BlockNum

An environmentally green
telephone number blockchain transaction
public switched SIP-based telephone network
using Proof of Consensus

GIGA

A transport token powered
by the revolutionary BlockNum™ blockchain network

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BlockNum

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Background

Since their conceptualization and implementation in the early 1990's, the use of blockchains and their transactional mechanism for both crypto and fiat currencies has increased exponentially – gaining popularity as both a means of executing financial transaction and as a straightforward investment asset.

However, despite their success as a means of executing financial transactions - the very nature of a system of decentralized ledgers using blockchains - the success of blockchains has led to a series of unintended consequences and bottlenecks in the system.

Included in this is the fact that blockchain transactions are astoundingly bloated and energy intensive – with a single transaction consuming more electricity than several houses in a day, and the fact that transaction times are now measured in times than can reach hours. The resulting increase in network has led to more servers coming online and the need for the blockchain to intensify the cryptographic complexity of transactions – therefore leading to even higher levels of energy consumption.

Furthermore, the complexity and "mysterious" nature of cryptocurrencies has limited their more widespread use with only some 15 million blockchain wallets in existence as of November 2017.

Clearly this is not a sustainable situation either from an ecological perspective or a practical one as the number of users increases and the current blockchain environment is a functional barrier to more mainstream use. Nevertheless, the principles of a blockchain as a digitized and highly decentralized public ledger of cryptocurrency transactions remain attractive to current users and to an ever increasing population of users and potential users.

With this in mind, this white paper introduces a radically new way of executing blockchain transactions which maintains the full integrity of the blockchain but without its inherent inefficiencies through the use of the traditional Public Switched Telephone Network, commonly referred to as the "PSTN". This mechanism consists of two primary components:

1) BlockNum - a technology which uses the PSTN for the blockchain
2) GIGA – a transparent transport token which carries all transactions within the BlockNum

The BlockNum and GIGA token will allow simple and rapid transactions to occur between BlockNum users. Furthermore as a transparent "transport token", the GIGA will be able to seamlessly facilitate transactions between users in their choice of:

1) Fiat money
2) Cryptocurrency
3) Utility Equivalents

The BlockNum

BlockNum is a Distributed Ledger Technology ("DLT") which uses the Public Switched Telephone Network to support secure transactions for the GIGA token through the development of a **Public Switched Teliphone Blockchain Network** or **PSTBN**. BlockNum is a highly permissioned blockchain with an access control layer for the blockchain nodes based on SIP messages with communication occurring solely via SIP-based message over IP protocol.

The PSTN provides an immense installed decentralized network base and when combined with SIP message, is an immensely secure system which is instantly scalable to allow the BlockNum to reach any person in the world who has a phone and phone number.

> The GIGA is the first token that can be fractionally "consumed"

BlockNum will operate on the principle of "**Proof of Consensus**" or **PoC** as opposed to "Proof of Work" "Proof of Stake" blockchains. Proof of Consensus focusses on determining that consensus has been achieved (the "consensus event") within a network of decentralized distributed ledgers and where the ledgers are held within a combination of trusted and independent anonymous nodes. Transaction "consensus" is achieved through a second layer of token nodes which sole function is to approve or deny a transaction in a consensus event.

The mathematics behind PoC is based on the well-established concept of "**Consensus Theorem**" which is a component of Boolean algebra used for reaching a basis of consensus.

This approach makes BlockNum PoC transactions equally robust as the current alternatives but much faster and significantly more energy efficient.

BlockNum will therefore be the first blockchain to be green and ecologically sound

The GIGA Token

The GIGA is the token which transports all transactions in the BlockNum. Therefore unlike cryptocurrencies, utility tokens or tokenized securities, the GIGA is a "transport token". As a transport token, the GIGA seamlessly "transports" a transaction between parties in the BlockNum in any combination of fiat, cryptocurrency or utility. This means that a transaction can begin in GIGAs, fiat, cryptocurrency, or utility while terminating in the same format or any other format.

A unique feature of the GIGA is that is the first "consumable" token with the ability to be consumed in real time. This means the GIGA can be used by companies such as mobile carriers to use the GIGA as a means of payment for services in real time.

In order to increase the practical aspects of the GIGA, a GIGA Exchange Network or GIGEX will be established to allow for the exchange of GIGAs to physical fiat currency at peer reviewed locations.

BlockNum Network Elements

BlockNum consists of five key network elements and the BlockNum network interfaces with a number of external components.

Each BlockNum node will be assigned a node number and working telephone number. The phone number will be assigned based on the node's geolocation (using appropriate country, city and regional codes as applicable). The latter is required because of the PSTN/SIP and for future routing purposes.

1. The BlockNum SIP Server

The BlockNum Server ("BNS") is an Asterix-based SIP Back-to-Back User Agent (B2BUA), SIP Registrar and is used to interconnect with the Public Switched Telephone Network (PSTN) SIP Trunk Gateway. It is the primary interface between BlockNum users and the BlockNum.

2. The Session Border Controller

The Session Border Controller ("SBC") acts as a transaction evaluator of sorts. As a BlockNum transaction proceeds through the verification process, an SBC will decide whether there has been sufficient validation by BlockNum nodes or whether the verification process needs to continue.

This determination is based on an algorithm which examines several factors such as the complexity of the transaction, the number of previous node verifications and the overall load on the BlockNum network.

All SBCs will be operated by BlockNum as this supports the integrity of the network and the gateways themselves require very little computational resources.

3. The Token Proxy Node

The token proxy is a SIP server and is the primary interface node between account holders, their GIGA wallets and the BlockNum. The role of the token proxy is to validate the transport token transaction through Full Nodes.

There are 2 types of token proxies. The first is what can be referred to as being part of the BlockNum trusted network. Token proxies within the trusted network have been otherwise vetted by BlockNum and therefore considered part of the trusted network.

The second type of token proxy is a server which is outside the trusted network. These are essentially operated by independent third parties and whose ownership may or may not be known to BlockNum.

Token servers within the trusted network are given an odd number identifier (e.g. SPS1, SPS3, SPS5 etc.) while token servers outside the trusted network are given even number identifiers (e.g. SPS2, SPS4, SPS6, etc.). This allows the BlockNum to easily identify which token servers reside within or outside the trusted network and forms part of the overall verification security configuration.

As will be the case with other components and which will become evident as we elaborate on a typical transaction, this allows BlockNum to utilize server services outside its trusted network and retain trusted integrity of the transaction. For any given transaction, it is a requirement that it commence and terminate via a trusted token proxy path.

4. The Token Full Node

The token Full Node is a SIP proxy server with a complete BlockNum SQL database – the history and status of the blockchain. The database is essentially a full ledger of GIGAs including who owns them and the number owned by the account holder. In general even though each Full Node will contain the complete SQL database, specific Full Nodes will be tasked as primary account registrars based on country codes.

The role of the Full Node is to validate the transport token which has been provided by a token proxy. As with the token proxies, Full Nodes will be assigned sequential Full Node numbers where odd numbers represent Full Nodes within the BlockNum trusted network and even numbers for Full Nodes outside the network. For a transaction to be validated, it must have been verified by no less than 51% and no more than 79% of Full Nodes which have been involved in a given transaction. This ensures the integrity of a transaction and eliminates the possibility of tampering by Full Nodes outside the trusted network.

5. The Token Super Node

The token Super Node is a SIP Proxy server which in its native state contains no data but which collects data regarding a transaction for comparison with other Super Nodes which populate transaction information and act as a checksum for any BlockNum transaction. The Super Nodes therefore provide the final transaction verifications before a BlockNum transaction is determined to be valid. The Super Nodes also maintain the Ethereum wallets in GIGA equivalents on behalf of the accounts in the Full Nodes.

BlockNum Transaction Fees

As with any blockchain, servers or nodes which participate in a transaction are paid a fee for services, whether this be for PoW, PoS, etc.

Fees for a transaction, payable in GIGAs will be incurred by the initiator of the transaction on the following basis:

a) 1% of the value of the transaction (transaction fee) distributed as follows:

Fee Paid to:	% of Transaction
BlockNum	0.100%
Session Border Controller pool	0.135%
Token Proxy pool	0.135%
Token Full Node pool	0.270%
Token Super Node pool	0.360%
Total Fee	1.000%

plus

b) the applicable cost of a the telephone call(s) required for automated confirmation (call fee) which will accrue to BlockNum

This fee approach contributes significantly to the low energy requirements of BlockNum versus the highly competitive alternatives which rely on heavy computational requirements to contribute to cryptographically-secure ledgers.

Democratic Principles

Nodes will be assigned randomly during the transaction process. This supports the notion of democratic principles of the blockchain – principles that are rapidly eroding with the move to heavy concentration of blockchain mining. The randomness and low energy requirements of BlockNum will mean that small mining operations will still be able to participate profitably and democratically to the BlockNum. However there is still an incentive for efficiency and a scaling as transactions must be completed in order to be available in the node queue.

BlockNum Transactions

Every transaction in BlockNum transaction follows the same sequencing, interaction between BlockNum components as needed and ultimately transaction completion by consensus through quorum. Interaction between components is via the SIP messaging process with transaction information added cumulatively to the customized SIP header from hop to hop.

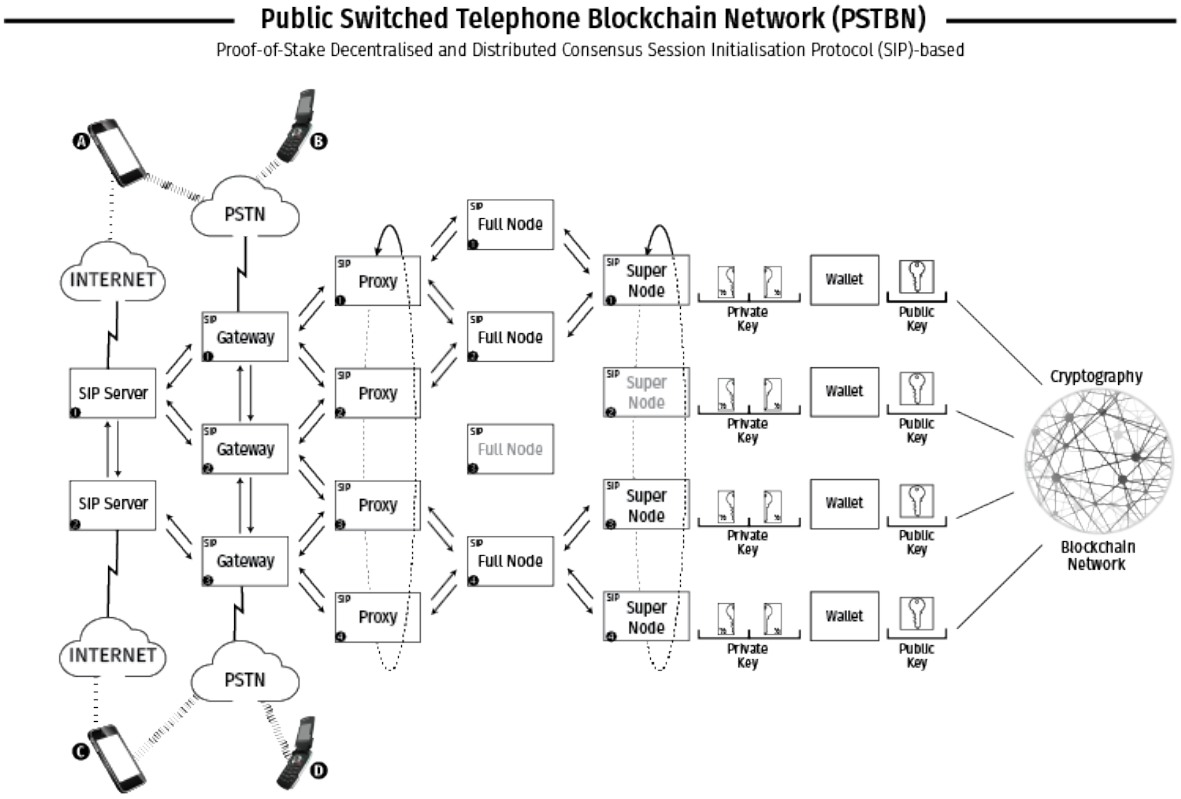
In terms of general sequencing transactions consist of:

A) Transaction Initiation
B) Generating a SIP message based on a standard template with custom header (which is continuously updated through the transaction) with transmission of TLS encrypted messages via port 5061
C) Pre-Approval of the transaction
D) Verification and queuing of the transaction
E) Consensus
F) Clearing of the transaction queue and database update
G) Check Status of transaction
H) Notification

A transaction initiation can consist of:

A) General interaction with BlockNum (e.g. queries, account creation, account transfer etc.)
B) A transfer request to send to another account
C) A transfer request to receive from another account

This is generalized in the following diagram.

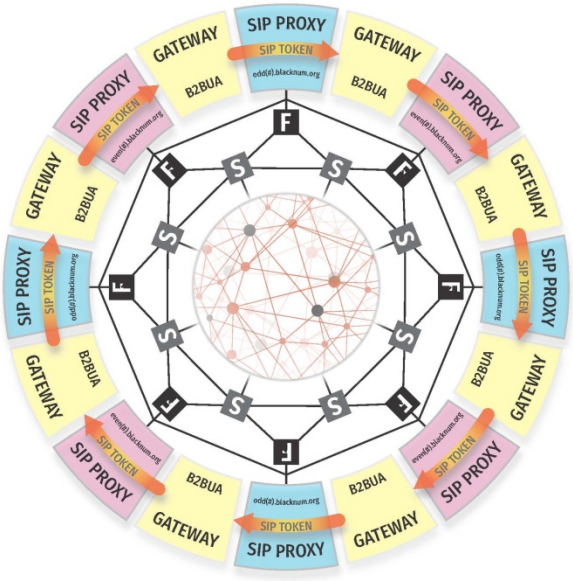


BlockNum Transactional Ecosystem

The figure below shows a global view of the BlockNum transactional ecosystem and the specific network elements (nodes) involved in reaching PoC.

The PSTN

The PSTN is the oldest, most ubiquitous, most robust and most decentralized communications network in the world. It is an "always on" network, available in virtually any location, and is operated by thousands of local network operators. It also offers BlockNum the ability to be instantly scalable because BlockNum accounts are based on phone numbers meaning anybody with a phone number can establish a BlockNum account. As the white paper will describe, BlockNum transactions always occur between two phones on the PSTN. However while any



phone can be used to receive a transaction, BlockNum transactions must be initiated on a smartphone.

SIP Messages

Session Initiation Protocol or "SIP" is at the heart of communications in the BlockNum. As such, the BlockNum is not connected directly to the Internet but rather relies on traditional SIP signalization which is not subject to public intrusion and which contains proprietary SIP headers which support the proprietary BlockNum SIP protocol or "B-SIP". As will be detailed further, the communication and protocols provide BlockNum transactions with unprecedented security, high transaction speed and very low energy consumption.

Security

With both PSTN and peer to peer SIP protocol in place, BlockNum has the advantage of not being very accessible on the public Internet as the SIP servers themselves are not generally connected to the Internet or are connected via a Virtual Private Network ("VPN") or in some cases communicate via a peer to peer network. Connections are also typically firewalled at each node. In addition, use of smartphones allows the incorporation of transactional limitations by geolocation, meaning parties can set the geographic parameters of where transactions are permitted.

Applications such as Wire Shark (an application that reads network packets) will be usable for BlockNum network packet inspection.

Proof of Consensus

The term "concept of consensus" was introduced in 1937 by Archie Blake related in the future to the "Blake Canonical Form. Some 20 years later, it was rediscovered by Quine and was then coined with the term 'consensus'. In mathematical logic, Boolean algebra is the branch of algebra (mathematics portion in which letters and other symbols used to represent numbers and quantities in formulae). Values of the variables are the truth. Values true and false, are more often refereed as 1 and 0.

The BlockNum Proof-of-Consensus relies on the main principle and operations of the Boolean algebra such as the conjunction and denoted as disjunction or denoted and the negation. Over the years Boolean algebra has been a key element in the development of digital electronic circuit boards and provided the foundation for modern programming languages.

Efficient implementation of Boolean functions is a fundamental element in the design of a combination of achieving BlockNum blockchain distributed PoC, by using the Consensus Theorem with the nodes.

In simple terms, BlockNum uses principles of Consensus Theorem to allow the Super Nodes to essentially "vote" on whether a transaction is "True" (i.e. that the transaction can proceed) or "False" (i.e. that the transaction should fail). As the Super Node verification and voting proceeds sequentially and since a given Super Node in a transaction does have voting information from previous nodes on the voting string in the SIP header for a transaction, a mechanism had to be developed to ensure that this voting information was not available to that Super Node in any meaningful way.

In order to accomplish this, when an SBC (the Session Border Controller), establishes the initial SIP protocol, the protocol contains a binary string of 1024 in length. It is this string which stores in sequence, the voting outcome of the Super Nodes. It further establishes randomly by a given position in the string, whether a "1" or "0" represents "True" or "False" and this information is only known by the SBC.

As the transaction passes to a specific Super Node, that Super Node is given the information as to whether a "1" or "0" represents "True" or "False" and "votes" accordingly.

Therefore as a transaction progresses through the Super Node consensus process, the string evolves and even though the previous string results are available to a Super Node, the Node would have no way of knowing what those votes actually represented.

As such, Super Node 6 might see a string showing (0 representing simply a standard lead digit):

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011111
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But the Super Node would not be able to interpret the data without knowing which digit represented "True" or "False" by position.

When the SBC does determine that there have been sufficient Super Nodes queried to likely determine an outcome, it provides to each Super Node the checksum information required to solve the Consensus Theorem algebraic equation and determine whether consensus has been achieved and within the BlockNum consensus parameters (i.e. 51-79% odd numbered nodes and 20%+ even numbered nodes)

Token Generation Event

A Token Generation Event ("TGE") for GIGAs under the management of UAC has been scheduled to begin on December 20, 2017 and run for 6 weeks. 10 million GIGA tokens will be generated at a face value of 35 GIGAs for 1 Ether ("ETH") during the crowdsale. 5 million GIGAs will be available during the crowdsale and the balance, including any unsold tokens, will be kept in reserve. Tokens will be purchasable at a sliding discount over the period of the crowdsale.

In order to purchase GIGAs during the crowdsale, purchasers will need to register on the GIGA TGE website:

www.blocknum.com

Purchase of GIGAs will be restricted to jurisdictions where permitted by law.

Half of the proceeds from the sale of tokens will be used to maintain reserves for transactions and half for the final development and ongoing operation of BlockNum and the BlockNum network.