

IonChain



IonChain

A High-Capacity IonChain
Transactional System

Ver. 0.1.5

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1. Executive Summary

With the increase of decentralized blockchains such as Ethereum and Bitcoin comes an increase in other distributed ledger technologies. With the volume of electronic transactions growing at a global scale, it is clear that there is a need to increase the number of blockchain based networks to keep up with demand. LightCoin offers an innovative blockchain which meets the global standard and provides a secure, scalable and decentralized technology which guarantees security through collaborative and permissionless mining. Security of transactions are ensured by our theoretic framework that means over 50% of total hash power is sent to the base chain which acts to prevent any double spending. Cross transactions can also be issued on the platform and confirmed within minutes, with the number of cross transactions increasing the response time. IonChain will operate a smart contract network which will be backed up by the Ethereum Virtual Machine.

Table of Contents

1. Executive Summary

2. Introduction

3. IonChain Vision

4. IonChain Network Technology

5. IonChain Positioning

6. Core Features of IonChain Network

7. Motivation

8. Security Features

9. IonChain Network

10. IONC Token

2. Introduction

Blockchain has advanced since its inception, from the first generation which Bitcoin created, to the second generation which included Ethereum and their smart contracts, allowing blockchain to perform cash like transaction and financial instruments such as bonds and loans. Currently Ethereum has a value of \$65 billion. Currently, the blockchain technology has moved to 'proof of stake' which is a step up from other currently ran but longer held technologies which run 'proof of work'. A benefit to the new system is that there is less hash power needed and allows for block rewards to be assigned to token holders proportionately. This acts to significantly reduce the energy needed to mine, which makes it more economically efficient. This type of innovation building on top of the last generation has allowed for ideas such as IonChain to not only come to fruition but retain a level of dominance in the industry due to being early movers in an industry which is still seeing exponential growth. The fact that major blockchains have a present problem in handling the high volume of transactions that they are seeing is proof of the need for more platforms to be created.

3. IonChain Vision

Leveraging the most recent technologies to include a network of databases commonly referred to as a shard, IonChain will bring large scaled and distributable systems which have the distinct advantage of scalability. This will allow IonChain to fill the gap that has been presented in the market and grow with the need of businesses globally. The distributable network increases IonChain's abilities exponentially and will act to see the IONC integrated into common transactions. Blockchain challenges which IonChain will address is the ability to scale, security and decentralization while maintaining a fast-moving service.

4. IonChain Network Technology

The principles of IonChain's design including increasing scalability but at the same time making sure that decentralization and security are paramount. Creating cross shared transactions seamlessly to give user quality of experience (QoE) within an ecosystem that is incentive driven is key to IonChain, being able to support different platforms and providing users with an easy to use account. Our design will allow for scalability to be in line across the requirements of maintaining high security with a good level of decentralization.

Current blockchain technology has two different basic functions in every block within a chain – the ledger, including the state of the current ledger, and the confirmation, which is required to confirm the transaction from a ledger and then mine blocks to reach desired difficulty levels (proof of work or POW).

The major aspect of a ledger is its ability to be crammed with data including keeping the ledger current and noting transactional details as they arise. This would include the destination, execution code, source, amount and any other detail that needed to be kept. There is a limit to the amount of data which can be stored in any one block, which gives rise to blockages in the blockchain. The transactional results create a confirmation occurring in the ledger and then mining a block for the desired POW to be reached. This allows for a confidence that any one user will not try to attack the system because it would be costly and economically inefficient to do so through fork mining. Of the two aspects, the confirmation would be the most computationally intensive of the tasks.

Keeping this in mind, IonChain has created a divide and conquer concept which separates these functions into two distinct layers, which acts to enhance the scalability whilst maintaining the appropriate security levels. Utilizing a layer of elastic sharding in the blockchain, smaller shards will be listed within the layers and as the number of shards increase the ability to process them concurrently, thereby increasing systems capacity. The network contains a base chain that will confirm all sharded blockchain blocks but will not process any transactions. It will also have a level of difficulty which will preclude anyone from reverting a transaction since it would not be economically efficient to do. The platform is designed to be able to support additional shards which will be able to independently process subsets of transactions.

5. IonChain Positioning

The IonChain design will allow for a fresh path within the blockchain society, given the relationship created between single and multiple blockchain systems. Whenever hash power of the whole base chain is 100%, the IonChain network system morphs to a single blockchain system. This is due to the fact that there aren't any minor shards and weak miners can join multiple pools with all miners mining the base chain. The base chain itself can be unlimited in size with the addition of many minor blocks.

Whenever the base chain hash power is 0% the IonChain system operates independently within a multiple blockchain system. Every IonChain shard is considered an independent blockchain which allows more scalability and a higher level of decentralization. It would also be insecure, however, due to a dilutional hash power wherein a malicious attack could be performed through double spend attacks on one blockchain in a 100-shard system using only 1/200 overall hash power network.

Since the IonChain network is more decentralized than other blockchain systems the level of security is also much higher, with 50% of the hash power allocation held on the base chain. Sharding technology allows the ability to increase capacity depending on how many transactions need to be processed, optimizing time with ease. This is beneficial for:

- Allowing the network to scale as needed without compromising on time or efficiency.
- Creating a higher level of decentralization than a normal blockchain.
- Security is created by maintaining 50% of the hash power in the base chain.

6. Core Features of IonChain Network

- An important core feature of the IonChain network is that it has been designed from the outset with scalability in mind.
- Horizontal Scalability – The network runs each node as a super full node which allows the same level of security against malicious attacks as traditional blockchains.
- The network is easy to use, safe, and allows for public participation with the ability to link weak miners together.

Sharding

Sharding is the partitioning of data from a large database into smaller databases. This is the most common way in which centralized systems reach their scalability needs. For example, Ethereum supports cross-shard transactions and has been noted as integrating sharding for their scalability needs. One complication which arises for existing blockchains is the ability to integrate sharding if it was not planned for at the outset. Challenges that surround sharding include cross sharding transactions, scalability issues and security issues such as single shard takeovers. Since the user's account would need to have multiple accounts to keep up with the sharding for the purpose of completing a transaction.

Trade-offs between scalability, security and decentralization must be met in a successful blockchain. For example, for security to be increased, so must the data per transaction will also be needed. This means if you want to have large storage capacity you will have to settle for slower transaction speeds.

Scalability

There are different ways to scale a blockchain, including either using a lightning network, multiple blockchain or sharding. Lightning networks act to defer the frequency of transactions across a fixed number of parties until every party has finalized their transaction. After that, only one of the parties will need to post the final result without the need to create multiple transactions of a historical nature. This type of network requires at least two transactions – one to complete the payment channel and one to destroy it. The lightning network is not good for use in all purposes, being made for a group of users to create repeated transactions between them. A random user trying to reach a sporadic target would be ineffective in a lightning network. Lightning channels will also track their transactions which creates a transparency concern, since they are tracked in the channels instead of the main blockchain. Third party sites such as PayPal are often required as well, with these type of off-chain solutions relying on such help. The number of centralized payment methods are at an all-time high, which creates uncertainty as to whether adding more would be helpful.

Multiple blockchains allow for scaling by splitting different transactions between several blockchains, such as Ethereum, Bitcoin or Litecoin. This creates a smaller demand for transactions but also creates less hash power to operate each blockchain. On a small chain it would be possible for a person to gather enough hash power to create a double-spend attack.

There is a benefit to the scalability feature, but the security that is traded off would not be an optimal solution. Multiple blockchains also limits the ability to perform cross chain transactions to

different crypto exchanges, all charging a fee for trading, with longer than average processing times and less security. Users would also have the requirement of maintaining an address within each network which would create further security issues and concerns around private key management.

Decentralization

The ability to decentralize trading and storage creates an ability to reduce necessary expenses which allows normal people to be able to leverage the technology the same as a large company would. It also gives the blockchain the security which it is known for. It is being reconsidered from a practical perspective however, with many mining pools forming for a POW based blockchain which allows even the weakest miner to collect a proportional share of block reward in the same timely manner as larger miners, instead of waiting to collect block rewards. This type of mining people helps centralization which in turn creates a risk to the decentralized POW blockchain.

The design of such a collaborative mining style creates incentives and algorithms that are difficult enough to distribute the hash power equally which allows the mining to be spread equally and therefore the system throughput is also evenly spread. Base chain controls the spread by maintaining 50% minimum of hash power over the entire network, which prevents malicious miners or any double spend attacks.

7. Motivation

Since the advent of blockchain, the response globally has been overwhelmingly positive, with users of cryptocurrency and blockchain increasing daily. Since this growth must be met, IonChain is entering the market with that in mind. Given the growth of transactions using smart contracts and blockchain increases on a global level, the need for providers like IonChain is known. While some global banks have already come forward to back the idea of blockchain and integrate it into their systems, the rest are certainly in the process of reviewing their own move into blockchain. More and more, transactions between parties are becoming faster without the need for the bank as a intermediary, and smart contract use can be seen as the way forward given the high level of technological adaptation that has been seen across all demographics.

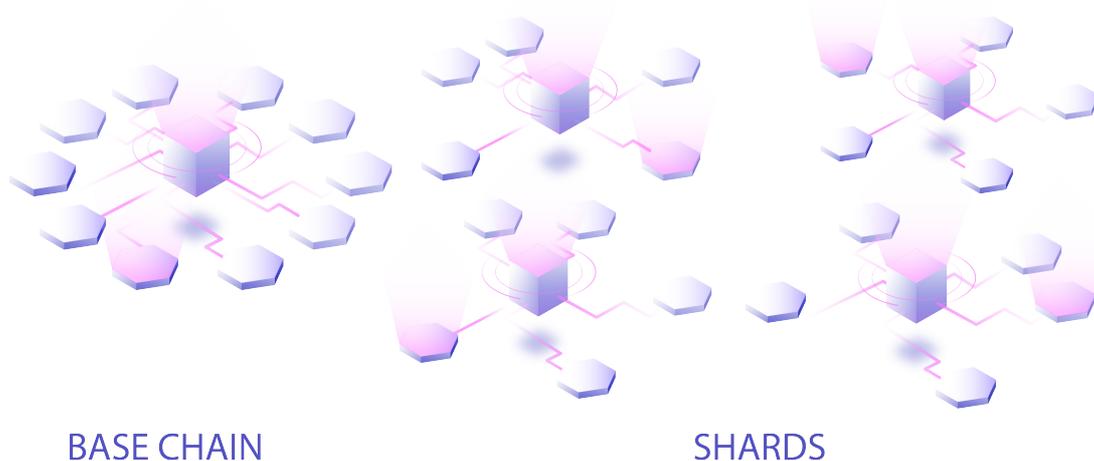
8. Security Features

Security issues can be dealt with by prioritizing the issue through the provision of a decentralized ledger. This adds to the basic security which is already inherent in blockchain and addresses the vulnerabilities on any transactional platform. Peer to Peer (P2P) blockchain networks have a requirement of being updated regularly in order to keep all the nodes in sync. For a POW based blockchain, 51% of total hash power is needed to complete the double spend ability for reversing any transaction. This type of attack is dependent upon the level of decentralization in the network with more decentralization being harder to attack. Blockchains that are decentralized to a sufficient

amount will create a high expense for any single miner or mining pool, in order to reach the required 51%.

The IonChain network is inclusive of the base blockchain as well as several minor blockchains, with different difficulty and incentive levels. Miners then choose their optimal blockchain given their optimal hash power price. An open market model of economics is thus created, wherein the blockchain acts as a seller of goods which are the block rewards, the miner is a buyer with currency that is comprised of hash power. The collective features of each party acts to benefit all of the parties, while all parties are still pursuing their own interests.

All transactions in the IonChain system will be protected through running a consensus algorithm across the base and shard networks, with a POW system being ran on the base chain whilst simultaneously a “base chain first pow algorithm” is being ran across the shard networks. Platforms such as Ethereum and Bitcoin use the POW system, with the additional base chain first POW algorithm being unique to shard network platforms such as IonChain. The latter operates by determining which of two shards will survive by having a node compare corresponding base chains and going on to allow the longer fork to survive. An attack on this system would be much more difficult since there would be the requirement of gaining at least 51% of the hash power to perform.



The IonChain Network is a highly sophisticated network solution which maximizes network simulations within shards.

There are 10 minor blockchains which operate in the IonChain network system with a base blockchain target of 100s duration and target block durations of 10s. This allows the overall system to operate at a level 10x above any single shard which creates even mining. Minor blockchain height reaches 4000s in close proximity to one another with similar work allowing the mining to be split evenly between shards. Base blockchain work is just under the 1.5m expected half hash value, at 1.2m. All of the minor chains complete 10k of work each 10 second interval with minor chains 10x shorter than the base blockchain.

The IonChain network deals with super full nodes problem by implementing multiple honest nodes in cluster form which runs like a cluster of super full nodes. Each node can only validate a subset of the chain, with the union of subsets covering the base chain. This also means if one node crashes the rest will still run and validate blocks by being able to have any two form a cluster. Cluster formation will be encouraged through miner incentives which will make miners want to work together.

With the IonChain solution, users do not need to create multiple accounts across shards to manage cross-shard transactions, only one account is needed to manage all accounts in all shards to complete any smart contract. A smart wallet will allow for cross-shard or in-shard transactions to be seamless transactions where the user could allow in shard transactions to complete payments.

Cross Chain Transactions

Using the IonChain design, cross-chain transactions are manageable through token conversion then transaction performance, through cross-shard transactions. There is also an option of offering a sub-chain to the other chain which would make the cross-chain a cross-shard.

9. IonChain Network Systems

1. Smart Contracts – smart contracts will be facilitated through Ethereum Virtual Machine as it is currently the most widely used.
2. On and off Chain Transactions – off chain transactions are accommodated for times when transactions must access information that is not on the blockchain. Smart contract specific data can be sharded as required.
3. Account management is made simple by allowing one account to be able to access all shards. Users can operate a primary account, which contains the user address in a default shard, or through a secondary account which manages all other addresses of the user in a shard. The primary account option will be mainly used, then only temporarily moved to an address in a second account if required, with any remaining balance in the secondary account being moved back to the primary account.

The two main types of transactions which will be performed on the IonChain network are the execution of smart contracts in specific shards and the transfer of tokens from one address to another whether they are sent within the same shard or between two different shards. The process will be of such an ease that the user will not be aware of the different operations that are going on between the shards, with the ability to automatically detect the user's primary account.

10. IONC Token

IonChain will use the IONC token, which is digitally cryptographically secured and designed as the primary token for the network. IONC will issue in the beginning as ERC-20 standard compliant digital tokens on Ethereum, which will then be migrated to the IonChain blockchain. IONC tokens are the unit of exchange between IonChain participants, providing a secure payment method. IONC cannot be construed as a shareholding in IonChain or in any aspect of its affiliates, the overall enterprise of the IonChain undertaking. IONC ownership does not carry any inherent rights except for the express right to use them as the means in which to interact on the IonChain network. Game and financial tech industries will be a key focus with the IONC token providing a solid and trustworthy exchange medium. IONC will therefore be a value carrier and transactional currency, with the ability to continuously grow as positive word of mouth spreads.

The IonChain network is mobile oriented with DApps supported infrastructure. On-site developer tools will also be offered on IonChain for creation of environments that are Android enabled. Developers will have an ability to create and run viable online (minimal) projects. The IonChain network also enables small to medium business owners to increase their authentication efficiencies by using the blockchain for their anti-counterfeiting business demands and high-volume transactions without spending the vast amounts that corporations have for such technology. The use of blockchain reduces costs associated with money transfers between parties and allows for automatic data collection through the use of smart contracts. The integration of such sharding blockchain technology has unlimited uses within the Internet of Things (IoT), which will bring many new users to the IonChain network.