

SymVerse

BETTER WORLD

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** This document is not a prospectus. It is provided for information purposes only. Contents will be updated in keeping with the development of SymVerse platform.*

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Nature uses only the longest threads to weave her patterns,

so each small piece of her fabric

reveals the organization of the entire tapestry.

– RICHARD FEYNMAN

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1. OVERVIEW

The world today is at the cusp of a tremendous technical breakthrough. Blockchain technology has come a long way from the modest beginnings nearly ten years ago when Satoshi Nakamoto first announced Bitcoin to a small group of tech enthusiasts. In the hands of brilliant inventors, such as Vitalik Buterin and a rapidly growing band of followers, blockchain technology is being armed with new forms, functions and applicability. Blockchain and its Siamese twin, cryptocurrency, are the subject of headline news, public interest, and ambitious R&D all around the world. However, blockchains have yet to become a part of mainstream life. The big challenge facing blockchain technology, evidently, is to make it commonplace—much like the way the internet has become an integral part of day-to-day living.

SymVerse[1] is a decentralized platform, whose goal is to put blockchains into common, universal use.

Decentralization and security form the cornerstones of the best and most successfully implemented blockchain technologies so far. SymVerse is true to this school of thought; believing that trust, forged by decentralization and security, will provide a stronger foundation for a better world.

1. *'Sym' means together or with; 'Verse' means turned or become. Behind the name SymVerse is the fundamental belief outcomes are best when we work together in a collaborative manner.*

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2. ELEPHANT IN THE ROOM

Blockchains and cryptocurrencies are inextricably linked. Cryptocurrencies serve as the front-end of the duo, thus garnering the largest share of interest from the public-at-large; little attention is devoted to the workings of blockchains, especially the utility or their lack thereof. It should be noted the world has yet to produce a successful application[2], much less a "killer-app" with blockchains.

2. *The cryptocurrency bitcoin is an app, whose success is fiercely debated.*

Fortunately, there is an active community of inventors, scientists, programmers and entrepreneurs, hard at work to address the conspicuous lack of practical blockchain apps. Many proposals, especially emphasizing speed and scalability, are in the works to apply blockchains for everyday use by common persons. This is encouraging and naturally gives rise to optimism for the future of blockchain technology.

It should be noted, however, that the problem with blockchains runs far deeper than their limited speed and scalability; rather a solution, that is robust and capable of withstanding the test of time, will likely need to address a much larger set of issues.

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3. GOALS

Not only speed and scalability mentioned above, but the advancement of blockchain technology depends on improvement in six key dimensions, fondly named “SixEss” in this paper. They are as follows:

- Speed
- Scalability
- Simplicity
- Security (including safety)
- Stackability
- Sustainability

Achieving progress in any one or two of these dimensions is highly desirable. In this sense, each dimension in the SixEss can serve as a worthy goal for any developer. The level of difficulty, however, is formidable as evidenced by the paucity of embraceable proposals being offered to the blockchain world. A quick fix is either hard to find or unavailable. Rather than attempt marginal changes to existing systems, the better approach may be to make large changes to fundamental components, thereby producing a new platform with a different architecture. This is the approach SymVerse takes; a big fix rather than a quick fix.

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4. THE BIG FIX

Blockchain 1.0 (Bitcoin) and 2.0 (Ethereum) brought together elements of cryptography, computer science and economics in inspired ways. There are few inventions which better illustrate the power of consilience. The builders of blockchain 3.0 have the advantage of standing on the shoulders of these giants. For the big fix, SymVerse will press the consilience button over and over again. Key insights will be drawn from Game Theory, Monetary/Financial Economics, Welfare Theory, Systems Control, Database Management, Network Design, IT Hardware, Payment Systems, Social Choice/Voting Theory and Ethics, to name the most representative disciplines.

Consilience/multi-disciplinary approach is at the heart of the innovations to blockchain technology introduced by SymVerse. This is necessary since blockchain 3.0 needs to be more than an ecosystem. It should aspire to be a socio-economic system.

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5. SYMVERSE INNOVATIONS

A big fix implies big changes. Innovations introduced by SymVerse can be classified into two types: technical and socio-economic.

1. Technical Innovations

Network	**SymNet**, featuring Proof of Network (PoN)
Consensus mechanism	**SymSensus**
Multi-block blockchain	**SymChain** and **SymBlock**
Universal transactions process	**SymTrans**
Information storage	**SymStack**
Smart wallet	**SymWallet**
ID management	**SymID**

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2. Socio-Economic Innovations

Coin supply and macro stabilizer	**SymStabilizer**, featuring SYM Supply
Work compensation /coin distribution	**SymReward**
Voluntary participation	**SymMechanism**

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6. HOW INNOVATIONS IMPROVE SIXESS

Innovations allow improvements to certain SixEss goals directly. In addition, one innovation can be the fundamental reason allowing for the possibility of another innovation. This then opens the channel for an innovation to allow indirectly improvements in certain SixEss goals. For example, it will be seen in later sections that the innovation SymSensus (consensus mechanism) results in only one block to be produced, which in turn permits SymBlock (multi-blocks), making it possible to have a SymStack (information storage) structure—which improves Stackability, a SixEss goal.

The following sections introduce the most important innovations. Some notable features are discussed. The innovations will have implications for how one innovation alone—or more likely in combination with others—will foster vertical integration with new families of apps. A more detailed discussion of vertical integration will be provided in a separate paper.

A bird-eye view of the relationship between the innovations in SymVerse and the goals called SixEss can be seen in Exhibit 1 below.

Exhibit 1
Relationship Between Innovations and SixEss

	Speed	Simplicity	Scalability	Stackability	Security/Safety	Sustainability
SymNet (PoN)	✓		✓		✓	✓
SymSensus	✓				✓	✓
SymTrans (UTP)	✓	✓		✓		✓
SymBlock/SymChain	✓	✓	✓	✓		✓
SymStack	✓	✓	✓	✓		✓
SymWallet		✓			✓	✓
SymID		✓		✓	✓	✓
SymStabilizer			✓			✓
SymReward			✓			✓
SymMechanism						✓

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7. TECHNICAL INNOVATIONS

1. Innovation 1: SymNet, Featuring Proof of Network (PoN)

The world of SymVerse can be viewed from several perspectives. Depending on one's leaning, it is: (i) a decentralized blockchain platform software; (ii) a blockchain ecosystem; (iii) a decentralized P2P network of nodes; (iv) a socio-economic system; or (v) whatever the imagination can come up with. Early blockchain pioneers explored (i) and (ii) with exceptional insights. However, inventive minds with knowledge in networks and economics will see additional intellectual real estate in the blockchain universe for further development.

A. SymNet: An Evolutionary Functional Distributed Network

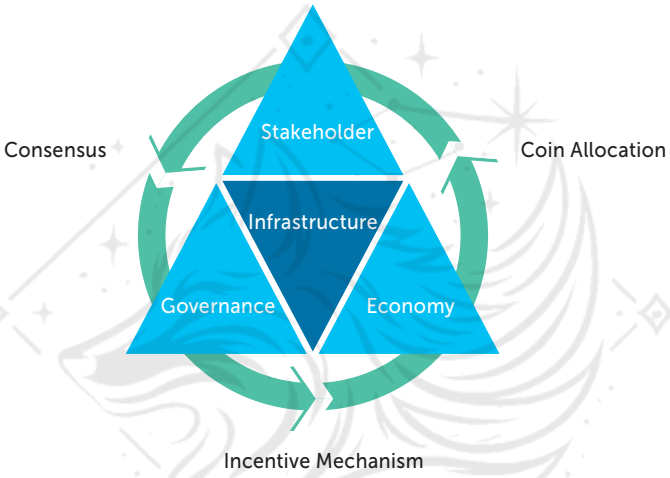
It is possible to think of break down the components of blockchain network as follows: (i) stakeholders; (ii) economy; (iii) governance; and (iv) technical infrastructure. Smooth functioning and the long run sustainability of the blockchain platform depends on these components achieving intra-process stability (on their own) and inter-process stability (operating with one another).

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That is to say, a successful design should have the following features:

1. Stakeholders (individuals and groups/institutions) co-exist harmoniously;
2. Coin supply and allocation do not violate incentive compatibility;
3. Consensus process operate autonomously and incorruptibly;
4. Technical infrastructure adapts to the demands of evolutionary changes over time.

Exhibit 2
Blockchain Platform Components



Let SymNet be the network aspect of SymVerse. SymNet is a forward-looking evolutionary functional distributed network (EFDN). SymNet achieves security, integrity, effectiveness, scale and sustainability with the following:

1. Nodes are incentivized to stay switched on perform work on behalf of the network;
2. Early detection of malevolent or dysfunctional nodes;
3. Organization of nodes according to functions for improved network speed and scalability;
4. Process management of consensus, load balancing, transaction aggregation (for block production); and
5. Development of useful and forward-looking services, such as file sharing, messaging and so on.

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B. Proof of Network (PoN)

Proof of Work (PoW) and Proof of Stake (PoS), together with their many variations, blazed the path for implementing decentralized consensus mechanisms achieving Byzantine Fault Tolerance (BFT). These structures, when built carefully, provide much needed security; Bitcoin is a good example. Sadly, it is widely recognized that even if a high level of security is attained, this success comes not without alarming social, ecological, ethical and/or economic costs. SymVerse breaks from the ill-begotten tradition of turning into a competition (such as work/computing power in PoW, and of wealth in PoS) the selection of a block producer.

Instead of PoW or PoS, SymVerse features Proof of Network (PoN). PoN[3] is the operational principle on which the EFDN is based. PoN consists of many elements, including the following four key parts:

1. Processing transaction and boosting network effectiveness
2. Automatic benchmarking test (prior to selecting nodes for block production)
3. Block production process
4. Reward mechanism for participation in the block production process

3. *PoN is comparable to PoW and PoS in the sense of being a means of selecting the nodes that the system rewards. However, PoN is not a part of the "consensus process". In SymVerse, the consensus algorithm is a part of PoN since PoN is the mechanism for evolutionary functionality of SymNet.*

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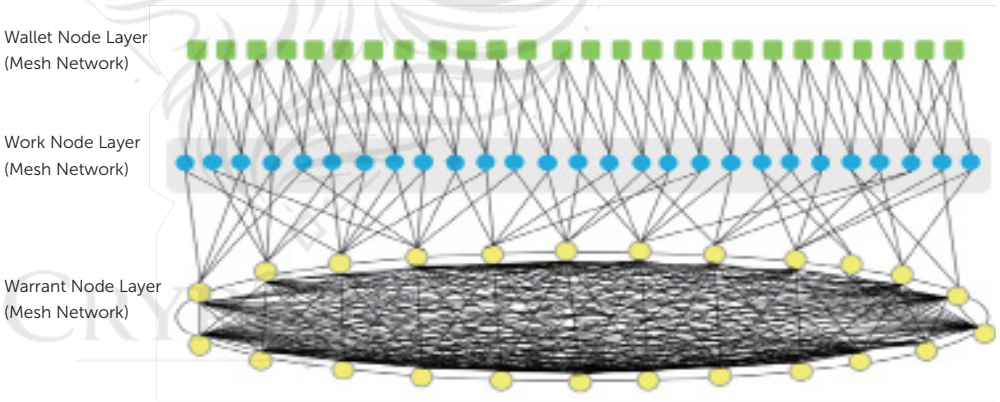
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i. Node Types and Processing Transactions

In SymVerse, all the nodes are classified into three categories:

1. Wallet Node: This is any wallet connected to the SymVerse network. A Wallet Node possesses a record of its own transactions.
2. Work Node: This node verifies all of the rules of SymVerse. A Work Node may possess the full data (including all the blocks in the blockchain), in which case it is called a Full Node. If the Work Node only possesses a portion of the data, then it is called a Light Node.
3. Warrant Node: This node produces blocks for the blockchain. A Warrant Node is a Full Node which has been selected randomly through a special process. At any one time, there exists only 25 Warrant Nodes.

Exhibit 3
Wallet, Work and Warrant Nodes



A Wallet Node processes transactions through a Work Node that is connected to the blockchain. The list of available Work Nodes is updated continuously and each Wallet Node must communicate with 3 Work Nodes for transaction processing. Out of the three, the Wallet Node can select one, while the other two are assigned by the system. In case a particular Work Node fails to respond, a replacement will be provided.

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The Work Node which receives transaction data from a Wallet Node will process that information and send it to two Warrant Nodes belonging to different groups (described in section 8.1 below).

Each Warrant Node sends all transaction data to all the other Warrant Nodes. After sharing the transaction data, and when the consensus process has been completed, the information is recorded on a block and included on the blockchain.

ii. Network Vigilance Check and Block Production/Reward Program

SymVerse is designed to produce one or more blocks every two seconds. In order to achieve this fast pace, the process of producing the block at time T starts 4 seconds before hand. The sequence of events is as follows:

1. At all times, Wallet Nodes and Work Nodes who desire to participate in the block production and reward program send signals to Warrant Nodes. In this way, the system maintains a pool of Wallet Nodes and Work Nodes for the production of blocks.
2. At time T-4 seconds, one Warrant Node (referred to as WN*) is picked randomly by the SymSensus protocol to be the block producer for time T (more details are provided in the next section). The protocol also picks randomly a number of Wallet Nodes to participate in the block production. This information is spread and shared by all nodes in the network.
3. Once picked at T-4 seconds, Wallet Nodes send signals to three different Work Nodes to confirm their desire to participate in the block production process. All Wallet Nodes send to the three Work Nodes its most recent transactions record. The Work Nodes verifies the record received, acknowledges receipt of this signal and relays the validated information to two Warrant Nodes. The 25 Warrant Nodes share all transaction data.

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4. When the participation level meets certain target standards, WN* announces the end of the the collection process. WN* asks the other 24 Warrant Nodes to validate all the transactions WN* intends to record on the block for time T.
5. Consensus is reached when WN* receives approval from at least two-thirds of all Warrant Nodes. As there are 25 Warrant Nodes, this means that WN* must receive approval from 16 or more Warrant Nodes in addition to its own approval.
6. WN* prepares a record of all nodes which participated in the block production process. This information is included in the block and is also recorded in the memory DB. The information is utilized at a certain point in time every 24 hours to reward all the participants of the block production process.
7. Following the consensus, WN* produces the block, which is then broadcast to all the nodes in the network.
8. All nodes who participated in the block production during the last 24 hours receive their portion of the reward, which is computed according to a predetermined formula (*see* Section 16).

iii. Notable Features of SymNet and PoN

First, through vigilance check of the network, PoN plays a crucial role in keeping SymNet secure. Verification and validation of information stored in all nodes are performed extensively and for all intent and purpose, continuously. This ensures and maintains the integrity of the network.

Second, PoN encourages nodes of all types in SymNet to stay switched on as much as possible. This contributes to the effectiveness of the network, which benefits from increased number of active nodes.

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Third, the layered organization of SymNet allows for division of node functions and tasks. This improves the speed of communications, efficiency of performing tasks, and possibilities for scaling up the network. Nodes are not only capable of providing basic functions such as participating in consensus building process, network load balancing (frequently left unattended by many blockchain networks) and advanced aggregating transactions in preparation for block production, but nodes will also be able to share files and have messaging services.

Fourth, PoW and PoS often stand in for a process by which a block producer is selected. In these schemes, since a block producer is usually the only recipient of the reward for block production, it is possible to think of PoW/PoS as being a selection process belonging to a work compensation/reward distribution scheme. PoN encourage many nodes to participate in meaningful ways toward the production of blocks and in maintaining the well-being of the underlying network. PoN, much like PoW/PoS, is also a selection process for work compensation/reward distribution.

Fifth, PoN minimizes competition. Consequently, it is not wasteful of resources, such as electricity, computing hardware, capital for "staking" purposes, and so on .

Sixth, when PoN is linked to a well-conceptualized work compensation program, there is an opportunity to avoid the phenomenon of "rich-get-richer, while poor-get-poorer", which frequently shows up in other blockchain worlds with winner-takes-all schemes.

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2. Innovation 2: SymSensus—Consensus Mechanism

SymSensus is designed to reach consensus speedily in order to produce blocks swiftly at a pace of one block every 0.1 to 2.0 seconds. The underlying infrastructure for SymSensus is as follows:

A. Warrant Node Council

The Warrant Node Council consists of 25 Warrant Nodes. This Council has two groups, A and B. Group A is composed of nine Warrant Nodes nominated by SymVerse Foundation[4]. Group B is made up of 16 Warrant Nodes, selected randomly from the pool of all Full Working Nodes and by applying the Benchmark Test (BMT). Members of both Group A and Group B participate in the decision-making process to approve or reject the a newly proposed block. A new block is produced only by a member of Group B.

4. *SymVerse Foundation is the entity charged with the mission to promote and support SymVerse blockchain platform for optimal performance and successful long run sustainability.*

The role of the Bench Mark Test (BMT) is to ensure that the Full Working Node selected to be a Warrant Node has the following desirable qualities:

1. Trustworthy character
2. High contributor to the workings of the network, including record of recent activity
3. High computing capabilities
4. Stake/Skin in the game[5]

5. *BMT will require posting a "stake" that is not onerous, wasteful or competitive. With respect to the amount posted, the threshold for passing BMT will be low.*

A Full Work Node that passes BMT becomes a Group A Warrant Node Council member for four days. Four new members are selected every 24 hours, while four old members retire. The membership in Group B, therefore, is rotated on a daily basis.

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B. Status within Group B

Group B is composed of four status levels.

1. Back Bench is the lowest status. This is the level the newly selected Warrant Node enters.
2. Middle Bench is the second lowest status. A Warrant Node is automatically promoted from Bench to Middle Bench after some passage of time.
3. Front Bench is the second highest status. At any given time, there are 2 or 3 Front Bench Warrant Nodes.
4. Primary Warrant Node: this member of Group B has the job of producing new blocks. At any given time, there is only one Primary Warrant Node. A Warrant Node serves as a Primary for two seconds, during which time one or more new blocks are produced. At the end of two seconds, the Primary Warrant Node retires and joins the Back Bench.

C. SymVerse Consensus Algorithm

The consensus algorithm in SymSensus is based on Byzantine Fault Tolerance (BFT) method. The Primary Warrant Node proposes a new block and requests its verification to all members of the Warrant Node Council. When two-thirds of the replies from the members are positive (so that the positive votes are two-thirds plus one of all votes), then the Primarily Warrant Node broadcasts the new block to all the nodes. This marks the completion of the consensus algorithm.

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D. Notable Features of SymSensus

First, SymSensus is designed to reach consensus in short time, producing blocks every 0.1 to 2.0 seconds. This is made possible through careful organization and process engineering, supported by SymNet and PoN. In particular, Work Nodes perform many important works, such as load balancing, processing transactions and other information to assist the Warrant Node.

Second, SymSensus is highly resistant to manipulations and Sybil attacks. Note that the consensus algorithm achieves Byzantine Fault Tolerance.

Third, the 9 members of Group A nominated by SymVerse Foundation play a critical role. It should be emphasized that Group A members cannot be block producers. However, without at least one validation from Group A, a proposal for a new block cannot reach positive consensus. In other words, Group A (which will act in a coordinated fashion at all times) have the power to veto a proposal. Of course, Group A is incentivized to veto only faulty or corrupt proposals for new blocks. Students of social choice theory, and voting theory in particular, will notice that SymVerse has benefited by borrowing the ideas of Gibbard, Satterthwaite and Hylland[6].

Fourth, since only one block is produced, there can be no branches in the blockchain. This property will feature in an important way in the Universal Transaction Process, to be discussed later.

Fifth, SymSensus allows all nodes from every category to participate and be rewarded for being a contributor in the block production process. Compare this with other systems with a "winner takes all" reward schemes.

6. *Gibbard Satterthwaite Theorem states: if a strict voting rule has at least three possible outcomes, it is non-manipulable if and only if it is dictatorial. Hylland extends this result to non-deterministic cases. SymVerse applies cornerstone theorems from game theory and social choice to create a consensus algorithm in which the randomly selected block producer has no possibility to profit through manipulation.*

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In those systems, over time, the rich get richer and the poor get poorer (because of what economists call seigniorage or inflation tax). SymVerse implements a reward scheme which aims to keep the playing field flat and fair for all. This is good for the sustainability of the SymVerse ecosystem.

Sixth, with respect to SixEss, SymSensus contributes to improvement in Speed, Security and Sustainability.

E. Delving Deeper: Warrant Node

A Warrant Node is a special type of Working Node. A Full Node can become a Warrant Node according to the following steps.

1. Full Node requests to be a Warrant Node.
2. The Full Node is considered to be a Warrant Node Candidate and now a part of the Warrant Node Candidate Pool, along with other Candidate.
3. The Full Node in the Warrant Node Candidate Pool is selected through a random process and subjected to the Benchmark Test (BMT).
4. After passing BMT, the Full Node serves as a Warrant Node for 4 days. At the end of this service period, the Full Node drops back to Warrant Node Candidate Pool.

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3. Innovation 3: SymBlock and SymChain —Multi-Block Blockchain

SymVerse is a multi-block system. In order to minimize confusion, it is necessary to introduce some new terminologies. SymBlock is the "whole block" produced at any given time. SymBlock consists of several blocks. The types of blocks are as follows:

1. **Main Block** stores current transactions and executes future transactions
2. **Future Block** stores future transactions
3. **Contract Block** stores contractual transactions
4. **Snapshot Block** stores account balance produced by Main Block at set times
5. **Citizen Block** stores ID information
6. **dApp Block** stores dApp information (type, fee payment, token exchange)
7. **Warrant Block** stores Warrant Node selection information
8. **Reward Block** stores reward distribution information
9. **Voting Block** stores voting information

One or more SymBlocks produced every two seconds. The Main Block can be produced rapidly, at a pace of one or more blocks every 0.1 to 2.0 seconds. Other blocks are produced on a need-only basis. This means that every SymBlock has a Main Block, but the inclusion of other blocks is as needed.

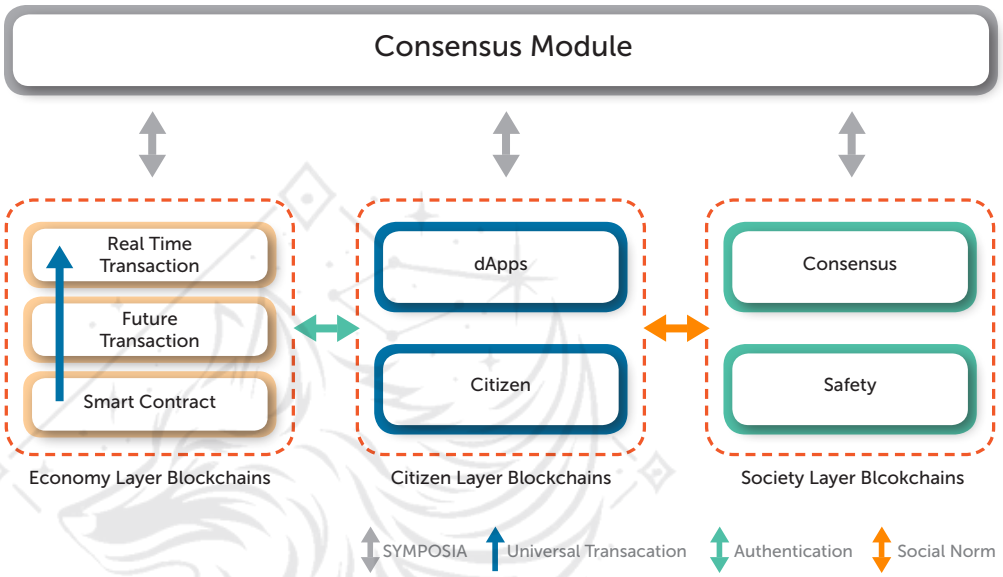
The series of Main Blocks are linked together to form the Main Blockchain. Similarly, there is the Future Blockchain, the Contract Blockchain and so on. The different Blockchains communicate with one another through a protocol called SymVerse Inter-Blockchain Protocol, or SIP.

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The series of SymBlocks are linked together to form a chain of blocks called the SymChain.

The blockchains communicate and coordinate with one another by means of SymVerse Inter-blockchain Protocol (SIP).

Exhibit 4
Symverse Inter-Blockchain Protocol



A. Notable Features of SymChain

First, the introduction of multi-block blockchain allows essential information to be separated from non-essential information. The latter is called up only when needed. Compartmentalization of information types is a basic tool in database management.

Second, a multi-block configuration is programmable in SymVerse. This is because the consensus mechanism, based on the BFT method, does not admit the existence of branches in the blockchain.

Third, the efficient management of the database allows SymVerse to gain operational speed.

Fourth, with respect to SixEss, SymChain and SymBlock contribute to improvement in Speed, Simplicity, Scalability and Sustainability.

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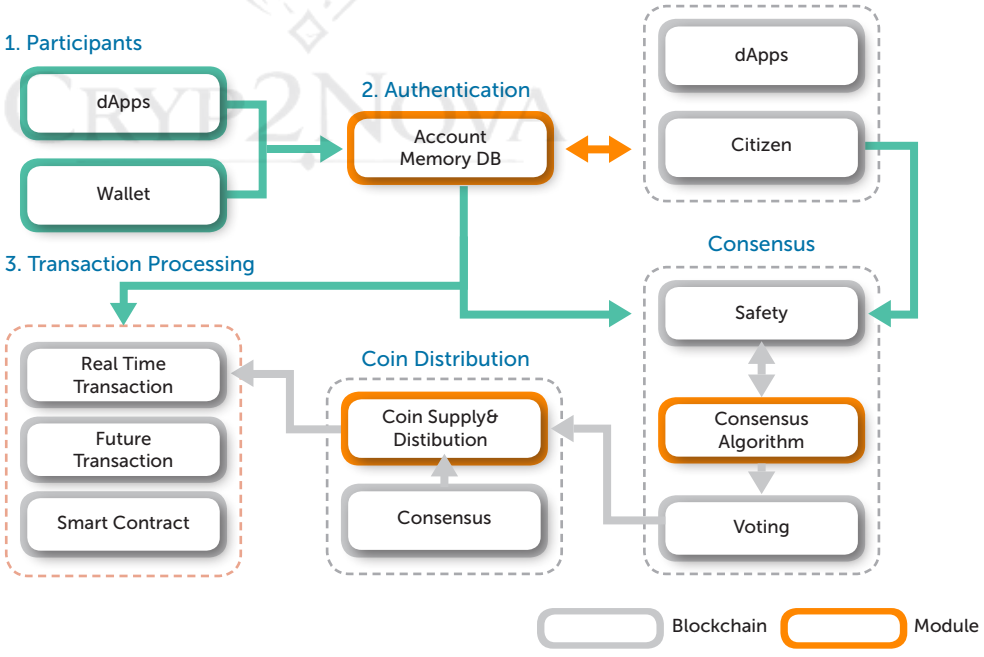
4. Innovations 4: SymTrans—Universal Transaction Processor

SymVerse uses the multi-block structure of the SymChain to distinguish general transactions from contract-based transactions. General transactions are further distinguished according to the execution time of the transaction; this gives rise to current transactions and future transactions. Each type of transaction is assigned its own blockchain.

The design and organization of the multi-block structure makes easy the job of sorting most transactions into basic categories. SymVerse provides ready-made templates which trivializes the level of technical knowledge to formulate and carry out most types of transactions. SymVerse, of course, uses smart contracts extensively. However, the template interfaces and the library of functions supplied by SymVerse should remove the need to know how to write smart contracts for nearly all common situations. For SymVerse, the goal is simplify to the extent the local corner store owner is able to use blockchains.

The Universal Transaction Processor, which we call SymTrans, utilizes SRC (SymVerse Request for Comments) on which templates, functions and smart contracts operate.

Exhibit 5
Universal Transaction Processor



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The applicability, versatility and functionality of SymTrans can be illustrated by noting some representative functions that the transactions processor supports. Illustrative examples are given in parenthesis.

1. Current transaction (straight forward)
2. Future transaction (payment for item from internet shopping after delivery)
3. Multiple transactions (send payments to many persons)
4. General transaction paired with smart contract transaction (trading options and futures)
5. Flexible transaction fees (extremely low for simple transactions)
6. Multi-party electronic signatures (verification/approval by many persons)
7. Authentication of documents (notarization of original documents)

A. Notable Features of SymTrans

First, for most users and for most application to everyday use, SymVerse will be simple and intuitive. For the first time, the power of blockchains will be placed at the fingertips of the common person. The importance of this development cannot be over-emphasized since one of the biggest barriers to mainstream adoption of blockchain technology is the level of technical knowledge required on the part of the potential user.

Second, the applicability, versatility, functionality and simplicity of SymTrans is good news for dApp developers; dApps will be easy to create. The neighborhood coffee shop owner, for example, should be able to create a dApp for store loyalty coupons. Needless to say, highly sophisticated dApps will also abound.

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Third, the two features discussed above gives rise to an important corollary: blockchain technology has a chance to become ubiquitous. That will also be a world with many types of cryptocurrencies/tokens.[7]

Fourth, with respect to SixEss, SymTrans contributes to improvement in Speed, Simplicity, Scalability and Sustainability.

5. Innovation 5: SymStack—Data Storage Efficiency

It is common practice in blockchain design to store every block in the chain, including the genesis block. Over time, as more blocks are added to the chain, storage becomes a problem. Speed is also affected.

SymVerse circumvents this situation by deploying SymStack. This process uses the multi-blockchain structure. SymBlock consists of several blocks, including Snapshot Block. When the Main Block grows in size and reaches a certain level, all the account information is recorded by taking a snapshot of the accounts in the memory. This snapshot is then stored on the Snapshot Block, which becomes a part of the Snapshot Blockchain.

A. Notable Features of SymStack

First, this data storage technology is made possible by the deployment of multi-block structure. Main Block, Future Block and Contract Block collectively store the full transactions data. Since the Future Block hash and Contract Block hash are also stored in the Snapshot Block, the data is not susceptible to manipulation.

Second, SymStack allows the Work Node to store only the Main Blocks that come after the Snapshot Block is produced. In other words, all the Main Blocks prior to the snapshot, going all the way back to the genesis Main Block, need not be stored. This means that the Work Node can economize on storage capacity.

7. Some readers, perhaps, will be fearful of having too many types of cryptocurrencies. However, it is difficult to argue that a world with N number of currencies (fiat or otherwise) should suffer more problems or difficulties than that same world with N-1 number of currencies, if N is greater than 2. In this connection, it is worth noting that there are over 180 fiat currencies co-existing in the world economy today.

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Third, all discarded Main Blocks, with all transactions data perfectly intact, are stored securely in separate storage archives. Information can be retrieved from the storage archives by using SymScan.

Fourth, with respect to SixEss, SymStorage contributes to improvement in Speed, Simplicity, Scalability and Sustainability.

6. Innovation 6: SymWallet—Smart Wallet

The role of the wallet in SymVerse goes far beyond what wallets do in other blockchain ecosystems. The wallet specially designed for SymVerse is called SymWallet. Best described as a smart wallet, SymWallet is a software program that operates on computers and smartphones.

SymWallet serves as the gateway for the connection to the SymVerse network. Over time, SymVerse network will play host to a large number of dApps. SymWallet should then serve as tool for searching, accessing, communicating and transacting with all other entities in the network.

Furthermore, as seen in the discussion on the consensus mechanism, SymWallet is the point of departure not only for transactions, but also for the consensus process.

The current version[8] of SymWallet has the following capabilities:

1. Open an account on SymVerse
2. Operates from anywhere in the world where there is internet connection
3. Transacts with any wallet or dApp with a SymVerse account
4. Low fees on transactions, with discounts for dApps connected to SymVerse
5. Browse and search across dApps according to business item and transactions amount

8. *SymWallet version 1.0 is expected to be available on October 31.*

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6. Trade many types of cryptocurrencies by P2P or through exchanges
7. Vote on constitutional matters pertaining to SymVerse
8. Participate in PoN
9. Receive rewards for participation in PoN

A. Notable Features of SymWallet

First, SymWallet is a smart wallet, endowed with many useful functions. It is simple to operate, user-friendly, and highly intuitive.

Second, SymWallet can form a line of defence against unwanted attackers. PoN assigns an important role to the Wallet Node. A requirement of an annual fee, together with evidence of recent transactions, will make it extremely costly and difficult for an attacker to own sufficient Wallet Nodes to successfully manipulate the consensus mechanism.

Third, SymWallet communicates with Work Nodes and plays a crucial part in keeping the Full Work Nodes activated. SymNet relies on the active participation of a pool of Full Work Nodes.

Fourth, with respect to SixEss, SymWallet contributes to Simplicity, Security, Safety and Sustainability.

7. Innovation 7: SymID—Managing Accounts

The world is constantly changing. For coins and tokens related to blockchains, different countries will seek to introduce different laws, regulations, rules of the game and market practices. Since it is too early to say how things will be, the best policy is to prepare to adapt. SymID, the identification system on SymVerse, is a case in point.

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Every user on SymVerse is given one SymID by a node belonging to CA (Citizens Alliance) Network after a verification process. CA Network is a group of servers with data mirroring. Each node is elected by SymVerse Foundation in recognition of the node's ability to bring large numbers of citizens and also to process KYC (Know Your Customer) and AML (Anti-Money Laundering).

SymID is a unique assignment, whose length is 8 bytes, given by a random number generator. The steps for set up the SymID is as follows:

1. User sets up an account through SymWallet and receives the public and private keys.
2. User puts in a requests for a SymID to the CA server.
3. CA server records assigned SymID, account number, and public key in Citizen Block.
4. One SymID can hold multiple accounts, so additional accounts can be registered.

When transactions are stored on SymBlocks, it is the SymID that is recorded. The use of the private key to sign results in the number issued being recorded. SymID is smaller in byte-size than the public key. Consequently, the replacement of the public key with the SymID for recording transactions on the block allows SymVerse to economize on data storage capacity.

Accounts have the following field:

<Public Key Hash@ Country, Mode, Trust Index, Function, Organization>

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Note the following:

1. Public Key is used for verifying the user signature.
2. Country is used for handling matters pertaining to country-specific needs, an example being international transactions.
3. Mode can be one of the following four states: Active, Revoked, Locked, and Marked. The user controls Active and Revoked states, while SymVerse platform controls Locked and Marked states.
4. Trust Index formulated by CA is indicated.
5. Function is used for verifying node characteristics, industrial features, tax-related matters, and so on.
6. Organization is used for verifying user-groups for various dApps.

A. Notable Features of SymID

First, in case the security of the user's private key compromised, the user can use that private key to compose a "lock account message" and record it on the Citizen Block. This message will be promulgated to all the nodes in the network.

Second, in case the private key is lost of compromised, the user can set up a new account (which generates a new private key as well as a new public key) and register it under the user's SymID. The user can then take the new private key generated by the new account and move all of the balance in the old account (associated with the lost private key) into the user's new account. This is possible because the user's unique SymID can list several accounts.

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Third, the problem of establishing the CA as a decentralized, autonomous, secure, and trustful organization is non-trivial. Until a solution is discovered, the CA will operate under the supervision of SymVerse Foundation.

Fourth, SymWallet will greatly simplify and speed up the process of obtaining a SymID and opening accounts.

Fifth, with respect to SixEss, SymID contributes to improvement in Simplicity, Security, Safety and Sustainability.

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8. SOCIO-ECONOMIC INNOVATIONS

1. Innovation 8: SymStabilizer

Blockchain ecosystems do not exist in a vacuum. There is continuous interaction with the world-at-large. SymVerse is no exception and the ecosystem (which accurately should be called a socio-economic system) will be subject to a plethora of external shocks and internal forces. Systems need controls if harmful developments are to be avoided.

A. SYM

SymVerse blockchain platform works inextricably with a native cryptocurrency called SYM. The wellbeing of the platform is reflected by the wellbeing of SYM, and the wellbeing of SYM reflects the wellbeing of the platform.

A study of early blockchain ecosystems reveals large and unsettling fluctuations in the value of their native cryptocurrencies. This is not a desirable quality if the cryptocurrency in question has any aspiration to be deployed as an instrument of exchange or more ambitiously, used in day-to-day life.

In a blockchain ecosystem, the process by which coin/token are (i) produced, (ii) distributed, (iii) circulated and (iv) taxed are all important. Production, circulation and taxation are discussed in the subsequent sections. This section deals with the method of production of SYM and introduces the autonomous SymStabilizer.

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B. SYM Production Method

9. *SymVerse constitution will determine the supply of SYM following the completion of the supply of the first five billion SYM.*

The total amount of SYM is initially capped[9] at one billion, written as "1,000,000,000 SYM". Out of this total amount, 10 percent (100,000,000 SYM) are injected into the system over a period of 30 years. The method of "producing" SYM for general circulation is inseparably related to the production of SymBlock for the SymChain.

10. *Transaction fee schedule will be prepared and announced in due course.*

1. Users pay a fee for transactions.[10] The sum of total fees collected over a period of 24 hours is compiled. Let F(t) denote the sum of all fees collected at time t.
2. Let S(t) denote the production of SYM at time t.
3. Let D(t) denote the total reward distributed for the production of SymBlocks at time t.
4. Then D(t) = S(t) + F(t) - U(t); where U(t) is the sum of fees received from micro-payment users, which are reimbursed.

Determination of SYM production amount S(t) is according to the following formula:

$$S(t) = V(t) * Z(t);$$

where V(t) is derived from the SYM supply function, which will be introduced in the next section and Z(t) is the SymStabilizer, defined as

$$Z(t) = \min \{1, F(t)/F(t-1)\}.$$

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C. Notable Features of SymStabilizer

First, SYM is injected into the world in a careful manner, taking into account important signals pertaining to demand conditions.

Second, the role of SymStabilizer is to adjust the supply of SYM into the system according to the level of transactions activity as measured by total transactions fees collected. Higher amount of total transactions fees collected indicate higher level of transactions activity, other things being equal. SymStabilizer adjusts SYM supply upward if transactions activity goes up, and downward if activity level goes down. In other words, supply goes up when demand goes up, and vice versa.

Third, SymStabilizer helps dampen the fluctuations in the value of SYM. It should be noted SymStabilizer will not dampen perfectly, and furthermore is not capable of ensuring that "the value of SYM never falls."

Fourth, SymStabilizer operates autonomously.

Fifth, with respect to SixEss, SymStabilizer contributes to improvement in Scalability and Sustainability.

D. Delving Deeper: SYM Supply

The previous section stated that the supply of SYM is described by:

$$S(t) = V(t) * Z(t) \qquad \text{[Equation 1]}$$

where V(t) is derived from the SYM Base Target Function, and Z(t) is the SymStabilizer, defined as min {1, F(t)/F(t-1)}. SYM Base Target Function is given by a Chi Squared function with 35 degrees of freedom and parameters a and b as given in the following formula:

$$V(t) = a + b * \text{Chi} \wedge 2\ (35),$$

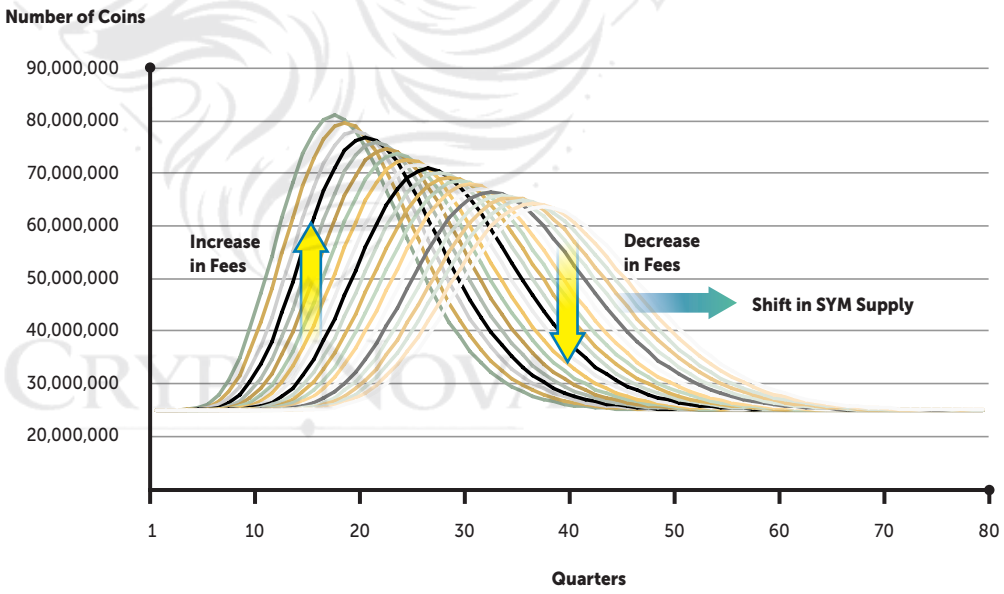
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where a>0, 0<b<1. The parameter a can be adjusted from time to time depending on the level of activity. Let y(s) be the level of economic activity in period s, then when adjusting a at time s, the rule is given by:

$$a(s) = \min \{[y(s) - y(s-1)] / y(s-1), c\}$$

where c is a constant with c > 0 and serves as a cap. The parameter b is expected to stay constant for long periods of time; changes will take place only when the SYM amount in the system is highly stressed. Changes in b will require the change of SymVerse constitution, which requires voting by all the nodes. For this purpose, the voting will be "one-node, one-vote". The following picture illustrates the shape of SYM supply over time, together with the direction of influence of changes in the transaction fee levels.

Exhibit 6
SYM Supply Over Time

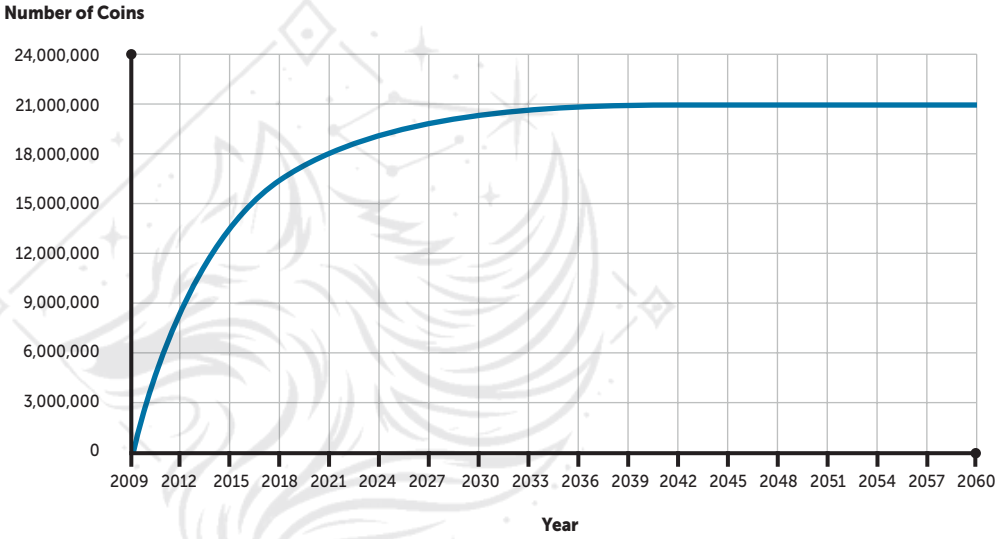


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i. Notable Features of SYM supply

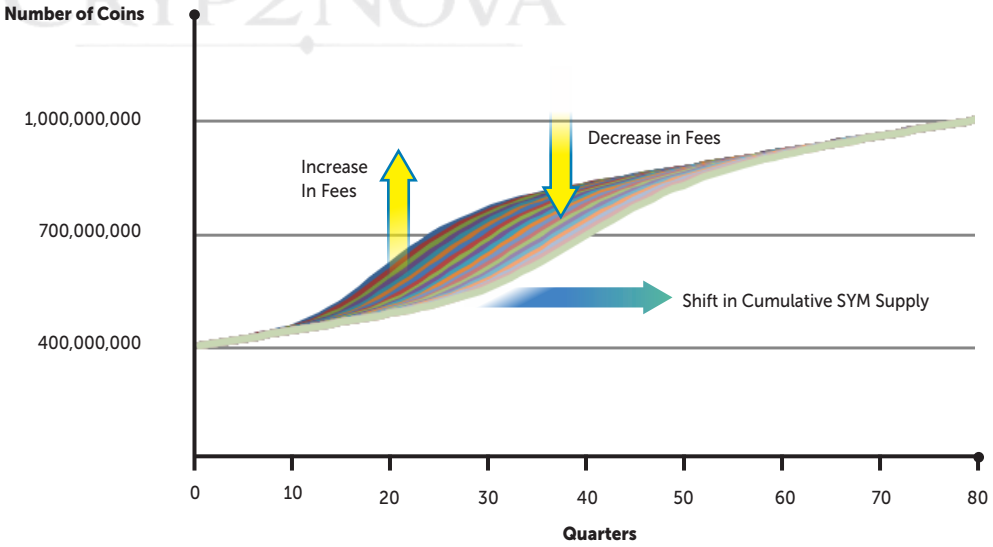
First, the hyperinflation experienced in Germany after World War 1 provides an important lesson from monetary economics as to the difficulties of supplying excessive amounts of currency. Unfortunately, this lesson often is disregarded by creators of blockchain ecosystems. In the case of Bitcoin, the cumulative supply of bitcoin is weighted at the beginning of time, which produces a concave curve, as illustrated in Exhibit 7.

Exhibit 7
Bitcoin Supply Over Time



This is in marked contrast to the shape of cumulative SYM supply, which produces an S-shaped curve as depicted in the picture below.

Exhibit 8
Cumulative SYM Supply



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Second, SYM supply policy has built-in stabilizers to factor in changes in demand for SYM. These autonomous mechanisms will help stabilize the cryptocurrency system. The value of SYM will fluctuate less violently, compared with the situation where there are no stabilizers.

Third, unanticipated changes in currency supply can confuse the public-at-large. The rules governing the supply of SYM should be public knowledge. The various data which monitors the level of "economic participation/activity" should also be made available to the public.

2. Innovation 9: SymReward—Compensation for Work and Distribution of New SYM

Newly produced SYM, along with the transactions fees collected, are injected into the world through the reward program associated with block production. The reward program, called SymReward, collects information regarding all block production participants and pays out compensation for work. The payment takes place every 24 hours. In contrast to other blockchain ecosystems in which one node (the block producer) takes all of the reward, SymVerse distributes the reward to the numerous nodes who participate in the production of SymBlocks.

At the macro level, the distribution of the reward—and therefore the distribution of newly produced SYM (Equation 1)—are determined as follows:

- 25 – 35% for Wallet Nodes who participated in PoN
- 25 – 35% for dApps
- 20% for Work Nodes
- 10% for Work Nodes who participated as Warrant Nodes
- 10% for CA Nodes

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A. Notable Features of SymReward

First, this is not a winner-takes-all program. Instead, every node has a chance not only to participate in the process of block production, but to also share the rewards of the work. A socio-economic system in which 'the rich get richer and the poor get poorer' cannot be stable. SymVerse strives to be more egalitarian.

Second, the supply of new cryptocurrencies in blockchain ecosystems effectively levies an inflation tax on all members. If block production and associated reward are outside the reach of most nodes and only open to an elite few (rich and powerful, or specially elected), it is the general public who suffers disproportionately the consequences of inflation.

Third, as discussed in the next section, SymReward encourages loyalty and greater activity on the part of all nodes. This is particularly true for dApps. In this way, everyone is incentivized to connect to SymVerse and help the system grow and develop.

Fourth, a highly simplistic (and cynical) view of Bitcoin is that it is a software for making coins. There is a conspicuous absence of mechanisms to improve social welfare. Satoshi Nakamoto, the father of Bitcoin, explicitly stated concerns about an evil entity amassing sufficient CPU power to attack the system. The reward program in Bitcoin, rather than guard against, ironically is supportive of such eventuality.

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3. Innovation 10: SymMechanism—Incentive Compatibility

The consensus mechanism in SymVerse rests on the voluntary participation of Wallet Nodes, Work Nodes and Warrant Nodes. All nodes are incentivized to participate since there are rewards for the work performed in PoN. The participants in PoN are selected according to the following criteria for contributions:

1. All nodes wishing to participate in PoN puts in request
2. Wallet Node contribution measured according to level of number of transactions, frequency of transactions and amount of SYM possessed.
3. Work Node contribution measured according to number of transactions processed, and the cumulative amount of operations performed.
4. Warrant Node contribution is measured as in the case with Work Node.

A. Notable Features of SymMechanism

First, the selection criteria incentivizes all nodes to behave in such a way (as if by an invisible hand?) the selfish actions of the individual nodes also promote the general benefit of SymVerse.

Second, the selection process is not unnecessarily burdensome or onerous. The selection criteria does not kickstart a wild and furious race to accumulate a bigger stake than the competitors, nor to install ever-greater computing power. In other words, SymVerse discourages wasteful or counter-productive competition.

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Third, all individual actions and participation are voluntary. SymVerse draws on findings from game theory and mechanism design. Individuals strategically make the best choice from their perspective; their choice is best and does not depend on the choice of others. The system design therefore is said to be individually incentive compatible.

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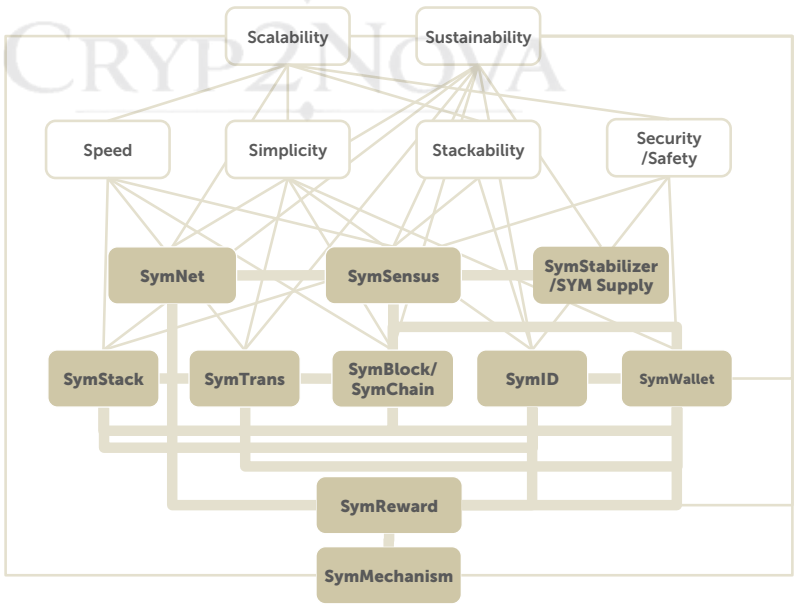
9. SIXESS REVISITED

Though a little complex, there is a clear relationship between SixEss and the ten innovations introduced in this paper. The discussion above is an attempt to highlight the many different ways the most representative innovations in SymVerse help improve elements of SixEss.

Which innovation is the most important? The answer is not easy. There is no simple one-to-one mapping between an innovation and an element of SixEss. Furthermore, innovations are often related to one another in interesting ways; for example, one innovation leads to the possibility of other innovations. SymSensus does not admit chain branches and produces only one block at a time. This makes it possible to have a multi-block (SymBlock) blockchain (SymChain) structure, which in turn paves the way for SymTrans, the universal transaction processor.

Exhibit 9 captures the interconnections between SixEss and the innovations.

Exhibit 9
Interconnection Between Innovations and SixEss



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Sustainability, in the context of SixEss, deserves special attention. It is not difficult to argue that meaningful improvements in one or more of the other 5 elements of SixEss *can*—not *will*—improve the chances of sustainability. However, sustainability of ecosystems is such an important goal, to relegate it to an indirect, chance outcome of other improvements would be an act of gross negligence on the part of the blockchain platform developer.

Sustainability depends on many variables. A blockchain ecosystem in which a native cryptocurrency features heavily should be considered a socio-economic system. The introduction of innovations, such as SymStabilizer, SYM supply, SymReward and SymMechanism, are steps to improve sustainability directly.

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10. GROWTH, DEVELOPMENT AND SUSTAINABILITY

An effective way to ensure sustainability is to design the right framework and incentives for growth and development.

1. SymNet is a P2P network which is capable of going through evolutionary changes. New functionality are easily incorporated. File sharing and messaging is available and more possibilities will be introduced over time.
2. SymBlock, SymChain and SymTrans help put blockchain technology in the hands of non-technical persons. Applications will be easy to make and the dApp world will flourish.
3. SymWallet will allow users to interface with the network simply and intuitively. The smart wallet serves not only as a gateway to SymVerse, but also serve as an important link to real economic and non-economic activities.
4. SymStack and SymChain opens possibilities for revolutionizing the way data storage is handled.
5. SymID removes one of the greatest barriers to keeping cryptocurrency—fear of lost wealth because of a lost private key. Eliminating anxieties builds trust.
6. SymStabilizer and SYM supply help keep the SymVerse economy on a stable path. The opposite, highly volatile path produces uncertainties, which negatively impact growth and development of economic systems.
7. SymReward and SymMechanism encourage everyone to be active and to pro-actively contribute to the growth, development and sustainability of SymVerse.

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11. ORGANIZATION

1. SymVerse Foundation and SymVerse Inc

SymVerse Foundation and SymVerse Inc will be formed as legal entities in Malta. This is one of the earliest countries to institute fully articulated laws pertaining to blockchains, cryptocurrencies and distributed ledger technology. The laws are expected to be implemented in October 2018.

A. Role of SymVerse Inc

SymVerse Inc will manage the early part of the development of the the project. This includes product development, recruiting and managing staffs and advisors, fund-raising, and marketing. SymVerse Inc will also be in charge of forming and managing Citizen Alliance and developing the dApp community.

B. Role of SymVerse Foundation

SymVerse Foundation will manage all aspects of SymVerse platform. This will fall under the responsibility of the Board of Directors of SymVerse Foundation. In addition, the Foundation will establish:

1. Technical Committee (for managing issues related to technology)
2. Asset Management Committee (for managing SYM supply and all assets including funds received through ICO/IEO)
3. SymWorld Committee (for approving SymApps and managing dApp community)

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13. SYMWORLD ALLIANCE

SymWorld is growing rapidly. The following list provides a small sample of the relationships being formed.

- **RelateID** – Self-sovereign ID on blockchain technology
- **Hancom Secure** – Leading software company in Korea
- **SOFT** – Social environment business
- **CLC Foundation** – Health contents
- **NIX** – Game contents
- **Anysign** – Payment
- **INCUBLOCK** – Incubator
- **Green Dream Coop** – Urban clean-environment business
- **TV Storm** – Media
- **Mirhenge** – Big data
- **Sejong Appraisal Co., Ltd.** – Real estate
- **PIENCE** – LBS
- **BlockchainHub** – Community
- **OWDIN** – Storage
- **KeyPair** – Crypto currency hard wallet
- **AQOOM** – Social Network

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14. ROAD AHEAD

1. Timeline

The key milestones are planned as given in the timeline below. These are the best forecast of future events at the time this paper is written and are subject to change without prior notification.

Q1 2019	SymVerse Dubai Head-Office Establishment Testnet Alpha Release BaaS PoC
Q2 2019	ERC-20 Token Release Testnet Beta Release dApp Service Testing
Q3 2019	SYM Reward Constitution Open DigiFinex Global Exchange Listing Blockchain Based Coupon Service
Q4 2019	Mainnet 1.0 Release SDK Release Developer Site Open Smart Contract Toolkit Release Bilaxy Exchange Listing

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2. Injection of SYM into the Network

The injection of SYM into the network is summarized in Exhibit 10. The time horizon for the planned supply of SYM is for 30 years or more. Thereafter, the supply of additional SYM will be determined by the SymVerse constitution and the pertinent decision makers.

Exhibit 10
Injection of SYM into the Network

Short Term	Sub-Total	60%	600,000,000
	Partnering & Marketing	10%	100,000,000
	Team & Advisors	20%	200,000,000
	Sales	30%	300,000,000
Long Term	Sub-Total	40%	400,000,000
	Future Reserve	30%	300,000,000
	System Supply (Over 30 Years)	10%	100,000,000
	Total SYM Supply	100%	1,000,000,000

For the 30-year horizon, the total supply is 1,000,000,000 SYM. Short term, over a period of 3 years, 600 million SYM will be supplied. Among this amount, 300 million SYM will be through sales. The others will be allocated to partners, SymVerse team members, and advisors. Where appropriate, these allocations will be accompanied by certain restrictions such as lock-up periods.

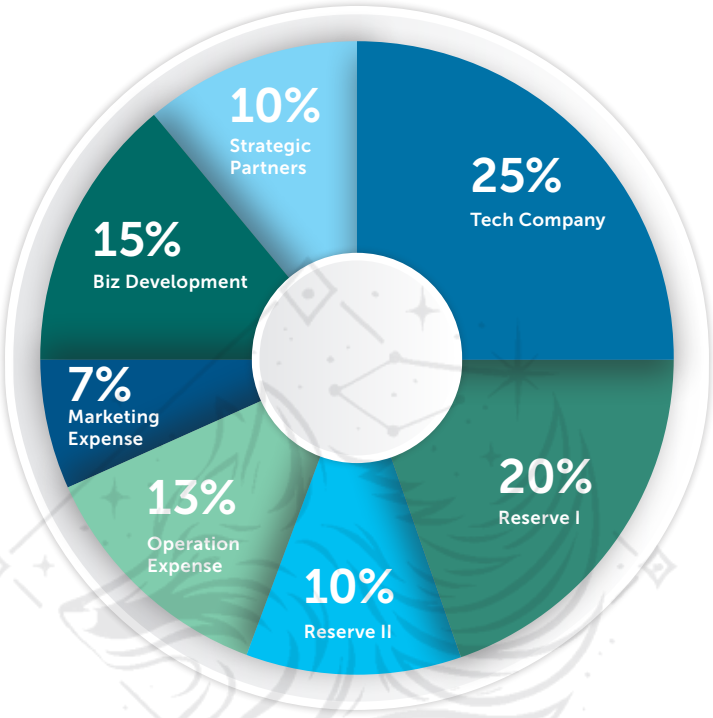
100 million SYM will be injected in relation to the future production of new blocks. Since the SYM supply function allows for adjustments in the rate of new SYM injection, the exact time for the full introduction of the 100 million SYM into the network cannot be predicted at the outset. SYM supply program will target a period of 30 years.

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3. Use of Funds

Funds raised through the sale of SYM will be used as follows:

Exhibit 11
Use of Funds



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APPENDIX A: NEW WORDS

1.	**SymVerse**	decentralized blockchain platform
2.	**SymNet**	network
3.	**SymSensus**	concensus mechanism, featuring Proof of Network (PoN)
4.	**SymBlock**	multi-block block
5.	**SymChain**	multi-block blockchain
6.	**SymTrans**	universal transaction processor
7.	**SymStack**	storage method, using snapshot
8.	**SymWallet**	smart wallet
9.	**SymID**	identification and account management system
10.	**SYM**	cryptocurrency native to SymVerse
11.	**SymStabilizer**	stabilizes SYM supply
12.	**SymReward**	compensation program for participants of block production

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13.	**SymMechanism**	incentive compatible mechanism
14.	**SRC**	SymVerse Request for Comments (cf. ERC in Ethereum)
15.	**SixEss**	goals (Speed, Simplicity, Scalability, Stackability, Security, Sustainability)
16.	**Citizens Alliance**	SymID management service

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