EU, irrespective of company domain and where the processing takes place.	While SAGE will initially launch in Singapore, it is expected to expand within Europe in 2019. Given this, we are expecting to follow provisions that concern processing of data of all EU citizens, irrespective of where modeling may take place.
Consent	Part 1: Users must make request for consent of data very clear, offered using clear language Part 2: Withdrawal of Consent: Users must be able to withdraw consent in an easy and clear manner	SAGE will design its UI/ UX to allow for ease of navigation, for users to agree to data sharing and certify which 3rd parties they are comfortable sharing with. The Terms & Conditions will be given using easy-to-understand language. It will be as easy to withdraw consent as it is to give it.
Breach Notification	Notifying users of a breach is mandatory and within 72 hours of first becoming aware.	In the event of an attack or data breach, SAGE users will be informed. The means of notification will be via email and notification within the platform.
Right to Access	Part 1: It is the right of data subjects to obtain from the data controller confirmation of whether or not their personal data concerning them is being processed, where and for what purpose Part 2: Data controller shall provide a copy of the personal data, free of charge, in an electronic format	SAGE will offer users the ability to conduct a digital audit, that confirms: the data collected and who has accessed the data. Details of the data collected and shared will be made available for download.

---

[9] European Union GDPR Portal: 2018 reform of EU data protection rules
[10] European Union Commission: 7 Steps for Businesses to get ready for the General Data Protection Regulation

CATEGORY	KEY PROVISION	HOW SAGE WILL COMPLY
Right to be Forgotten	Also known as Data Erasure, the right to be forgotten entitles the data subject to have the data controller erase his/her personal data, cease further dissemination of the data, and potentially have third parties halt processing of the data.	Raw data will not be transmitted or stored over the blockchain. Rather, encryption keys to data will be shared via the blockchain. SAGE will put in place measures to cancel encryption keys to cut off data at the source, and to discontinue processing of user data.
Data Portability	This is the right for a data subject to receive the personal data concerning them, which they have previously provided in a 'commonly used and machine readable format' & given right to transmit data to another controller.	SAGE will strive for compliance.
Privacy by Design	At its core, privacy by design calls for the inclusion of data protection from the onset of the designing of systems, rather than an addition.	SAGE will be a protocol that includes key elements of GDPR into its design from the outset, to enable maximum compliance.

11.   COMPETITIVE LANDSCAPE

There are a number of data marketplaces that are designed on the blockchain. This serves as validation of the potential for open data marketplaces that tokenize the sharing of personal data.

SYMPHONY is a unique entrant to the landscape of blockchain-based data marketplaces, in several important ways:

VALUE PROPOSITION:

SYMPHONY is not a data marketplace that connects buyers & sellers of raw data. SYMPHONY's core service is to develop customized solutions and to extract high level attributes into standard data format, to allow comparability across data sets

TECHNICAL:

SYMPHONY is not a newly-conceived idea. SYMPHONY is a proven idea based on past work of building large scale analytical labs for industry titans, that puts the service on the blockchain & tokenizes the participants. The founding team of SYMPHONY has deep experience in developing the model, making SYMPHONY closer to version 4.0 of a proven concept. What is new is the addition of blockchain and tokenizing the sharing of individual data.

MARKETING:

SYMPHONY is the first blockchain based data exchange to be supported by a full, 360 integrated marketing communications plan that will target Millenial users aged 18-25. The marketing plan will include creation of brand logo & visual identity system, events & recruitment, social media & influencer strategy.

12. ROADMAP

The origins of SYMPHONY are rooted in a series of multimillion dollar analytical labs set up for industry giants. These analytical labs integrated large and disparate data sets to develop customer profiling, segmentation and begin to build predictive behavior models. These labs served as the "Proof of Concept". SYMPHONY introduces the ability to add this proven idea to the blockchain, through the creation of an ecosystem and by tokenizing users.

The Project Roadmap for future milestones is organized into both Technical & Business Development milestones. These milestones will be well synchronized, and the operating team will work to create a feedback loop between users, the Business Development team representing the "voice of the customer", and the tech team.

PROJECT HISTORY:

2013   Established Pinnacle Lab analytics center for China Ping An Insurance Group, which developed advanced analytics models and algorithms in combining social, behavioral and financial data sets for the China market

2016   Set up DBS-SMU Life Analytics lab to mine for insights and apply advanced modeling of Singapore population

2016   Developed preliminary idea of SYMPHONY in the area of personal data banking

2017   Incorporated blockchain technology as the underlying platform for SYMPHONY

Feb 2018   Developed initial white paper & Concept validation

May 2018   Conducted focus groups of target Millenial users for Sage concept validation

June 2018 Begin community engagement & Token sale

July 2018 Use proceeds to begin forming the team and initiate development efforts
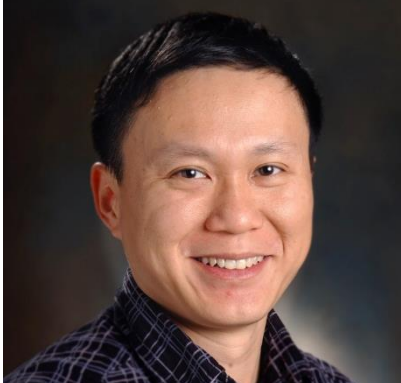
FUTURE ROADMAP:

	2018			2019			
	Q2	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
TECHNICAL	Completed SAGE App Beta version (Android)	Release SAGE App Beta UI/UX test (iOS and Android)	Launch SAGE Merchant Platform	Complete & launch SYMPHONY Test net	Test, gather feedback & validate SYMPHONY Test net	Launch SYMPHONY Main net	Support and enlarge SYMPHONY DApp ecosystem
BUSINESS DEVELOPMENT	• Conduct SAGE user focus groups for concept validation & feedback, initial UI/ UX testing	• Complete study of data acquisition targets (Value/ Availability/ Feasibility) • Develop SAGE Marketing plan (VIS, Branding & Comms plan) • Data: Sign deal with payment aggregators to access 5,000+ offline merchants (SG)	• Add media, social and browser data • Launch SAGE Marketing plan • Commercial: Conduct data acquisition drive; Sign on additional 3-5 partners • Data partner: Target 3-5 agreements with aggregators	• User: Expand Rewards in loyalty store • Identify 2nd market for launch outside of Singapore • Commercial: Expand partners to other industry partners • Data: Recruit large retailer & data set	• Sign partnership with regional eWallet players • Launch 2nd market + Onboard partners for 2nd market • Commercial 15-20 partners in total + Develop Partner data dashboard • Data partner: Add media data set	• Expand data acquisition and partnership strategy into other industries including healthcare, insurance, etc • Commercial: 20-30 Partners • Data: Add Financial/ Health data • Launch 3rd market	• Expand to more horizontal and vertical data partnerships to achieve 2 million user downloads • Commercial: 30-50 Partners • Launch 4th market

13.   SYMPHONY TEAM

	Feida Zhu **Co-Founder** Feida is a tenured associate professor at Singapore Management University. He is a global expert in data mining, AI & block chain. He specializes in helping industry giants leverage big data & AI for a wide range of business applications. He has published 100+ papers, with multiple Best Paper Awards. He founded the Pinnacle Lab for Analytics, a multimillion-dollar collaboration with China Ping An Insurance Group, & DBS-SMU Life Analytics Lab with DBS Bank Singapore. He holds a PhD from the University of Illinois at Urbana-Champaign.
	Eleanor Jones **Co-Founder** Eleanor served as Director of Digital Leadership for The Coca-Cola Company, supporting the company's digital transformation. This involved developing and implementing digital strategy, leading eCommerce charter for Asia Pacific and piloting the Digital Council of Asia Pacific. Previously, she held a variety of roles at Coca-Cola in Strategy & Planning and Customer leadership, both across Asia Pacific and ASEAN. Eleanor holds an MBA from Emory University and a BA from University of North Carolina at Chapel Hill.
	Virgil Zhao **Head of Technology** A veteran in the blockchain arena, Virgil has over 3 years of development experience in blockchain infrastructure and applications. A full-stack developer himself, he has 15 years of project management experience leading sizeable teams in Touchpal, Soft International and other tech companies.
	Xiaokui Xiao **Chief Research Advisor** Prof. Xiaokui Xiao is an associate professor at National University of Singapore (NUS). He is a renowned expert in the field of computer science & security. Also, He was formerly one of the few Nanyang Professors (1M SGD Award) in NTU. His research focuses on database management, especially on data privacy and spatial databases. He has published extensively in the premier database conferences and journals, including ACM SIGMOD, VLDB, IEEE ICDE, ACM TODS, VLDB Journal, and IEEE TKDE.

Andy Cui
Technology Developer
Andy has developed a keen interest in blockchain over his 10 years of software development in a series of high-tech companies including Microsoft, Micro Focus and Pacteria Technology Co.. He was a team leader of Shanghai iOS Team in the project Mobile Center.

Peyman Salehian
Head of Business Development
Peyman is an NUS Ph.D. holder with three years of entrepreneurship experience as a co-founder of two start-ups. He entered to blockchain space in 2015. A disciplined investor with a solid understanding of the cryptocurrency market, focusing on investor relationship, business development and go-to market success, supported by deep research and analysis of blockchain technology.

ADVISORS

Jian Pei
Vice President, JD.com Chief AI Scientist, Huawei IEEE/ACM Fellow Professor Simon Fraser University

Floyd Dcosta
Floyd DCosta is the co-founder of Block Armour and CEO of Blockchain Worx. With a background in management consulting, Floyd has over 17 years of international professional experience in setting up and growing international business practices as well as advising senior executives on decisive topics. His experience encompasses eleven years at Capgemini and over 5 years in Blockchain strategies; apart from separately advising multiple token projects including security tokenization platforms and digital asset exchanges. Based out of Singapore, Floyd helps institutions harness the potential of Blockchain technology for digital transformation.

	Philip S. Yu Philip S. Yu is a Professor in the Department of Computer Science at the University of Illinois at Chicago and also holds the Wexler Chair in Information and Technology. He was manager of the Software Tools and Techniques group at the IBM Thomas J. Watson Research Center. Dr. Yu has published more than 1,100 papers in refereed journals and conferences with 99,762 citations and an H-Index of 146, ranking Top-10 globally in computer science and electronics (as of August 2018). He holds or has applied for more than 300 US patents.
	Ethan Yang Partner & Managing Director, Head of China BCG Digital Ventures 15+ years mixed experience in digital, technology, strategy, management, innovate and operate digital platform with 10M active monthly users, and organization over 300+ direct report team members.
	Maria Sun COO of Ctrip.com 18 years of online travel industry including accomodation reservation, transportation ticketing, package tours and corporate travel management.
	Min Yang Prof. Min Yang is the chief scientist of the National 973 Program of China, the chief scientist of the Tongdun Mobile Security Research Institute as well as the chief scientist of Baidu Mobile Security, and professor of Fudan University. He possesses in-dept knowledge and great expertise in data security, terminal interface security and smart contract security.

SUPPORTING TEAM

	Jun Hao Ong Founder of BlockConnectors.io – Consulted for more than 15 Initial Token Offering (ITO) – Token Sale. Helped grow various groups to approximately 20k-35k in size, including CGCX, Strykz, Kinguin, BTU protocol, Lendo, AgentNotNeeded, Axens's Telegram groups. Build a total community of more than 200,00 across multiple token sale projects. Raised more than $200 Million for all projects collectively. Over 25,00 followers on different platforms. Passionate about Cryptocurrency and the underlying technology, blockchain. Deep understanding of the cryptocurrency market. Has 17,000+ followers on Telegram.
	Elisha Koh Elisha is an operations manager and marketing strategist at BlockConnectors. He has consulted for multiply token generation events both locally and internationally and has seen through those projects from their pre-sale stage to their post-sale stage. His specialist experience in digital marketing, graphic design, video editing, branding, public and investor relations, community and bounty administration supplements his management of the token generation events and allows him to cover all the aspects needed to successfully market any project.

14.   LEGAL DISCLAIMER

The legal notes contain the terms and condition that govern the terms and conditions upon which the SYMPHONY coins (the "token") are sold you (the "purchaser", "you") by (the "issuer").

The legal notes set out herein does not constitute an offer of securities nor is it registered with or specifically approved by any regulatory authority in any jurisdiction. The terms here contain clauses requiring binding arbitration and waiver of representative proceedings. There are also representations and warranties you have to accept prior to purchasing the tokens. If you do not agree to these, please do not purchase the tokens.

No offer of securities: The tokens are not being structured or sold as securities or any other form of investment product. Accordingly, none of the information presented by the white paper is intended to form the basis for any investment decision, and no specific recommendations are intended. No regulatory authority has examined or approved any information set out in these white papers or any information provided or communicated by the white paper and the publication and dissemination of any such information does not imply that applicable laws, regulatory requirements or rules have been comply with.

Risks and forward-looking statements: the information presented to you by the white paper ("information") may contain forward looking statements based on the white paper's assumptions and projections and third-party information/publications. Please not that no independent review of the information has been carried out and we cannot assure the accuracy or completeness of the information or the underlying assumptions made in third-party information/publications. Further, the risks set forth herein are not an exhaustive list of the challenges currently facing or that may develop in the future. There may be additional risks not described below or not presently known or that currently considers as immaterial that could turn out to be material, which may in the future have a material adverse effect on the development of the tokens. The purchaser expressly acknowledges and agree that you have not relied on any or all of the information, and you agree to assume all these risks and uncertainties, including the potential loss of your entire purchase amount.

Disclaimer: Any and all responsibility for any direct or consequential loss or damage of any kind whatsoever arsing directly or indirectly from: (i) reliance on any or all of the white paper information, (ii) any error, omission or inaccuracy in any or all of the white paper information or (iii) any action resulting from such white paper information.

No advice: No information shall be construed as advice of any sort. If you ae in any doubt as to any matter relating to the tokens, you should consult your legal, financial, tax or other professional adviser about your particular circumstances. You should not invest the tokens if you do not understand the nature of blockchain or cryptographic tokens and other digital assets, smart contracts, storage mechanisms (such as digital or token wallets), blockchain

based software systems and blockchain technology, or are not comfortable with the accompany risks.

By purchasing the tokens, you expressly acknowledge, accept, understand and agree to assume the following risks and disclaimers pertaining to the token:

14.1   The tokens are sold on an "as is" and "as available" basis and the issuer expressly disclaims all implied warranties as to the same, including, without limitation, implied warranties of merchantability, fitness for any particular purpose, title and non-infringement.

14.2   The tokens are designed for very specific use with respect to certain virtual ecosystems and should not be treated as being merchantable and do not necessarily have any other use or value. There should be no specific outlook or expectation on the merchantability or market price of the tokens and the purchase of tokens is therefore not subject to protections of any kind afforded by securities laws in the purchaser's home jurisdiction or in any other jurisdiction.

14.3   The tokens are not intended to be or function under any circumstances as any form of security, commodity or any other kind of financial instrument, including but not limited to:

   a) A security or representing any equity or ownership interest in the issuer or any other entity in any jurisdiction;
   b) A debt or liability of any nature owed by the issuer to the purchaser or any other entity;
   c) Any form of financial derivative including, but not limited to, a futures contract, forward contract, option, swap or warrant;
   d) A contract for difference of any form or kind or any other contract, the purpose of which is to secure a profit or avoid a loss by reference to fluctuations in the value or price of an asset or an index;
   e) Any commercial paper or negotiable instrument;
   f) Any commodity or asset that any person is obliged to redeem or purchase;
   g) Any note, bond, warrant or other certificate that entitles the purchaser to repayment of the purchase price, any interest, dividend or any other kind of return on the investment price by the issuer or any other entity;
   h) Giving the purchaser rights pf any form with respect to the issuer or its profits, revenues or assets (both current and future), including, but not limited to, any voting, distribution, redemption, liquidation, proprietary (including all form of intellectual property), or other financial or legal rights (including but not limited to fiduciary duties); or
   i) An interest or share in any investment fund or collective investment scheme;
   j) The pooling of monies with the aim of spreading investment risk; and/or
   k) Entitling the purchaser to participate in any profits or gains from the acquisition, holding management or disposal of assets.

14.4   The issuer expressly disclaims any liabilities whatsoever to the purchaser, and shall not be liable to the purchaser for any loss, damage or delay caused by, arising from, or in respect of the following:

a) Private key(s) may be compromised. Private access keys or a combination thereof ars necessary to retain access to and control over any tokens you have stored in your digital wallet(s). In the event that these keys are lost, stolen or hacked by a third party, or if the service provider gets compromised, you may lose all of the tokens you have stored with little to no avenue of recourse. The assure assumes no liability to the purchaser in such situations.

b) The Ethereum protocol. Any failure, dysfunction, destruction, or desertion of the Ethereum protocol is beyond the control of the issuer and may have a material adverse effect on the tokens and/or the SYMPHONY Protocol, which is being built upon it. Other technological developments and advancements in areas such as blockchain technology, cryptography, or quantum computing may also render the Ethereum protocol obsolete. These also represent existential risks to the tokens and the SYMPHONY Protocol.

c) Delays and/or default in delivery. Due to the nature of the blockchain technology being used for cryptocurrencies, including the issuer's smart contract system, the purchaser may not receive the tokens on the same day that the purchase price is paid, or at all, and the blockchain may also be prone to periodic congestion during which the purchaser's transactions may be delayed or lost.

d) Resource volatility. The issuer remains vulnerable to price fluctuations of the resources used to fund the development of the token and the SYMPHONY Protocol. Such resources are derived from the sale of the tokens, among other sources, and include Ether, Bitcoin, other related cryptocurrencies as applicable, and fiat currency. The ongoing development and maintenance of the issuers' technologies and infrastructure may be adversely affected, delayed or suspended by such unpredicatability.

e) Mining attacks. The accurate lodgement and recording of transactions on the Ethereum protocols depends greatly on the process of distributed verification by miners. This process of validation is vulnerable to many known exploits which may impair or affect the ability of the SYMPHONY Protocol and the Tokens to function.

f) Cybercrime and security failure. The SYMPHONY protocol and/or the tokens remain susceptible to malicious cyberattacks by autonomous software or hackers, and other illegal cyber activities. Such attacks could include, among others, phishing, malware attacks, distributed denial of service attacks, consensus-based attacks, Sybil attacks, smurfing and spoofing. The internal security of the SYMPHONY Protocol's core infrastructure may also be compromised by external agents or the employees, agents and affiliates of the issuer, which could debilitate the functioning of SYMPHONY Protocol and the Tokens.

g) Secondary markets. There are no secondary markets for the trading of the Tokens that are being supported by the issuer. In absence of any valuation system, the Tokens may have little to no value outside of the SYMPHONY Protocol, or they may be subject to lack of demand or volatile price fluctuations, leading to illiquidity. Further, many secondary third-party exchanges function with little supervision from the relevant authorities, heightening the risk of failure, fraud, theft, or manipulation.

h) Issuer or ecosystem may be dissolved. Due to any number of uncertainties in the cryptocurrency industry, including but not limited to resource volatility, business failure, government regulations, lack of technological development, or any other unforeseen circumstances, the issuer or the SYMPHONY Protocol may be rendered non-viable and dissolved without notice.

i) Development of ecosystem. The SYMPHONY Protocol has not been finalised for deployment and remains subject to review, changes, and further research and development. There are no guarantees that the SYMPHONY Protocol and the Tokens will function as intended or if they will function at all. Circumstances may arise which call for the entire ecosystem to be revamped, for the characteristics of the Tokens to be redefined in any number of ways, or any combination thereof. Further, the SYMPHONY Protocol remains vulnerable to systemic failure, unidentifiable malfunction, and lack of skill or resources for proper maintenance and/or further development

j) Alternative ecosystems. The establishment of other commercial ecosystems which offer products, services or solutions identical or superior to the SYMPHONY Protocol, or which utilise the same underlying protocol, may result in competition. In such event, and where the issuer is unable to compete for any reason, the SYMPHONY Protocol and the Tokens may suffer failure.

k) Cloud storage. The issuer may utilise cloud storage solutions for any of its operational and commercial needs. Such systems are vulnerable to the accompanying risks of information decentralization, including but not limited to breach of storage security, service interruption, cyberattacks, loss of assets, and suspension of access. The issuer may irretrievably lose large amounts of important data, rendering it unable to function temporarily or permanently. Among other negative consequences, this may result in the indefinite disruption or suspension of access to and usage of the Tokens and the Symphony Protocol.

l) Governance rights. The issuer is not afforded any voting or corporate governance rights by investing the Tokens. Therefore, it will have no right to participate in any aspect of corporate decision-making by the issuer. Actions affecting the SYMPHONY Protocol and the Tokens may be executed by the issuer without reference to, or approval from the purchasers.

m) Lack of Critical Mass. The SYMPHONY Protocol depends on adoption and participation by a critical mass of users in order to be functional and commercially viable. In the event that there are insufficient users over a prolonged period of time, the functionality of the SYMPHONY Protocol and the potential utility of Tokens may be diminished or rendered commercially non-viable.

n) Regulation impacts. The regulatory status of cryptographic tokens, including the Tokens, digital assets and blockchain technology is unclear or unsettled in many jurisdictions. In the event that any governmental authority makes changes to existing laws, regulations and/or rules or financial institutions make commercial decisions and such changes/decisions negatively impact the Tokens in various ways, the issuer shall be entitled to cease the distribution and maintenance of the

Tokens or cease operations in any jurisdiction without incurring any liability whatsoever to the purchaser.

o)   Intervention. The industry in which the issuer operates is new and may be subject to heightened oversight and scrutiny. There can be no assurance that governmental authorities will not examine the operations of the issuer and/or pursue enforcement actions against the issuer. The issuer may be subject to judgments, settlements, fines or penalties, or cause the issuer to restructure its operations and activities or to cease offering certain products or services, all of which could harm the issuer reputation or lead to higher operational costs, which may in turn have a material adverse effect on the Tokens and/or impair the ability of the issuer to perform its obligations under this white paper. In such event, the issuer shall not be held liable for any losses suffered by the purchaser.

p)   Reliance on third parties. The issuer may rely on other third parties, in whole or in part, to implement the sale, development or supply of the Tokens, and there is no assurance or guarantee that said third parties will be competent, complete their work for the issuer, properly carry out their obligations, or otherwise meet any Party's needs, all of which might have a material adverse effect on the issuer's ability to perform its obligations under this white paper.

q)   Other unforeseen threats. Much of the cryptographic token industry remains unchartered and untested. Hence there may be a variety of unforeseen and unanticipated risks associated with the Tokens and the SYMPHONY Protocol which are not explicitly addressed herein. Such risks may materialise at any point before or after the purchaser acquires or uses the Tokens.

14.5   The issuer retains all rights, title and interests in all of issuer's intellectual property (whether registrable or not), including, without limitation, inventions, ideas, concepts, code, discoveries, processes, marks, methods, software, compositions, formulae, techniques, information and data, whether or not patentable, copyrightable or protectable in trademark, and any trademarks, copyright or patents based thereon. The purchaser may not use any of issuer's intellectual property for any reason whatsoever.