Non-Constitutional

Abstract

The Arbitrum Foundation is seeking 5,134 ETH, which is a combination of:

- Assertion and challenge bonds.

4,234 ETH to allow the Arbitrum Foundation to run a BoLD validator and fulfill the role of being the first honest and active proposer.

- Service fees.

500 ETH to pay proposers who are actively participating and advancing the chain. We estimate the funds will last for 3 years of operation and the Arbitrum Foundation will not be entitled to collect any service fees.

- Refund L1 gas costs.

400 ETH to reimburse all L1 gas costs for active proposers who are actively advancing the chain and defending against malicious challenges, assuming 1 challenge per year.

This proposal is contingent on the proposal "AIP to upgrade the DAO-governed chains to use BoLD" being approved by the ArbitrumDAO. If the AIP to upgrade the DAO-governed chains to use BoLD does not pass - then the Arbitrum Foundation will return the funds, in its entirety, to the ArbitrumDAO within 30 days of the BOLD proposal being hypothetically rejected.

Motivation

The AIP to upgrade the DAO-governed chains to use BoLDis scoped to only propose the technical upgrade and intentionally does not yet include the introduction of an economic incentive mechanism. In the absence of an economic incentive, the ArbitrumDAO holds the risk that no entity will fulfill the role of being the first honest party to secure Arbitrum One. By adopting this proposal, the ArbitrumDAO is appointing the Arbitrum Foundation to be the first active proposer for Arbitrum One.

Key Terms

- Active proposer

. A proposer who is actively posting assertions and helping advance the chain. Validators are not considered active proposers until they successfully propose an assertion with a bond. In order to become an active proposer for Arbitrum One, post-BoLD, a validator has to propose an L2 state assertion to Ethereum. If they do not have an active bond on L1, they then need to attach a bond to their assertion in order to successfully post the assertion. Subsequent assertions posted by the same address will simply move the already-supplied bond to their latest proposed assertion. There can only be 1 "active" proposer at any point.

- Assertion

. A claim posted to the Arbitrum rollup contracts on Ethereum L1 about the Arbitrum L2 execution state. Each claim consumes messages from the Arbitrum rollup inbox contract that are ordered by the Sequencer.

- Assertion bond

. Creating an assertion in the rollup contracts requires the proposer to join the validator set by putting up a bond, in the form of 3,600 ETH. Subsequent assertions posted by the same party do not require more bonds, instead, the protocol always considers validators to be bonded to their latest posted assertion until they withdraw.

- Challenge bond

. The challenge process in BoLD requires a proposer to post a bond whenever they want to challenge a malicious (and invalid) assertion from a dishonest proposer. This applies to the block level, big-step sub-challenge, and one-step sub-challenge levels, as part of the interactive dispute game played between challengers.

- One honest party

. In BoLD, a single, honest party can protect the integrity and liveness of the system. While only a single party is required to act, it is still an open and permissionless system, allowing anyone to step up at any time.

- Proposer

. An agent who looks up the list of ordered transactions, executes them off-chain, and then proposes a claim on the final execution output by posting an assertion on-chain. A proposer must

have a bond deposited into the BoLD rollup contracts on Ethereum to be considered eligible, by the protocol, to post assertions.

- Service fee

. A fee for proposers who are actively and successfully posting on-chain assertions which should amount to the same income that Ethereum validators receive over the same time period. The fee is paid for every on-chain assertion posted by the proposer once their assertion is confirmed. This fee removes the disincentive to lock up capital and be a proposer for the protocol and should not be viewed as an incentive or reward.

Budget Request

This section focuses on the budget request from the ArbitrumDAO treasury alongside the motivation for why the funding is required.

Assertion and Challenge Bonds

We are requesting 4,234 ETH from the ArbitrumDAO treasury to cover the bonds required to establish a single honest proposer with the capability to defend the system.

The requested ETH is a combination of:

- 3600 ETH required to post an assertion bond, and;
- Subsequent 555 ETH + 79 ETH for challenge bonds for one challenge.

The Arbitrum Foundation will deposit these funds in the RollupCore.sol

contracts on L1 Ethereum for the validator. If theBoLD AIP passes, then the Arbitrum Foundation's staked validator will be enabled to immediately act as a proposer for Arbitrum One

Note: the Arbitrum Foundation is proposing to be the first active validator, not the ONLY validator. BOLD removes the reliance on a permissioned set of validators, and any interested parties and/or teams can permissionlessly run nodes and validators for Arbitrum chains upon a successful upgrade of the dispute protocol.

Service Fees for BOLD Validators

All blockchain systems, including Arbitrum, should reward participants who actively work to advance the system.

In the case of Arbitrum, the DAO will pay a service fee to an active proposer who is helping to advance the system by posting assertions. If approved, the service fee will correlate to the same annualized income earned by a validator on Ethereum mainnet. At the time of writing, the estimated annual income is approximately 3% to 4% of the staked ETH, according to the Composite Ether Staking Rate benchmark by CoinDesk Indices

We must highlight that this payment is a fee and not a reward. In BoLD, a new assertion can be posted every round (1 hour) and only a single fee is paid per round. There can be multiple agents who deposit the required assertion bond and run a proposer, but the fee will only be paid to the proposer whose assertion is the first to be accepted on L1. The proposer whose assertion is accepted by L1 and paid the service fee is called the active proposer for this round. Subsequent assertions posted by the same address will simply move the already-supplied bond to their latest proposed assertion. Meanwhile, if an entity, say Bob, has posted a successor assertion to one previously made by another entity, Alice, then Bob would be considered by the protocol to be the current active proposer. Alice would no longer be considered by the protocol as the active proposer and once Alice's assertion is confirmed, then Alice gets her assertion bond refunded.

We estimate the following service fee per year:

- Assuming a 4% service fee based on the 3600 ETH bond size, equates to a maximum of 144 ETH per year per active proposer.

The Foundation is therefore requesting 500 ETH to support service fee payments for up to 3 years (with a buffer of 68 ETH in case the average Ethereum validator income increases) in the event that an active proposer, who is not the Arbitrum Foundation, steps up to advance the chain. Moving forward, the DAO may consider allocating a portion of ETH from the ArbitrumDAO governed chains' sequencer fees to fund the ongoing service fees for active proposers.

To learn more, please read the section on Service Fees in the BOLD AIP.

Note: The Arbitrum Foundation will NOT be entitled to receive the service fee.

Reimbursement of L1 Gas Costs

We are requesting 400 ETH to reimburse the on-chain gas costs for active (and honest) proposers who are helping advance and defend the Arbitrum chain. It is estimated that 400 ETH will be sufficient to cover ~3 years of operational costs.

There are two on-chain gas costs:

- Posting assertions.

An active proposer must post an assertion for the chain to advance.

- Challenges.

A proposer who is defending the system must participate in a multi-round challenge process.

Note: we only propose to reimburse L1 gas costs since that is publicly verifiable and computable by all. The off-chain costs to run a proposer will not be reimbursed and it is expected the service fee will be sufficient to help cover the operational cost for it.

Estimated Reimbursement Costs

This section focuses on the estimated costs to reimburse the L1 gas costs for proposers who are actively posting assertions and participating in the challenge process.

Assertion Gas Costs

The on-chain gas costs for posting assertions are available from the BoLD testnet deployed onArbitrum Sepolia:

- 'stakeOnNewAssertion' function.

It costs 163,109 gas per invocation.

Assertions are expected to be posted every hour and under normal operations:

- 163109 gas * 24 hours * 365 days = 1,428,834,840 gas per year.

If we assume 50 gwei/gas on L1 Ethereum, then the estimated total gas costs will be 71.44 ETH/year. This equates to 214.32 ETH for a 3-year period.

Challenge Bonds Gas Costs

A challenge should only occur if a dishonest proposer posts an assertion that is not valid. Given the financial cost to a dishonest proposer, we are not expecting many challenges to occur. Even so, we should always be prepared for the worst-case scenario and be ready to defend against it.

According to the BoLD whitepaper and theoretical calculations conducted by the Offchain Labs team, honest moves to defend a full challenge will cost honest parties roughly 62,632,000 gas (not including the top-level assertion).

Per challenge, the L1 gas costs will depend on the gas price at the time of the challenge:

- At a 50 gwei/gas price, this equals 3.1316 ETH in L1 gas costs
- At a 100 gwei/gas price, this equals 6.2632 ETH in L1 gas costs
- At a 500 gwei/gas price, this equals 31.316 ETH in L1 gas costs

Assuming one challenge per year for 3 years in the worse case scenario on gas prices, we estimate 93.93 ETH will be required.

Gas Cost Summary

Assuming a nominal gas price of 50 gwei/gas during normal operations (i.e. no challenges) and assuming an elevated 500 gwei/gas price during a challenge (i.e. worst-case scenario), to fully reimburse an honest party's gas costs incurred for posting assertions and for performing honest moves to defend Arbitrum in the event of one challenge per year, the Arbitrum Foundation is requesting 400 ETH for 3 years.

This includes ~308 ETH to cover the above costs and a ~92 ETH buffer in the event of higher gas prices during normal operations, during a challenge, and/or in the event that there is more than one challenge per year.

Steps to implement & timeline

1. Publication of an AIP to the ArbitrumDAO forums for engaged discussion and debate [this post].
2. Two separate temperature checks on Snapshot (1 week).

a. Bond sentiment.

Test whether the ArbitrumDAO may approve the Arbitrum Foundation's request for 4234 ETH to run the first BOLD validator.

b. Operational cost sentiment.

Test whether the ArbitrumDAO may approve the additional service fee for active proposers (excluding the Arbitrum Foundation) and the reimbursement of L1 gas costs for running an active proposer. Total request is 900 ETH to cover a 3-year period.

1. Depending on the temperature check result:

a. Continue to Tally.

If there is strong consensus on both temperature checks, then the AIP will be published as one on-chain AIP on Tally for an on-chain vote.

b. Re-iterate on numbers.

If either temperature check is rejected by the DAO, then it will be iterated on and re-submitted for a temperature check again, until the DAO has consensus of what an appropriate ask from the DAO treasury is.

1. Assuming a successful vote on-chain, the funds will be transferred to a multi-sig wallet controlled by the Arbitrum Foundation.
2. The Arbitrum Foundation will then deposit the funds in a validator that will be used to secure Arbitrum One, if the AIP to upgrade the DAO-governed chains to use BoLD is passed.

Payment facilitation, final costs & restrictions

The Arbitrum Foundation is requesting 5,134 ETH from the ArbitrumDAO to cover the following costs:

- 3600 ETH to run the first BOLD-enabled proposer for Arbitrum One,
- 634 (555 + 79) ETH budget to counter one BOLD challenge,
- 500 ETH as service fees for active BOLD proposers (excluding the Arbitrum Foundation), and,
- 400 ETH to reimburse honest parties on their L1 gas costs for 3 years.

Notable points:

- Arbitrum Foundation will not be entitled to the service fee,
- Arbitrum Foundation will be reimbursed for the L1 gas costs,
- All service fee payments will be manually processed by the Arbitrum Foundation on a periodic basis (weekly or monthly) alongside a requirement that all payments adhere to the Foundation's compliance process.

All requested funds will be sent to a multi-sig controlled by the Arbitrum Foundation and the funds will be returned if the BoLD proposal is not approved by the ArbitrumDAO. Additionally, after 3 years, any unspent funds from the service fee or gas reimbursements will be returned to the ArbitrumDAO and a subsequent proposal will be posted to help cover the future operational costs of Arbitrum.

The ArbitrumDAO reserves the right to revoke the Arbitrum Foundation's proposer at any time and return the bonds back to the treasury. This will be implemented and enforced via the BoLD smart contracts:

- Withdrawal Address.

The funds will be deposited into BoLD and the withdrawal address set to the 'UpgradeExecutor' contract on L1.

- Triggering Withdrawal.

The ArbitrumDAO (via governance) or the Arbitrum Foundation will have the authority to trigger a withdrawal and the funds

can only be sent to the pre-established withdrawal address (i.e. the ArbitrumDAO's treasury).

Put another way, the ArbitrumDAO will have the authority to single-handedly return the funds back to the ArbitrumDAO treasury. This model can be used for future proposals if other entities want to run a proposer on behalf of the ArbitrumDAO.