GLOBE

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I. Executive Summary

GLOBE is a natural synthesis of the Gold standard and the FIAT monetary system, reinstating real value as the basic building block of the financial system. Courtesy of blockchain technology, the supply of GLOBE will be increased to exactly match world earnings and production growth, as measured by official GDP data. GLOBE will be a digital benchmark for how national currencies and monetary systems should be managed in order to reap the greatest social and economic benefits. A GLOBE-based world monetary system will prevent trade deficits, discourage unproductive speculation and resource allocation, and lead to optimal economic growth and income distribution. The Network will use a PoA consensus system with Nodes elected and authorized by the GLOBE Foundation. This will allow GLOBE to maintain high transaction rates, industry leading security and agility to remain competitive going forward.

II. Introduction

i. Currency and Value

Throughout the ages, gold has been used to represent value. Because of gold's ability to keep prices stable, it was considered the best option available for currency. But gold's price-stabilizing property was only its indirect qualifying characteristic. The underlying reason why gold was chosen as world currency was the way its circulation increased in line with economic production and income. However, because GDP figures were not fully developed until the mid 20th century, this GDP link was overlooked.

Use of gold as currency remained in place for around 5,000 years, undergoing small changes to improve ease of use. Gold competed with silver (ref Pound Sterling) as the best representation of value, but the supply of new silver from the silver mines was periodically too big and so gold became the unifying world currency by the late 19th century. With World War 1, the gold standard was suspended, as is usually the case when governments borrow or print excessive money to wage war. After the war, the gold standard was strained by excessive debt and a gold production that trailed economic growth. A shift began whereby the United States Dollar and British Pound became global reserve currencies, linked to gold. In 1931, the UK abolished the gold standard. In 1933, the US followed suit, prohibiting the private ownership of monetary gold. In 1944, the US dollar became the only world reserve currency, and in 1971 the commitment of the US Federal Reserve to exchange dollars for gold was unilaterally suspended by the US government.

Since 1971, a growing divide has developed between money and economic production. With fiat currency to (mis)represent real value, economic growth has halved and global debts have increased from about 100% of GDP to more than 3 times that level today. The escalation in debt is exponential, with credit expanding 7 times economic growth in 2017 (the last full year from which we have data, figures from IIF). With credit spiralling off from its economic base, asset prices have done the same. Of the $21 trillion in credit growth in 2017, only $3 trillion had a natural origination in economic production and income. The rest, an incredible $18 trillion, or 23% of GDP, was manufactured by the financial system.

This is what governments call low and stable inflation. In reality there is nothing low and stable about a monetary system that allows $8 out of $9 in debt growth to pass under the inflation radar to inflate housing and financial markets. Inflation is not really an increase in consumer prices, it is an increase in money supply over and above economic production. When the gold standard was in operation, inflation was directly related to the money supply. This was changed after the gold standard was terminated and governments shifted the focus from fair and stable money to inflation targeting.

The inflation era was off to a rough start. Contrary to what was expected, unemployment increased and economic growth declined. A new economic expression was coined in the 1970s: stagflation. Since then, economic growth has continued to fall for four straight decades. At the same time, debt and inequality have soared. Before the suspension of the gold standard, workers got their fair share of production in the sense that they were compensated for both inflation (if there was any) and the production growth they contributed towards. This is how Western workers were lifted out

of poverty, from the subsistence level to a state where the average worker could afford to buy 5 times the food he or she needed. It is a mistake to blame capitalism for the inequality and inequity that have developed after the gold standard was suspended; the validity of the free trade theory that underlies capitalism remains unchallenged 200 years hence. The real offender is the monetary system.

When the gold standard was in operation, an on-going trade deficit was impossible because a country running a trade deficit would have to pay for the excess imports in gold and thus find itself running out of gold reserves. Today, funding a trade deficit is no problem. Banks can, and do, lend as much money as they wish. It has been empirically proven that banks create loans and deposits simultaneously, at the push of a button. This allows nations to outsource production and jobs to lower-cost nations and pay for excess imports with FIAT credit. This undermines the best interests of workers and expands the banking sector at the expense of the rest of society.

The FIAT currency system forces people to speculate in stocks and real estate in order to maintain the purchasing power of their money. This deprivation of personal freedom is not only socially and economically debasing our societies, it feeds the craving that has been associated with human misery since the days of the first philosophers.

A deflationary currency is not the solution to any of this. Bitcoin has brought us an invaluable new technology, but as a fixed circulation currency it cannot work as a world benchmark currency. A fixed circulation currency would make prices fall by the same rate as economic growth. Like an inflationary currency, a deflationary currency would foster unproductive speculation, only of another kind: Where inflationary currencies make people speculate in stocks and real estate, a deflationary currency would make people hoard the currency itself until prices stop falling, most likely not before economic growth hits the zero mark. This is why economists speak of deflation and economic depression in the same sentence. Bitcoin was designed to be a peer-to-peer payment solution. It is unsuitable as a world currency.

Inflationary and deflationary currencies err on each side of the economic equilibrium represented by real economic growth.

III. SOLUTION

i. GLOBE

GLOBE is a pure representation of real value creation as measured by official global GDP data.

GLOBE is an objective and unpolitical world currency that will be distributed in a transparent manner using tried and tested distributed ledger technology. The supply of GLOBE will increase by the exact same rate as the growth of global GDP.

GLOBE will not replace existing national currencies. The purpose of GLOBE is to serve as a trusted benchmark for how national currencies should be managed. In this way it is similar to gold, only more accurate, efficient, transparent and trustworthy in the way it administers the correct amount of currency to the world economy. Like Bitcoin, gold was never meant to be a world currency, it was simply the best choice for currency among metals. In terms of a currency's role as a store of value, GLOBE defines what money should and must represent.

GLOBE is designed to drive users towards a savings and productive investment mindset. This is achieved by the GLOBE currency insulating users from inflation.

GLOBE is a digital currency made available to all. Oracles will be an integral part of the system to propose the increase in supply each year. The distribution of GLOBE will be carried out daily to GLOBE holders in proportion to daily wallet balances, thus ensuring fair distribution to all users. Oracles will be nominated by a Foundation which oversees the management, promotion and operation of the GLOBE digital currency. Network Nodes will be nominated by the Foundation to process transactions with specialized hardware. This will enable future upgrades and ensure that only certain nominated parties can run nodes. Should parties be found to attempt to tamper with the network or attempt attacks, they will be removed as a node. Nodes will be rewarded with transaction fees to ensure sustainability.

GLOBE will be high-speed and contain data specific to transactions that are stored on the blockchain. Transactions data will be immutable and fully transparent.

ii. Oracles

GDP growth is external information that is not naturally registered on the blockchain. Therefore, GLOBE needs an "Oracle" to feed the GDP growth. This has been a central problem for blockchain developers.
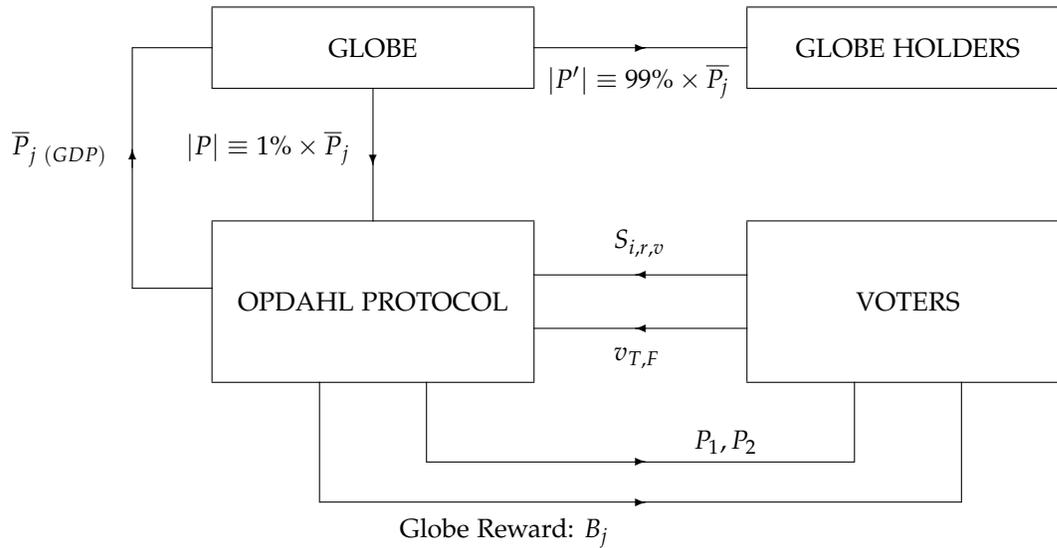
GLOBE

GLOBE HOLDERS

$|P'| \equiv 99\% \times \overline{P}_j$

$\overline{P}_{j\ (GDP)}$

$|P| \equiv 1\% \times \overline{P}_j$

OPDAHL PROTOCOL

$S_{i,r,v}$

VOTERS

$v_{T,F}$

P_1, P_2

Globe Reward: B_j

Figure 1: *Proposed decentralized Oracle model*

There are several theories on how this can be solved in a decentralized manner, but no solutions that are fully without a central point of failure exist. In every proposed solution, there has been an element of undesirable centralization.

"Though there is every reason to mistrust government if not tied to the gold standard or the like, there is no reason to doubt that private enterprise whose business depended on succeeding in the attempt could keep stable the value of a money it issued." - F.A Hayek (Nobel laureate in economics 1974)

In the beginning, the GLOBE Foundation will manage the total supply of GLOBE by manually increasing the supply with correct, official GDP-numbers as specified in IMF and World Bank publications. The GLOBE Foundation realizes that its members represent a single point of failure of the kind that the blockchain technology was created to resolve, but the risk of failure is minimized by the incentives of the GLOBE Foundation to produce the expected supply adjustments.

The GLOBE supply is totally transparent and any deviation in the GLOBE supply growth from actual GDP growth will lead to a loss of trust in GLOBE. Potential competition from other currency suppliers ensures that the GLOBE foundation will be committed to supplying the exact number of GLOBE to mirror global economic production. It is possible to use a combination of centralized and decentralized oracles and gradually phase in the proposed decentralized version when the technology for this is sufficiently tested and the data can be fully trusted and verified.

A description of a possible decentralized solution is outlined in figure 1. In a research paper by Adler et al. published on 1. August 2018, an oracle solution called Astraea is presented. Astraea improves upon previously proposed solutions to decentralized oracles. An evolution of the Astraea ideas is proposed in a research paper called "Shintaku: An End-to-End-Decentralized-General-Purpose Blockchain Oracle System." Shintaku focuses on implementation and solves, in a better way, the special case of the verifiers dilemma: the degenerate case where all voters consistently vote "true" or "false" and always reward users, creating a garbage in, garbage out feedback loop. GLOBE further improves upon this research in its deceentralized oracle model. In it, players are incentivized to participate over the long term through a GLOBE rewards structure.

By implementing the Opdahl protocol to GDP input, GLOBE will be decentralized and autonomous without a single point of failure. The system is designed to be completely permissionless and based on staking. The protocol will by design prevent sybil attacks without requiring users to identify themselves. Players use GLOBE to act with the Oracle. Players decide themselves when to participate in contrast to earlier proposed solutions. The protocol is based on a voting game with an economic incentive to play truthfully.

The proposed oracle system is made up of two classes of players, submitters and voters. The submitters submit a number of predefined proposals of the next period's GDP change that is to be voted on by the voters of the game. The model accepts any numerical proposals. Every proposal has an attached bounty or reward of GLOBE tokens to be distributed

to truthful players voting along with a majority. The level of the majority or consensus that is required is one of several parameters that is decided by the council.

A player i who wishes to participate in this voting game, stakes a number of globe tokens on a currently unknown proposition. The Opdahl contract returns with two random propositions. The randomness in the proposition assignment represents a configurable resistance in the cost of manipulation of individual propositions. The player votes truthfully if he believes the propositions to be *TRUE* (T) or *FALSE* (F). If a player decides with the majority, the player is rewarded with a share of the bounty $B(j)$ from proposition j according to the reward model, where $B_j = 1, 2 \ldots |P|$:

$$(1) \quad R_{v(T)} = \frac{1}{2}\left[\frac{S_{i,1,T|F}}{S_{TOT,1,T|F}} \times B_1 + \frac{S_{i,2,T|F}}{S_{TOT,2,T|F}} \times B_2\right]$$

The player does not choose the amount to stake in the two different propositions in the proposition pair. The stake is split evenly between the two propositions. Players are rewarded for each proposition in the pair independently. When a player agrees with the majority, he is eligible for a reward, and if he disagrees with the majority he is penalized by having his stake slashed. The player only receives a reward when votes differ, meaning one vote for *TRUE* and one vote for *FALSE* on a set of propositions. If a player receives two propositions where he believes both to be either *TRUE* or *FALSE*, resulting in a vote TT or FF, the stake is returned to the player if his votes agree with the majority. Another parameter that needs to be defined in the contract is the maximum stake amount, S_max. The S_max limit prevents a large player to take control of the votes through staking large volumes of GLOBE.

In a perfect world, every player would vote *TRUE* on the correct GDP growth. The expectation is that players vote truthfully, because they are economically incentivized to do so, but with an accuracy, q, which is not equal to 1. In the event of several propositions being accepted as the correct proposition on the "correct" GDP change, the arithmetic average over $P(j)$ proposals will be the resulting output from the Opdahl protocol to the network.

The GDP change will then allow for the creation of more GLOBEs that will be distributed to the existing GLOBE holders. To ensure long-term sustainability the GLOBE will keep a small percentage, expected to be 1% or less of this GDP increase and spread over a number of new proposals every quarter to create incentives to participate in future voting.

Voting for GDP changes and thus for adjustments to the GLOBE supply will be done on a per wallet basis. In order to vote, users must stake a small amount of GLOBE. This is designed to discourage false voting and botting, wallets that participate will require verification aiding in removing malicious activities. The voting system will also be used for elections in the Foundation. There may be tests to ensure voters have studied materials applicable to the vote, ensuring all facts are known, showing sufficient capacity in voters to contribute positively to the community.

iii. Governance

The GLOBE Foundation will be an overall governing body for the GLOBE currency. The Foundation's purpose is to promote adoption of GLOBE and to maintain the currency with two key principles in mind:

- Maintain the Opdahl Protocol and ensure that the circulating supply matches economic output as closely as possible.
- Ensure the network remains secure and stable.

The GLOBE Foundation will consist of a number of council members who will be elected by GLOBE holders. Elections will require users to use wallets where issuance is subject to KYC - proving identity, checks will then be carried out to ensure wallets are not held en masse by nefarious entities. Council members will serve for 2 years and may serve a maximum of 2 consecutive terms. Further terms may be served following a single term absence. Council members will have no restriction on location, only a minimum age of 18 will apply. This is to ensure a diverse and well-rounded council.

Voting of the council will require a two thirds majority to pass resolutions, without this majority, the resolution will fail and will need to be resubmitted. This is to ensure that progress can be made without needing an unanimous vote, which can often lead to failed outcomes. As part of this, the council will have the opportunity to remove and reallocate nodes should they consistently fail to accept legitimate transactions or be found to attempt to insert illegitimate transactions. The Council will also be responsible for driving forward technical innovation, and so may propose changes that will provide security or performance improvements to the network.

GLOBE will be designed such that protocol, algorithmic or security changes can be made without significant effect on network stability. This ensures the council and GLOBE will remain competitive in a changing environment. Changes and additional capabilities may be

requested by network users and will be subject to regular voting. The council will retain the right to veto any outcome if it is defined to contravene the two key principles.

IV. Token

i. Key Benefits

GLOBE offers a number of benefits over existing blockchains, digital and fiat currencies. The system itself is decentralised, with the council and node structure ensuring that no single entity can control the network. By using a *proprietary blockchain* regular updates to competitive capabilities and network security can be made, ensuring future prominence. Finally, GLOBE is designed to be truly stable relative to real value, a key issue that has been lacking in all digital and fiat currencies.

ii. Network

Once development of the network is completed, tokens will be issued. The GLOBE Network will consist of 21 nodes (validators). Operation of the network will function as follows:

1. Transactions are broadcast to all 21 nodes

2. Nodes add transactions received into a block

3. Nodes check transactions against the master ledger for available funds

4. Nodes broadcast block completion time and failures

5. Two thirds of Nodes agree, the block is broadcast as 'accepted' and all nodes then update the master ledger

The Network operates on a Proof of Authority (PoA) consensus mechanism, where nodes are authorized by the GLOBE Foundation. This ensures that Nodes that show a poor trend are replaced, Nodes will also need to stake a number of tokens to ensure there is an incentive to maintain legitimacy. Though there is staking, authorization is not dependent on the stake nor the size of the stake, therefore, the system remains PoA. This ensures network integrity, while also maximizing efficiency due to a small footprint and enabling high transaction throughput. Due to the nature of the network and its intended use case – primarily for highly secure, large transactions, GLOBE can be considered to be a permissioned, semi private, PoA blockchain (top two diagrams on the next page).

Block time becomes limited by a few key principles:

- Number of transactions submitted to the network (block size)
- Network latency
- Node hardware capability

Block sizes are yet to be decided, as it will be dependent on bandwidth and latency of nodes on the network and so will likely use a dynamic system to ensure optimized network performance. Blocks will be designed to contain a minimum number of transactions which will be increased with increased utilization of the network and hardware limitations. The initial minimum will be set at 20 transactions. Therefore, a block will require a minimum of 20 transactions, after which the nodes will begin a time based countdown to account for global network latency. Once the countdown is complete the block will be considered filled and will then be processed as above. Countdown time may also be reduced as network and node requirements dictate. It is expected that a 0.5 second block time will be required to ensure individual transactions are executed with sufficient rapidity for all use cases. Blocks effectively will be capped by data transfer limitations as ever more transactions are carried out.

Fees for transactions will be pegged at 0.1% of transaction value, capped at 10 GLOBE. Transaction fees will be attributed to ensure Nodes make a 20% margin on operating expenses, the remainder of the fees are attributed to the Foundation.

The GLOBE Network will be able to accept additional data, much in the same way as other digital currencies. This will initially only hold text details. As the network grows, additional functionality will be added, based on feedback from network users and nodes. This may include an ability to run side chains for governmental and company internal funding, with the resulting changes posted to the network. Due to the intended use case of the network, it is not currently anticipated that full smart contract capabilities will suitable or required for the network. However should feedback from the network dictate, this may be added.

GLOBE believes the system, though primarily catering for institutions, may be used by anyone with any size of transaction. Security and reliability are therefore of utmost importance. GLOBE will remain proprietary in order to protect the network and will only be made available to partnering entities.

iii. Propriety network VS Existing network

There are several considerations to account for in using a proprietary GLOBE network or using an

existing network such as Ethereum or Bitcoin. Key issues to account for with a network designed to replace existing monetary systems is to know and trust those that are safeguarding a users balance and transactions. Existing networks such as Ethereum and Bitcoin are effectively centralised and controlled by large corporations. Producers of ASIC mining hardware have significant influence over the network. This negates any benefit provided by a potentially decentralised network. GLOBE will aim to avoid such issues by using custom hardware, rolling algorithms and PoA.
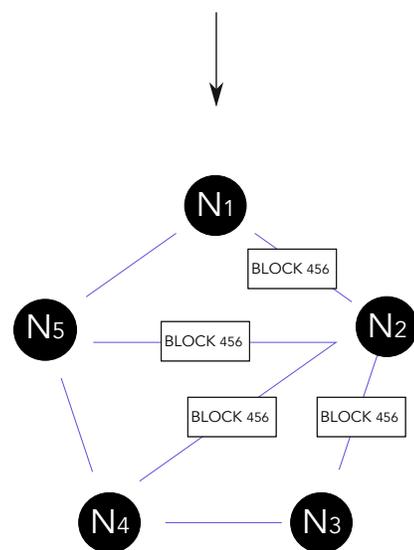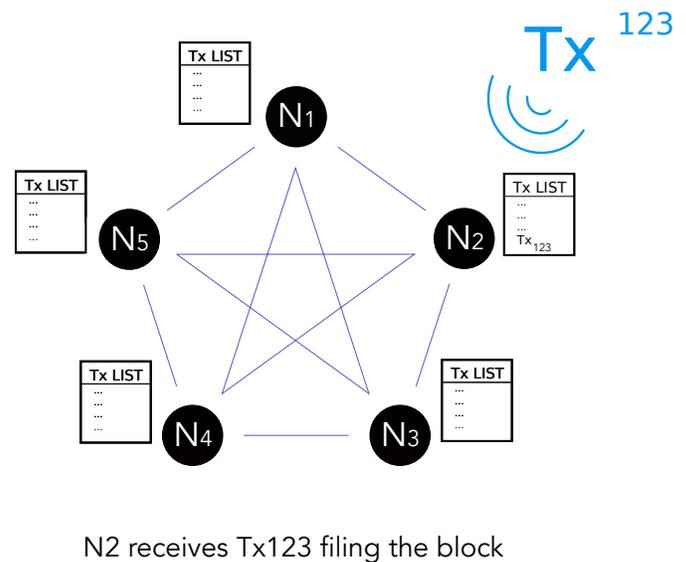
There are arguments for PoW, PoS and PoA consensus, GLOBE believes in PoA due to the ability to ensure nodes are trusted. If users and institutions have confidence in the network, the likelihood of acceptance increases. PoA is the idealised middle ground between fully decentralised and anonymous and, centralised but known.

iv. Algorithm Switching

The GLOBE Network will undergo regular algorithm switching. This is to ensure continued network security against brute force attacks and to ensure non approved hardware cannot be used in the network. Algorithms will be proposed by users or the council to be used within the network, they will then be audited to ensure stability and security equivalence with SHA3 standard or greater. To ensure all nodes are synchronised, all software will be updated in parallel, tested on a test net before being taken live. The parallel computing capability of the hardware used ensures this can be carried out by all nodes without disruption to the network.

v. Network Attack Resistance

The GLOBE network uses PoA, with nodes being appointed by the Council. This is designed to drive reputational awareness on the platform. Nodes will sign communications with the network, this means that unsigned communications will be rejected by the network nodes. Therefore, unless a node is appointed and has the ability to sign transmissions, they will be disregarded from the network. This then works to not only keep the network intact, but to help with trust, if a node fails to be trustworthy, its signing capability can be removed and network integrity is restored rapidly.


N2 receives Tx123 filing the block

N2 applies timestamp and broadcasts to network N1,2,3,4,5 receive completed block from N2 . Timestamp is earlier than their blocks or they have not yet filled their blocks and BLOCK456 is processed.

Figure 2: *Verified transactions transmitted and block is accepted. Simplified overview of the consensus method in the GLOBE PoA protocol. Only 5 nodes were used to convey in an easily deciphered diagram how blocks are filled, transmitted, processed and accepted.*
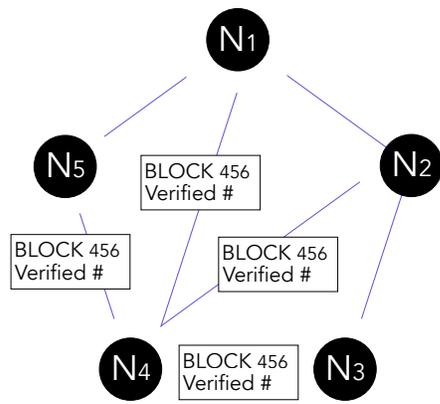
N 3,4,5 agree and broadcast acceptance to network. N1 receives N-1 acceptances first and, combined with its acceptance, broadcasts acceptance hash to network, results are written to master ledger and new block is formed.

Figure 3: *Transmitting verified transactions to the network and accepting blocks*
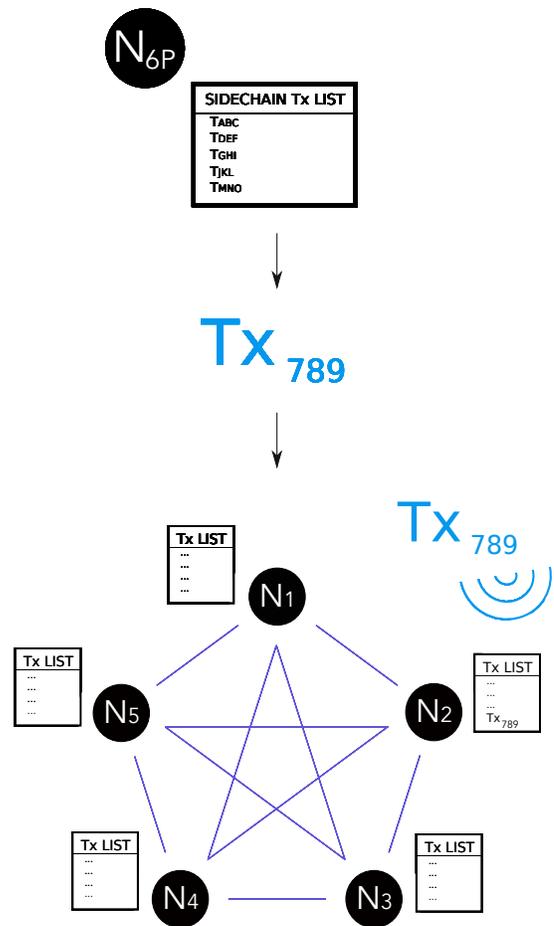
Figure 4: *Design for an entity to run internal transactions. This provides large entities with the ability to conduct a significant number of transactions internally without incurring transaction fees associated with publishing to the main network each time. Furthermore, entities may choose when to publish, this enables the company to undo transactions the may have been made by mistake with ease. In these transaction the company may keep an entirely separate ledger with as much data as needed, removing any unnecessary or confidential traffic from the public network. Frequency of updates is to be defined by the private network operator.*

vi. Nodes

21 Nodes will make up the GLOBE network. This is to ensure sufficient decentralisation away from singular entities and to provide for the two thirds consensus rule. Node operators will be full nodes meaning each node will keep a primary and backup of the full chain. Nodes will operate hardware as dictated by the Foundation. This will be highly specialised equipment capable of high throughput and adaptable to future changes in network protocol, algorithms and functionality. Each node will be required to purchase the hardware from the Foundation, with hardware being closely monitored

and serialised with a unique signature to ensure only registered hardware contributes to the network.

vii. Security

GLOBE will implement SHA3 standard algorithms ensuring all traffic, transactions and data is protected. Due to the network hardware, it will be possible to rapidly implement new security methods as they become available. GLOBE will aim to use the most secure methods at all times.

Considering the scale and scope of operations that governments and large business users represent, security is a key concern for the network. In large transactions, speed becomes less of a concern when compared to security of the transaction. This leads to a tiered structure for transactions. Smaller transactions will be authorized as rapidly as the network allows, and as transactions grow in size, they will require a greater number of processing blocks to be authorized. It is expected that transactions will fall under the following categories:

Size of transaction(GLOBE)	Processing requirements
<1,000	Single block
1,000<X<100,000	5 blocks
>100,000	100 blocks

Block processing requires that larger transactions be processed multiple times. Each time the transaction is processed and 'accepted' in the block, a signifier is added to denote the processing point. This then enables either party to cancel the transaction by sending a cancellation request to the network. Cancellation requests have the same block processing requirements as transaction requests. Block processing requirements will be under the jurisdiction of the council and may be changed as the network requires.

viii. Wallets

There will be a number of wallet types offered, this is to cater for differing markets and usage requirements. This is analogous to the traditional financial system where a large institution may want a number of people to have access and potentially more than one person to authorize transactions. A personal account may want something simple, with few restrictions but simplified capabilities. GLOBE aims to cater for all markets with having a number of wallet types available for those that need additional features or a simple wallet. To deliver a currency that is available to all, every wallet

will have several key features as given below.

- KYC required to gain a wallet
- Unlimited transfers and value held
- Obtain records output showing transactions and balances
- Send to others through simple ID

Further features will be offered in more advanced wallets:

- KYC of individuals who will have access and entity registration details
- Multi-signature capability through password or biometrics
- Add additional data to transfers

Simple ID is a system designed to make the transfer of the GLOBE digital currency as easy as possible, with minimal difficulty. This means users will be able to transfer GLOBEs using a short numeric ID associated with their profile. This ID will be generated instantaneously and will be valid for a user-defined period, a Professional wallet will be able to request Simple IDs without an expiry date. Once a payment has been made via Simple ID, the user will have the option to save the sender to a locally stored address book or to associate with a contact in the address book.

ix. Development

Development of the GLOBE blockchain will begin in the second half of 2019. It is expected that an alpha will be produced in around 6 months, showing basic functionality and proof of intended functionality. At this point there will be consultation with early stakeholders to incorporate changes to improve security, capability and stability. Once Beta development begins significant lobbying integration with traditional institutions will commence. This will begin in a targeted manor, integrating with regional organizations and authorities before expanding globally. Using a regional approach allows GLOBE to develop firm relationships in forward thinking regions. Further rollout with institutions will be applied as quickly as is practicable.