Litepaper v1.1

Introduction

In the last few years, web3.0 has gained significant adoption, most of which has been on Ethereum. A wide variety of new protocols & use cases have emerged; decentralized exchanges like Uniswap, lending and borrowing protocols like Aave, and NFT plays like Opensea. We have a plethora of new cryptocurrencies in the form of ERC20 tokens, and ERC721 tokens which later got popular as NFTs.

However, with all this DeFi & NFT adoption the Ethereum blockchain has become really clogged. The activity is much higher than the chain can efficiently process and as a result, we observed absurdly high gas fees. This lead to the introduction of Ethereum scaling solutions usually referred to as Layer 2 solutions, side-chains, rollups, etc. The main idea behind Ethereum scaling solutions is to make the transaction computations faster and cheaper. This is done by committing proofs of multiple transactions in a batch on the Ethereum blockchain which can be verified and proven on-chain. We have also seen the proliferation of other Layer 1 chains that achieve higher throughput at lower costs for dApps and their end-users.

As more and more dApps move to chains beyond Ethereum, the multi-chain reality of web3.0 is becoming clearer. This forces multi-chain dApp users to navigate across numerous chains. Thus, we are now seeing a ton of bridge solutions that help move funds between various chains. The current multi-chain web3.0 has various Layer 1s, Ethereum scaling solutions, their native tokens, a long list of cross-chain bridges, and dApps spread across all these ecosystems.

These developments have introduced new issues and intensified some existing problems for the future of web3.0.

Problem

Problem #1 Complicated UX

Every interaction with a dApp is a blockchain transaction, and blockchain transactions are complicated. Users need to be proficient in crypto wallets, understand gas, and how

to properly estimate it so you don't overpay or underpay. They need to actively manage each blockchain interaction. Even then, they face failed transactions and long waiting times for transaction completion. High gas prices have become a major hurdle for most web3.0 users.

Layer 2s & scaling solutions such as Polygon, BSC, Avalanche, etc have provided some respite. But they come with their own UX issues. While each application deployed on multiple chains is reaping the benefits of the underlying blockchain, it becomes very difficult for a user to interact with the application across different blockchains.

Users need to understand layer 2s and why they can't access their funds on dApps on these chains. They need to manually change RPC to interact with various chains. They need to use bridges to send their funds to these chains. They also need to buy & hold the native token for gas to do any action. The issues of managing gas for every transaction still exist.

Moving between these different chains is another UX headache. Onboarding to any of the scaling solutions is slow, complicated & expensive. Most bridges take hours to move your funds. As dApps scale to multi-chain architecture, the users bear the burden of added complexities. The multi-chain nature of web3.0 compounds the already existing UX issues.

The mainstream user doesn’t want to deal with these blockchain headaches. They expect the dApp to deal with gas, transaction management, bridges, and everything else under the hood.

Problem #2 Fragmented multi-chain infrastructure

The issues of high friction in movement between various chains go beyond just complicated UX. They cause delays in the movement of value and do not offer instant and seamless transfer of funds. And it's not only value that has to move smoothly between these chains, the communication & contract calls across these chains are also

non-trivial and highly technical. DApps & users should be able to communicate efficiently across the whole multi-chain web in real-time.

These high levels of friction between various chains, layer 2s & sidechains have currently caused fragmented liquidity & usage. This creates isolated communities with lower network effects & lower composability for the multi-chain web3.0.

The underlying infrastructure itself is disjointed, leading to users either enjoying Ethereum's network & composability or layer 2's cheaper & faster transactions, but not both. The multi-chain infrastructure should seamlessly scale as dApps & users move to various chains.

Solution: Multi-chain Relayer Protocol

The solution that web3.0 needs to solve both the above problems is a multi-chain relayer protocol. This consists of three key components:

A. Meta-Transactions

Essentially, meta-transactions let a third party (a relayer) execute a transaction on behalf of the user. The user just signs a message that contains the details about the transaction they want to execute. Then the relayer executes these transaction details on the desired blockchain, even paying the gas.

This way, the relayer manages the whole transaction for the user, shielding the user from complicated blockchain UX. The user doesn't need to own the native tokens. They don't need to estimate gas. They don't even need to pay the gas fee. They just need to click once to sign, and then the relayer ensures a 100% success rate handling everything under the hood.

Here dApp projects and protocols would be subsidizing the gas fees on behalf of end-users. DApps can impose limits to help prevent spam and the relayer ensures they're paying the optimal gas fees to guarantee quick finality of the transaction. This works best for projects on Layer 2 or low fee chains where it's economical for dApps to subsidize their users' gas costs.

B. Multi-chain transaction network

We enable meta-transactions on a variety of blockchains & L2s. Thus, dApps on these networks can enable meta-transactions & gasless transactions for their users.

The Biconomy protocol will also enable the flow of value & messages across different chains in an easy, affordable, secure, and decentralized way. Thus, users can instantly move their funds between various chains. They can also enjoy instant cross-chain communication & contract calls. The Biconomy blockchain will contain verified information for a transaction on any blockchain X. This way the interaction between users and dApps on every chain will be seamless.

Thus, our transaction network is inherently multi-chain. It acts as the foundation for a seamless multi-chain infrastructure for web3.0.

C. Decentralized Relayer Protocol

The meta-transactions, cross-chain transfers, and cross-chain communication are managed and processed by our decentralized multi-chain relayer network. A distributed set of node operators on every supported chain will power the Biconomy network.

Network role

There are multiple stakeholders that contribute to the functioning & maintenance of the Biconomy network:

1. **Node Operators:** These include validators & executors. They stake $BICO to provide their service and earn $BICO and protocol revenue for their work.
    a. **Validators**: The validators listen to and verify the transaction request from the user. They also verify if the executors have done the transaction successfully. Once a decentralized network of validators reaches consensus, this information is added to the next block in the Biconomy blockchain.
    b. **Executors**: The executors pick up transaction requests made to the Biconomy relayer network & then execute the transaction on the required destination

chain.

2. **Liquidity Providers:** Anybody can add liquidity to the protocol and earn a fee as well as $BICO.
3. **Delegators:** Token holders can delegate their tokens to node operators. These node operators will stake the delegated tokens and pass on some of their $BICO rewards to the delegators.
4. **Consumers:** The consumers are web3.0 projects that use Biconomy's services. They pay the network proportional to the amount of work requested.

Biconomy Protocol Design

Different actors of the Biconomy Network come together to solve the aforementioned problems by providing the following capabilities:

Multi-chain Meta transactions

Cross Chain Single Asset Transfers

Cross-Chain Smart Contract Calls

A. Multi-chain Meta transactions

Biconomy network will consist of a gas-efficient relayer infrastructure to enable meta transaction support for any dApp across multiple chains. The executors and validators will manage this decentralized relayer infrastructure. Executors will be running the relayer nodes and they will be responsible for executing the meta transactions on the respective blockchain while the validators help secure the network by verifying the executor's transactions.

Executors

Executors play a crucial role in providing meta transaction support by running the relayer nodes in the network.

dApps will be able to get a list of all the eligible executors from the Biconomy Blockchain along with their performance parameters/reputation details. They can choose a relayer address as per these parameters. The dApps can also set default criteria to automatically choose the best relayer available from the pool.

Executors will have key parameters about their performance such as premium fee charged, transaction success rate, total uptime, etc. While each executor can decide the premium they wish to charge per relayed transaction, the rest of the metrics will be dependent on their relay history.

Executors will relay the received transaction and pay for gas in order to get the transaction included in the next block on the destination chain. The executors will be reimbursed the gas fee in the destination chain's native token. They will also receive the premium fee in the same transaction. After validators successfully verify the relayed transaction, they will also receive a reward in $BICO for the work that they have done.

> 💡 **Executor's payout per transaction = Gas fee + premium fee + $BICO rewards**

Validators

Validators verify the transactions relayed by the executor nodes.

After the executors successfully relay a transaction they send this detail in a Biconomy transaction. The information present in this Biconomy transaction will be verified by the validator nodes. Verification is done by checking the receipt on the destination chain and cross verifying the receipt data with the data sent in the Biconomy transaction. Each validator verifies the transaction and once they reach a majority, it is included in the next block.

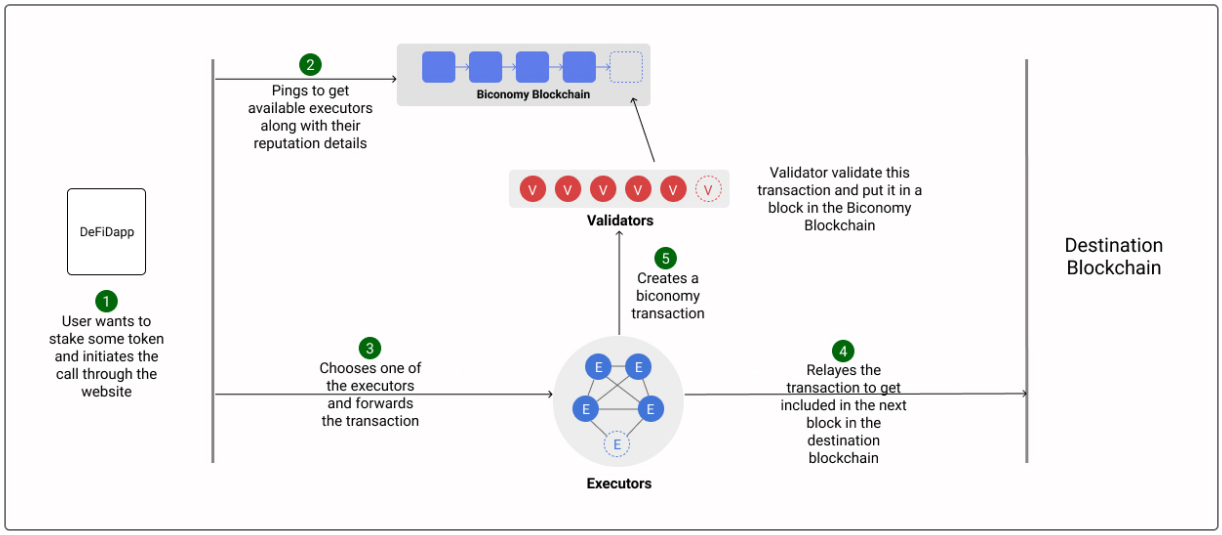
Executors will be rewarded once their transaction gets included in the Biconomy blockchain.

> 💡 **Validator's payout per block = $BICO block rewards**

Example Flow for Multi-chain meta transaction

Let's say Emma wants to stake a few tokens on DeFi dApp.

1. She initiates a contract call from DeFi dApp's website.
2. DeFi dApp forwards that call to one of the executor nodes in our decentralized relayer network.
3. The executor relays the staking transaction for the end-user and pays the required gas fee. The transaction gets successfully added to the destination chain.
4. Once verified, the dApp pays the gas refund + the small premium charged by the executor.
5. In the same transaction, executors will get a refund for the gas fee that they have spent in native chain tokens + the premium.
6. Once the transaction has been successfully relayed, the executor node creates a Biconomy blockchain transaction with the details of the relayed transaction to claim their reward.
7. Validators see this transaction and they cross verify the data received in the Biconomy blockchain transaction with the information present on the destination chain.
8. Once a majority of the validators reach consensus and the information is verified, the data is added to the next block in the Biconomy blockchain.
9. Once the relayed transaction gets added to the Biconomy blockchain, the executor gets a reward in $BICO token.



B.1. Cross Chain Single Asset Transfers

Leveraging the Biconomy Network of Validators and Executors, the protocol will provide cross-chain single asset transfers. This will enable instant transfer of funds between various chains for the users.

The user deposits their funds on any source chain. The validators will constantly listen for these asset transfer requests from the users on the source chain. The Executors will initiate the final transfer to the user on the destination chain.

Validators

Validators will act as listeners on each supported blockchain. They are connected to the source blockchain and will listen for deposit transactions to the LiquidityPool Manager contract on the source chain.

Once validators find a deposit transaction, each validator verifies the transaction and one of the validators puts this information in a Biconomy Transaction. Biconomy transactions will include information about the cross-chain transfer request such as source chain, destination chain, the token being transferred, a mapped token on destination chain, amount, decimals, and some other metadata if needed. This transaction will be included in the Biconomy Chain in the next block.

> 💡 **Validator's payout per block = $BICO block rewards**

Executors

Executors listen to the Biconomy chain for cross-chain funds transfer requests. They will be responsible for initiating the fund transfer transaction on the destination chain.

Executors will transfer funds to the user on the destination chain and pay the gas fee for this transaction. The executors will be reimbursed the gas fee in the chain's native token along with a small portion of the transfer fees collected from the user. After successfully verifying that the funds have been received, they will also receive a reward in $BICO for the work that they have done.

> 💡 **Executor's payout per transaction = Gas fee + transfer fee + $BICO rewards**

Liquidity Pools

Each chain will have liquidity pool smart contracts where Liquidity Providers will be able to add any token liquidity. When the user initiates a cross-chain transfer request, they deposit their funds (in y tokens) to the y token liquidity pool on the source chain. The executors use the y token liquidity pool on the destination chain to send the funds (in y tokens) to the user.

In return, LPs will get a portion of transfer fees in the ratio of liquidity provided. Apart from the fee from transfers, there'll also be APY rewards for providing liquidity to the pools. These rewards will be distributed in $BICO tokens.

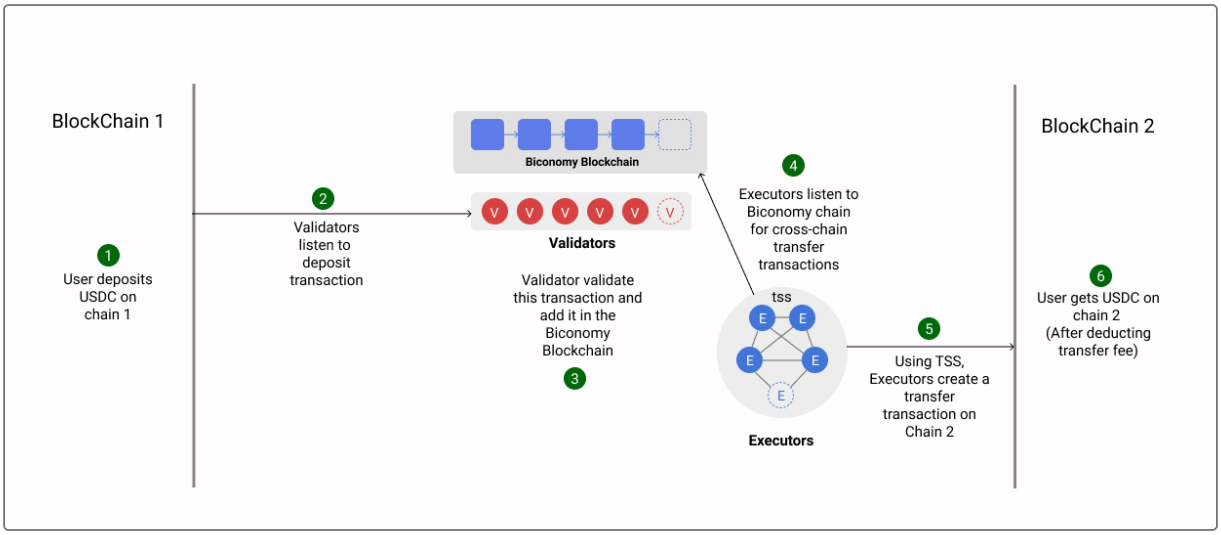
When the available liquidity on a particular pool decreases, APY rewards will be increased to promote people to provide more liquidity. In case no one provides more liquidity on the pool, rebalancing can be triggered by the Executors to balance liquidity across chains using Native bridges.

> 💡 **Liquidity Providers's payout = transfer fee + $BICO rewards**

Example Flow for Cross-Chain Single Asset Transfers

Let's say Alice wants to transfer 100 USDC from the source chain Blockchain 1 to the destination chain Blockchain 2.

1. Alice initiates the transfer, and the protocol takes her 100 USDC & deposits to the source chain Liquidity Pool Manager contract
2. Validators see this deposit transaction on the source chain and create a Biconomy chain transaction
3. Once a majority of the validators reach consensus and the deposit information is verified, the data is added to the next block in the Biconomy blockchain.
4. The executor listens to this Biconomy chain for cross-chain transfer transaction and initiates a transaction on the destination chain as per the user's request.
5. This transaction will release the funds from Liquidity Pool Manager (on the destination chain) to Alice's address after deducting the fee. (This receiver address can be different from Alice's address as mentioned in the deposit transaction)



B.2. Cross-Chain Smart Contract Calls

Leveraging the Biconomy Network of Validators and Executors, the protocol will provide cross-chain smart contract calls. This will enable the user to instantly interact with & trigger smart contract calls on any other chain, without having to move to that chain. Thus, multi-chain dApps can seamlessly communicate between their smart contracts deployed on multiple chains. This will allow a variety of cross-chain use cases.

For example, you can spend the tokens on chain A to perform a transaction on the destination chain. eg: Deposit the USDC you have on Ethereum to provide liquidity to QuickSwap on Polygon.

To enable cross-chain smart contract calls, a Gateway Smart Contract (GSC) will be deployed on each supported chain. The Gateway Smart Contract on source and destination chain will act as the intermediary contract to support cross-chain smart contract calls. Validators will be listening to all transactions happening on the source chain GSC while the Executors will be responsible for ensuring that the smart contract call gets executed on the destination chain via the destination chain GSC.

Validators

The Validators will be listening to the transactions on GSC on the source chain. Once they receive a GSC transaction on the source chain, each validator verifies the transaction and one of the validators puts this information in a Biconomy Transaction.

The Biconomy chain transaction for Cross-Chain Smart Contract Call will contain the destination smart contract call-data and address information along with the information about the source chain, destination chain, and other metadata if needed. This transaction will be included in the Biconomy Chain in the next block.

> 💡 **Validator's payout per block = $BICO block rewards**

Executors

Executors listen to these cross-chain smart contract calls on the Biconomy Chain. Once they receive such a request, they initiate a transaction on the destination chain GSC by passing all the information. GSC internally calls the destination Smart Contract on the destination chain and passes the calldata to it. This initiates the user requested action on the destination chain smart contract.

When Executors initiate a transaction on the destination chain, they'll be paying the gas fee on the destination chain in its native token. Executors will also charge a premium fee to cover the cost of running the executor nodes. The gas fee will be reimbursed to the executors in the destination chain's native token. They will also receive the premium fee in the same transaction. After successfully verifying that the destination smart

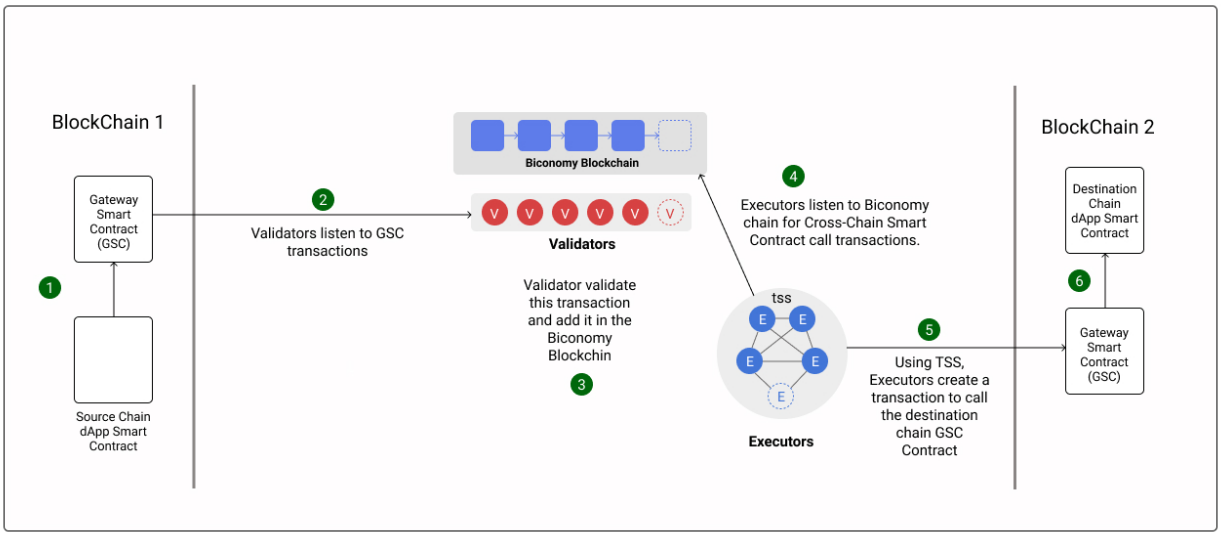
contract has been called, they will also receive a reward in $BICO for the work that they have done.

> 💡 **Executor's payout per transaction = gas fee + premium fee + $BICO rewards**

Example Flow for cross-chain smart contract calls

Let's say Mary has funds on Ethereum (Blockchain 1) and wants to add liquidity to QuickSwap on Polygon (Blockchain 2).

1. She initiates the contract call on Ethereum (source chain) & sends 100 USDC to be added as liquidity.
2. The calldata of this contract call contains the necessary information to add this liquidity on QuickSwap on Polygon.
3. The smart contract on Ethereum forwards that call to the Gateway Smart Contract (GSC) on the Ethereum chain (blockchain 1).
4. Validators see this GSC transaction on Ethereum and each validator verifies this information and puts it in the Biconomy chain as a Biconomy transaction.
5. The executor listens to this Biconomy chain transaction and interacts with Polygon GSC (destination chain).
6. Polygon GSC calls the QuickSwap Smart Contract on Polygon (blockchain 2) and passes the calldata to it.
7. The USDC sent by Mary gets added as liquidity to QuickSwap on Polygon.



$BICO Token

$BICO is the native work & governance token of the decentralized multi-chain relayer infrastructure.

Token Utility

$BICO plays a key role in decentralizing the network by acting as the network fees, incentivizing all stakeholders to secure and maintain the network, and participating in the network's governance.

Network fees

$BICO is the native token of the Biconomy blockchain. The Biconomy blockchain will act as a settlement and verification layer for all the activity on the Biconomy Network across all supported chains. The node operators (executors & validators) pay a transaction fee in $BICO to add any information on the chain and they earn $BICO proportional to the work they perform on the network.

Stakeholder incentives

1. **Node operators** (Validators and Executors) have to stake $BICO to start contributing to the network. They earn $BICO proportional to their contribution and their $BICO stake. The network can also slash their stake in the case of bad behavior.

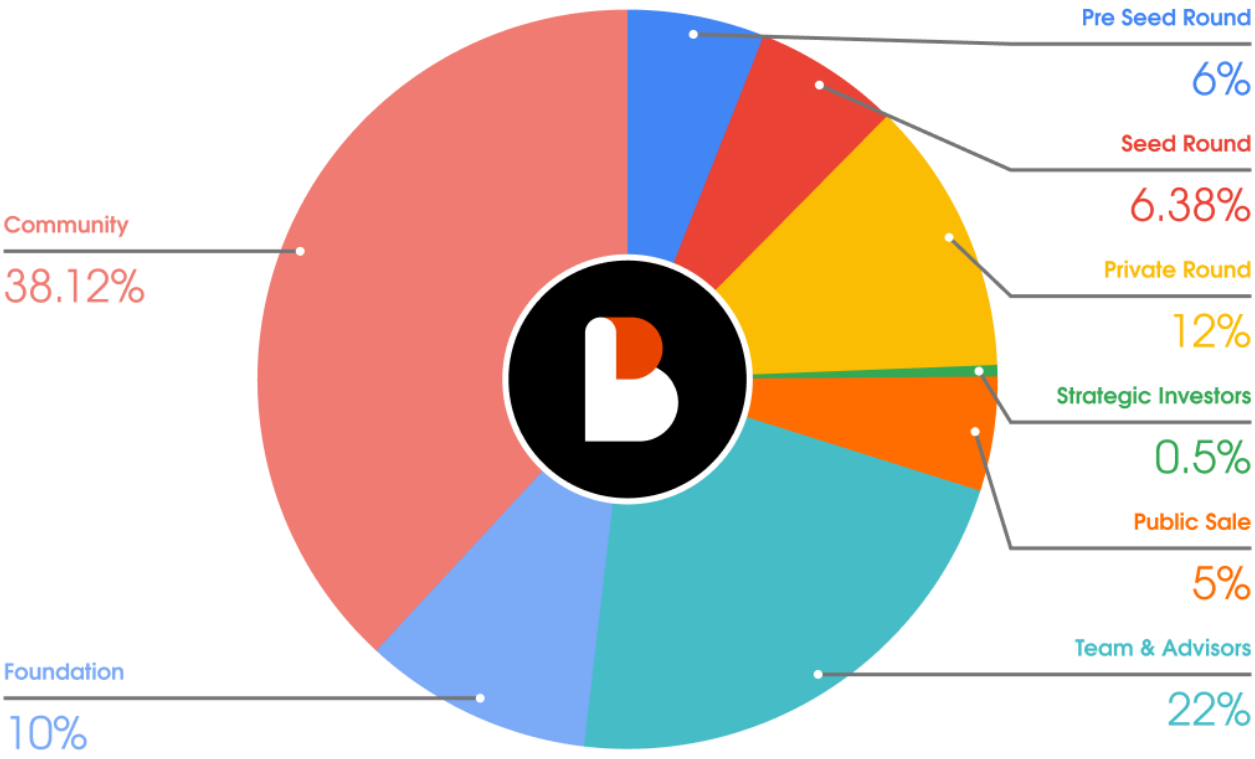
2. **Delegators** are $BICO token holders who can stake their tokens to secure the network further. They earn $BICO proportional to their $BICO stake.
3. **Liquidity providers** can provide liquidity in a variety of crypto assets to the protocol's liquidity pools on different chains. A small fee will be collected when a user uses the liquidity pools, which will be distributed to the liquidity providers. Apart from this fee, they will also earn $BICO in proportion to their relative contribution to a given Liquidity Pool.

Governance

$BICO holders can propose and vote upon decisions affecting Biconomy's protocol and overall Network. Such decisions can include changes to the Network's code, adding additional services, or decisions regarding the disbursement of its treasury funds. Any $BICO holder can submit a proposal for consideration by the wider Biconomy community.

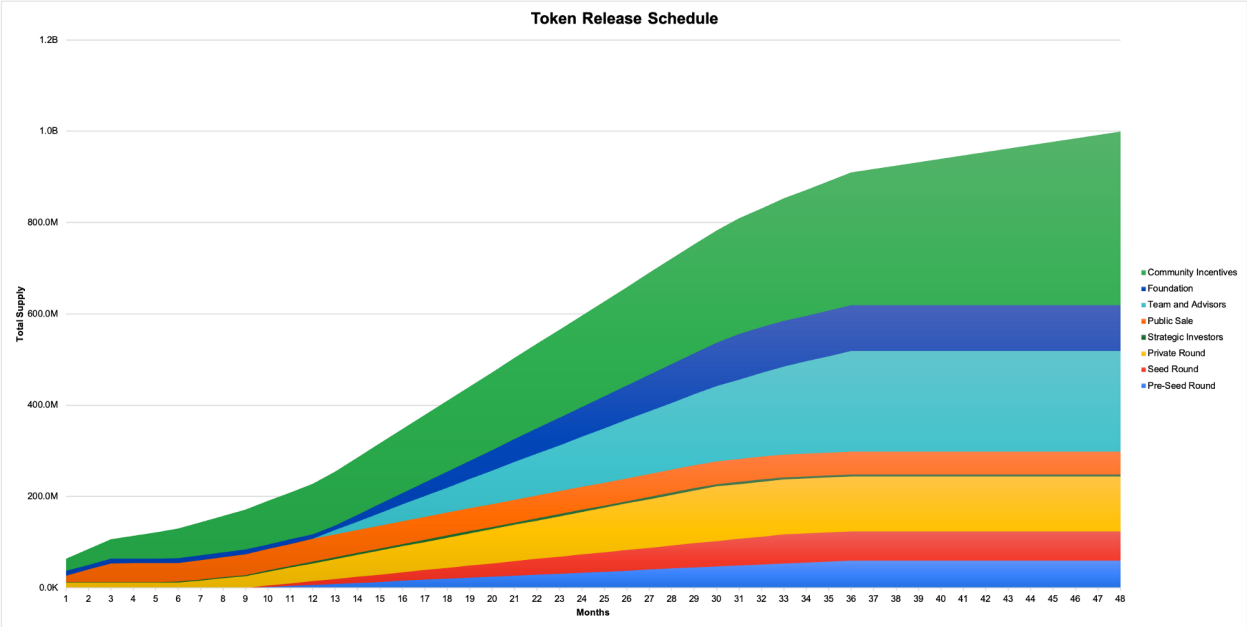
Distribution and Release Schedule

There are in total 1 billion $BICO tokens in supply. The token allocation is as shown below:



The $BICO release schedule is planned as follows:

Segment	Total Supply In %	Release Schedule
Pre Seed Round	6%	9 month lock up, linear vesting for 27 months (total vesting 3 years)
Seed Round	6.38%	9 month lock up, linear vesting for 24 months (total vesting 2 years 9 months)
Private Round	12%	10% liquid on TGE, 6 month lockup, linear vesting for 24 months (total vesting 2.5 years)
Strategic Investors	0.5%	10% liquid on TGE, 3 month lockup linear vesting over 12 months (total vesting 15 months)
Public Sale	5% (Option 1 – 4%) (Option 2 – 1%)	Option 1: 3 month linear release Option 2: 10% liquid TGE, 6 month lockup, 6 month linear release (total vesting 12 months)
Team & Advisors	22%	12 months cliff, linear vesting for 24 months (total vesting 3 years)
Foundation	10%	10% liquid on TGE, 12 month lock up, linear vesting for 24 months (total vesting 3 years)
Community Rewards and Incentives	38.12%	7.5% liquid on TGE, 1/47 each month linear release



Staking and Slashing

A decentralized network of node operators (validators and executors) run & maintain the Biconomy multi-chain relayer infrastructure. Anyone who wishes to be a node operator needs to stake $BICO to contribute to the network.

The network will reward credible work with $BICO rewards. The network will punish bad behavior by slashing a portion of the node operator's staked $BICO.

These incentive mechanisms will ensure that the network functions successfully in a trustless & decentralized manner. Each actor will actively verify and challenge the work of other actors and nodes in the network.

All transactions are verified by Validators on the Biconomy blockchain using Proof of Stake (PoS) consensus. In case of any false transaction on the destination chain, or funds being taken away by Executors, or any other misconduct by the Executors, the security deposit can be slashed by the Validators for every Executor node which participated in that transaction.

Further to reduce the trust assumptions on Executors for carrying out the cross-chain transaction or smart-contract calls, Threshold Signature Scheme (TSS) will be used to distribute an authorized key that has the right to execute the transaction on the destination chain.