

## Abstract

This AIP proposes to combine two separate actions into a single on-chain vote for the ArbitrumDAO to consider: the adoption of Timeboost and a Nova Fee Sweep action. Timeboost introduces a new transaction ordering policy for Arbitrum One and Nova. The Nova Fee Sweep action will forward historical transaction fees to the ArbitrumDAO Treasury, a task leftover from the [Nova Fee Router Proposal](#).

As a recap, Timeboost enables auctions for the rights to an express lane on both Arbitrum One and Nova, giving the winner a time advantage for transaction inclusion. Use of bid proceeds from the auction will be at the discretion of the ArbitrumDAO, with the ArbitrumDAO having already signaled strong support for collecting bids in ETH in the [temperature check vote on Snapshot](#).

Meanwhile, the Nova Fee Sweep action applies to historical Nova transaction fees currently held in the [L1TimelockAlias](#); these fees will be swept into the DAO Treasury with the use of the modernized fee collection infrastructure outlined in the [Nova Fee Router Proposal](#). The full balance of ETH—currently 1,885 ETH—will be transferred to the DAO Treasury on Arbitrum One using established smart contract infrastructure.

## Motivation

### Timeboost

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

1. Easy to understand and implement,
2. Replicate Web2 user experience for instant transaction confirmation, and
3. Protect users against front-running.

Unfortunately, relying solely on FCFS transaction ordering is not an ideal long-term solution. This is because 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 off-chain 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.

### Nova Fee Sweep

Historically, Nova transaction fees accumulated to the [L1TimelockAlias](#) address, which required a lengthy constitutional proposal process for the ArbitrumDAO to access or spend. The successful passing of the [Nova Fee Router proposal](#) redirected these fees to a system of “fee routers” that automatically transfers funds to the ArbitrumDAO treasury, reducing quorum requirements, reducing delays, and simplifying accounting by consolidating funds directly in the treasury. As of 28 August 2024, Nova transaction fees began accumulating to a series of RewardDistributor contracts as outlined in the Nova Fee Router proposal, streamlining the revenue collection process for the DAO.

However, transaction fees that accumulated to the L1TimelockAlias before the Nova Fee Router change went into effect remain in the L1TimelockAlias, totalling 1,885.79 ETH. This proposal intends to sweep these historical Nova transaction fees from the legacy L1TimelockAlias address into the new fee collection system. This will be a one-time task because funds collected after 28 August 2024 have been, and will continue to be, automatically forwarded through the new fee collection system to the ArbitrumDAO treasury.

## Rationale

### Timeboost

**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 is already being collected by winning latency races on-chain.

**Technically-Inclusive:** Timeboost allows any user to benefit from faster transaction inclusion via an autonomously-run auction that is open to all users.

**Neutral and Open:** The auction for the express lane is permissionless and participation is open to everyone, where the highest bid wins but pays the 2nd highest bid.

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

## **Nova Fee Sweep**

Operations: Collecting historical transaction revenue from Nova enables the DAO to continue funding general operations.

Transparency: Transaction fees will be forwarded to the DAO Treasury with the use of verifiable on-chain actions and audited smart contracts.

## **Key Terms**

### **Timeboost**

Auction Contract: A smart contract that handles the state, accounting of funds for bids, and various operations of the Timeboost auction. The contract is deployed on the target chain for which Timeboost is enabled.

Autonomous auctioneer: Off chain software that receives bids from Timeboost auction participants, processes and validates bids, and then posts the top valid bid (or top two valid bids in the case of a tie) to the Auction Contract to resolve the Timeboost auction. The autonomous auctioneer, for a given chain, is provisioned & deployed by an entity designated by the chain's owner.

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

Express lane controller: An address, defined in the Auction Contract, that is granted the privilege to use the express lane. These privileges are granted after verifying that the incoming transactions were properly signed by the express lane controller, among other checks.

First come, first serve: A type of transaction ordering policy used by the sequencer in Arbitrum chains whereby incoming transactions are sequenced into a block in the order that the transactions arrived.

MEV: Maximal extractable 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.

Timeboost: A transaction ordering policy in which entities can bid for the right to access an express lane on the sequencer for faster transaction inclusion. See the [research specification](#) to learn more.

Transaction ordering policy: The rules and logic employed by a chain to order incoming transactions into a block.

## **Nova Fee Sweep**

[L1TimeLockAlias](#): address that historically accumulated Nova transaction fees but was replaced by RewardDistributor contracts as a part of the [Nova Fee Router Proposal to upgrade the fee collection infrastructure](#); historical fees held by this address are the subject of this proposal.

[ChildToParentRouter](#): smart contract that, when called, creates an L2-to-L1 message which sends the contract's full ETH balance; once the message is executed, the ETH is transferred to a ParentToChildRouter smart contract on L1

[ParentToChildRouter](#): smart contract that, when called, creates a retryable ticket which transfers the contract's full ETH balance from L1 to the DAO Treasury on Arbitrum One

## **Specifications**

### **Timeboost**

The full specification for the Timeboost auction can be found here: [GitHub - OffchainLabs/timeboost-design](#).

The implementation consists of an auction contract, autonomous auctioneer, and changes to the sequencer:

- 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 receives bids from participants and resolves the top two bids to the auction contract. This AIP proposes that the current sequencer operator provision and set up the autonomous auctioneer, if Timeboost is adopted.
- Sequencer updates - Changes to the sequencer include: background processes to use the auction contract as the

source of truth for the current round's express lane controller, new business logic to delay non-express lane transactions, and to verify and honor the rights of incoming express lane transactions. Additionally, new endpoints are introduced for the express lane controller to submit their transactions to and for the auctioneer to submit calls to the auction contract for auction resolution.

Timeboost changes the guarantees around transaction inclusion and introduces two different paths:

- Normal path - Transactions in the normal path will experience a short delay (defaulted to 200ms), but will otherwise remain unchanged unless the ArbitrumDAO decides to do so.
- Express lane - Transactions in the express lane do not experience any delay.

Nearly all users will continue to submit transactions using the normal path. Timeboost introduces an express lane that can be purchased by sophisticated actors via an auction every minute, with each auction closing 15 seconds before the next round begins.

All bids in the auction 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. A bid will only be accepted if it is at or above a minimum bid (the `reservePrice`). The autonomous auctioneer has the right to change the `reservePrice`, but it cannot be lower than the `minReservePrice`, which can only be changed by the ArbitrumDAO. Note, the `reservePrice` does not represent the expected value of a bid for the express lane, it is just a minimum bid that will be accepted.

This proposal proposes setting the `minReservePrice` to 0.001 ETH, as the ArbitrumDAO has already signaled strong support for collecting bids in ETH in the [temperature check vote on Snapshot](#). As mentioned above, the ArbitrumDAO has full control over how to spend the proceeds from the Timeboost auction, with 3% of auction proceeds to be set aside for the Arbitrum Developer Guild, which helps fund core Arbitrum development. Governance can change the token used for the auction and the `minReservePrice`, at any time.

If this proposal passes, the following data sources will eventually be made available after Timeboost goes live on Arbitrum One and Arbitrum Nova:

- Historical bid data for auction participants, outside of the two highest bids (that are otherwise posted on-chain)
- A way to label/identify which transactions were sequenced in the express lane (i.e. Timeboosted transactions).

Finally, the proposed version of Timeboost is compatible with a centralized sequencer. However, the Timeboost policy will also be compatible with proposals for a decentralized sequencer.

## Timeboost Implementation Adjustments

[Timeboost's design](#) is the culmination of over a year of research and development by the team at Offchain Labs. While the on-chain implementation will be independently audited by Trail of Bits before the Tally vote, the long term performance of Timeboost can only truly be evaluated with real-world data - data that can help hone and fine-tune Timeboost's design for the benefit of the ArbitrumDAO.

To that end, although the auctioneer will function autonomously, this AIP proposes granting the current sequencer operator the below rights to make the following adjustments from time to time for a period of two (2) years. The rights described below are expected to only be exercised in circumstances where doing so would enhance Timeboost's long-term stability, preserve or improve the user experience for those using Timeboost-enabled Arbitrum chains, increase the security posture, resiliency, or stability of the chain, and/or otherwise help increase revenue for the ArbitrumDAO:

- The right to adjust the `NonExpressDelayMsec` parameter, which is the default delay that non-express lane transactions would be subject to. The default is 200ms, but adjustments could be to any value between 100ms & 500ms, inclusive.
- The right to change the `maxBidsPerSenderInRound` parameter, a limit on the number of bids per participant per auction round, to mitigate against active or perceived Denial-of-Service (DoS) attacks on the auctioneer. The starting default will be 5.
- The right to change the `reservePrice` to increase the DAO revenue from Timeboost bid proceeds and/or to mitigate the risks of bidders colluding. To start, the `reservePrice` will simply be the `minReservePrice`.
- The ability to rotate the auctioneer's key for submitting bids and the reserve price setter key for changing `reservePrice`.
- The right to pause the acceptance and verification of bids. This is to allow the current sequencer operator to provide reliable, consistent UX and maximize infrastructure stability.
- The right to disable Timeboost entirely in the event of a security risk or otherwise malicious attempt to harm Arbitrum One and Arbitrum Nova node operators, existing deployed applications, and/or end users. The Arbitrum Foundation and Offchain Labs commits to sharing publicly post-mortems and analyses should this scenario arise.

Should this vote pass, modifications to other Timeboost parameters, including to values outside the specified ranges and to those not already listed above, but which are otherwise listed in the design specification, will require a constitutional governance vote, in accordance with the [ArbitrumDAO Constitution](#). In cases where the ArbitrumDAO wishes to pause or disable Timeboost, the ArbitrumDAO may use the outcome of a Snapshot vote to do so (since Timeboost has an off-chain component). This special provision allows the ArbitrumDAO to react to market conditions quicker than what a Tally, on-chain vote would allow (~14 days as opposed to ~30 days). The transfer of express lane rights will not be supported by the Arbitrum Nitro node software in the initial launch and may be implemented at a future date via a regular node upgrade. A round's express lane controller, at their choice, can still sign transactions on behalf of others on a per-transaction basis.]

It is important to emphasize that for Arbitrum One and Arbitrum Nova, the DAO-elected Arbitrum Security Council can, at any time, perform either Emergency Actions or Non-Emergency Actions to execute software upgrades, perform routine maintenance, and other parameter adjustments to Timeboost, in each case in accordance with its existing powers. These actions can include, but are not limited solely to, exercising the rights proposed above for the current sequencer operator. More information about the Arbitrum Security Council and their scope of powers can be found in the [ArbitrumDAO Constitution](#).

## **Nova Fee Sweep**

The full script for executing the Nova Fee Sweep can be found here [Standalone Nova Fee Sweep Proposal #303](#)

This script will be executed following a successful governance vote and transfer Nova transaction fees from the historical [L1TimelockAlias](#) to the [ChildToParentRouter](#).

Once transaction fees are received by the ChildToParentRouter, the automated fee collection process will be activated, forwarding fees to the [ParentToChildRouter](#) on L1 and eventually to the [DAO Treasury](#) on Arbitrum One; complete implementation details for this automated fee routing can be found in the [preceding Tally proposal](#). Please note that Reward Distributor contracts are irrelevant for this particular action as historical fees from the L1TimelockAlias will be transferred directly to the ChildToParentRouter.

## **Steps to Implement**

The proposal to have Arbitrum One and Arbitrum Nova adopt Timeboost was posted to the [governance forum in June 2024](#), to gather feedback and facilitate productive discussions. Furthermore, a [temperature check vote on Snapshot was passed](#) by the ArbitrumDAO, signalling support for Timeboost and the use of ETH to collect bids. Since then, a third-party, independent audit of the Timeboost auction contract was done by Trail of Bits and all issues were addressed (audit report published publicly [here](#)). Testing of Timeboost's components end-to-end has begun and there are plans to imminently roll out Timeboost to Arbitrum Sepolia (the ArbitrumDAO and the public will be informed when this happens).

Similarly, the proposed Nova Fee Sweep action will forward historical transaction fees to the ArbitrumDAO Treasury, a task left over from the [Nova Fee Router Proposal](#). More specifically, this action applies to 1,885.793 ETH worth of historical Nova transaction fees currently held in the [L1TimelockAlias](#); these fees will be swept into the DAO Treasury with the use of the modernized fee router infrastructure. There will be a separate temperature check on Snapshot for the Nova Fee Sweep action which will be posted next Thursday on January 30th.

This proposal combines both the Timeboost AIP and the Nova Fee Sweep action AIP into a single proposal for an on-chain vote on Tally. If the on-chain vote on Tally passes successfully, Timeboost will be enabled on Arbitrum One and Arbitrum Nova and the Nova Fee Sweep action will be executed. Down the line, the Arbitrum Foundation will update the DAO on a tentative date for the creation of the onchain AIP on this proposal thread.

## **FAQs and Expectations for Timeboost**

Here is a [compilation of FAQs](#) based on questions received from the community.

If there are questions that are not covered in this FAQ document, please add them as a comment to this forum post, and they will be added to the FAQ document accordingly.

Similarly, a one-pager has been published that recaps a few key principles about Timeboost and summarizes the expectations around Timeboost's use for chain owners, like the ArbitrumDAO [here](#) for delegates to refer to when considering this proposal.