Submitted by: The Arbitrum Foundation

Category: Constitutional, Software Upgrade

Abstract

This AIP proposes the adoption of Timeboost, a new transaction ordering policy for Arbitrum One and Nova. Timeboost enables auctions for the rights to an express lane, giving the winner an advantage for transaction inclusion and allowing them to potentially capture arbitrage and backrunning opportunities. Proceeds from the auction are at the discretion of the Arbitrum DAO, with two main options outlined in this proposal: collecting bids in ETH or collecting bids in ARB.

Motivation

Arbitrum Chains currently order transactions on a First-Come First-Served basis (FCFS). The motivation to implement FCFS was twofold:

1. Easy to understand and implement,
2. Replicate Web2 user experience for instant transaction confirmation,

Unfortunately, relying solely on first-come first-served transaction ordering is not an ideal long-term solution.

When opportunities to profitably arbitrage across exchanges arise on Arbitrum, “MEV Searchers” race to get their transaction included before anyone else so that they can capture this profit. This latency race involves a lot of spam, placing stress on chain infrastructure and causing searchers to wastefully invest in faster hardware. Furthermore, none of the MEV generated is captured by the chain and instead all profits are collected by searchers.

Timeboost is a new transaction ordering policy that retains many of the great benefits currently in place for Arbitrum chains, including frontrunning protection and fast block times, while allowing the chain to reduce negative externalities from the racing behavior induced by MEV searchers. Additionally, it can socialize the benefits of the transaction sequencing market back to the ArbitrumDAO.

Rationale

Sustainable

: Timeboost offers the ArbitrumDAO an opportunity to capture additional revenue that does not come at the expense of users, since the value being captured already exists.

Technically-Inclusive

: Rather than capturing arbitrage opportunities by having the fastest hardware, participants can win these opportunities by bidding in an auction.

Neutral and Open

: The auction for the express lane is permissionless and participation is open to everyone, where the highest bid wins.

Empowerment

: The Arbitrum DAO can configure all aspects of Timeboost, including enabling or disabling it, the auction’s design, and how to handle proceeds.

Key Terms

Express Lane

: A separate path for submitting transactions to the sequencer that has priority access compared to normally submitted transactions.

MEV

: Maximal extractible value. In the context of Timeboost, MEV refers to the maximum amount of profit someone could make by including their transactions slightly faster than anyone else.

Specifications

The full specification for the Timeboost auction can be found here:GitHub - OffchainLabs/timeboost-design

Arbitrum chains that adopt Timeboost will have two paths for transaction submission:

- Normal path

: Transactions in the normal path will experience a short delay (defaulted to 200ms) but will otherwise remain unchanged.

- Express lane

: Transactions in the express lane do not experience any delay.

Access to the express lane would be auctioned off in one-minute rounds, with the auction happening 15 seconds before the round begins. Bids are kept private until after the bid submission deadline, and the auction winner will pay the same price as the second-highest bid of that round. There are two reserve prices, which determine the minimum bid one can place, that are configurable by the DAO.

The first is a “minimum reserve price,” which is set by governance. The second is a “current reserve price.” An address designated by governance can call the auction contract to change the current reserve price to any value greater than or equal to the minimum reserve price. To start, the proposed minimum reserve price is 0.001 ETH or 3 ARB per round (depending on what currency the DAO votes to collect bids in), and there is no address designated to change the current reserve price. The reserve prices are only meant for establishing a minimum bid, and does not represent what the expected value of the express lane will be. There are two main components that facilitate the express lane auction:

- Auction contract

: Prospective bidders must deposit funds into the auction contract before bidding in the auction. The contract is also responsible for verifying bidders’ signatures, checking auction contract account balances, deducting the second-highest bid amount from the account of the highest bidder, and handling the proceeds.

- Autonomous auctioneer

: An offchain program that captures bids from participants and reports the top two bids to the auction contract. This AIP proposes that the sequencer act as the autonomous auctioneer if Timeboost is adopted.

The proposed version of Timeboost is compatible with a centralized sequencer, however, the Timeboost policy will be compatible with proposals for a decentralized sequencer. 3% of auction proceeds would be left aside for the Arbitrum Developer Guild, which helps fund core Arbitrum development.

The ArbitrumDAO can configure the currency in which bids are collected and how the auction proceeds are handled. This AIP proposes two main options that the community can vote on if it decides to adopt Timeboost. Governance can change these options at any time.

- Collect ETH

: Collect bids in ETH and send the proceeds to the DAO treasury.

- Burn ARB

: Collect bids in ARB and burn the proceeds.

Depending on which option the Arbitrum DAO chooses, the auction contract can either transfer the proceeds to a designated account or burn them.

Steps to Implement

If the Arbitrum DAO approves the AIP, the path would consist of:

1. Discussion of the proposal on the forum and governance call(s)
2. A vote on Snapshot to decide between Option 1 (collect ETH), Option 2 (burn ARB), or Option 3 (don’t adopt Timeboost)
3. Sufficient time for testing on a public testnet
4. An onchain vote to deploy the upgrade on Arbitrum One and Arbitrum Nova