This last month MEV-Boost hit 90% adoption, we open-sourced our block builder and presented details of our next step towards enabling fair mempools and decentralized block building for any

blockchain with SUAVE.

Overview

Two years ago, on November 23, 2020, Flashbots: Frontrunning the MEV crisis was published as a call to action against the emerging negative externalities MEV posed on public blockchains. The post described the motivation behind Flashbots and our ambition to create a permissionless, transparent, and fair ecosystem of MEV extraction that reinforces the ideals of Ethereum.

Two years later, on November 23, 2022, we updated our public commitment in a sequel to the original post on the Flashbots mission: The Future of MEV is SUAVE.

SUAVE

A month after @phil first introduced SUAVE during Devcon VI, we've now shared additional details on the S

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xpression. In the post The Future of MEV is SUAVE we present the three main components of the chains architecture:

- Universal Preference Environment

: A chain and mempool specialized for preference expression and settlement to surface and aggregate the preferences from users and searchers from all participating chains in a single place.

- Optimal Execution Market

: A network of special parties called executors who listen to the SUAVE mempool and compete to provide the best execution for user preferences.

- Decentralized Block Building

: A decentralized network for and of block builders to access the encrypted preferences from users and merge them into partial or full blocks.

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From

[The Future of MEV is SUAVE

](https://writings.flashbots.net/the-future-of-mev-is-suave/)

SUAVE is an independent, EVM-compatible blockchain that can act as a mempool and decentralized block builder for other chains. It unbundles the mempool and block builder role from existing chains and offers a highly specialized plug-and-play alternative. By sharing the same sequencing layer, SUAVE allows block builders to capture cross-domain MEV, ensure maximum revenue for validators, and the best execution for users, while reducing the economic centralization pressure of MEV on each domain.

SUAVE will be progressively decentralized with improved trust guarantees and increased expressiveness over time. It will be developed in the open and we invite all interested parties — users, wallets, searchers, builders, researchers, and blockchain developers — to work with us!

For additional information on SUAVE beside the post, see the Tweet threads by Flashbots mates and join the conversation!

MEV-Boost

On November 10th a denial-of-service vulnerability was exploited by a malicious builder sending bids to the Flashbots Mainnet relay, leading to a drop in MEV-Boost blocks between 12:00 and 16:00 UTC.

The issue was reported by Manifold Finance, with tests in Goerli. In close collaboration with EF security, consensus client, and relay operators teams, we identified the root cause of the issue, an incomplete builder submission validation, and deployed a solution to all networks.

There was no risk of proposers missing slots as nodes willfall back to proposing locally built blocks if they fail to receive blocks from MEV-Boost. Approximately 350 locally built blocks were proposed instead of MEV-Boost blocks during the incident.

For more details, see the full post-mortem by @metachris. More updates on the latest MEV-Boost developments can be found in MEV-Boost Status Update - 2022-11-17.

The Cost of Resilience

With the addition of the -min-bid

parameter in MEV-Boost v1.4.0, validators have the ability to set a minimum bid value in their configuration. If the blocks relayed from MEV-Boost are below this value, the validator will propose a locally-built block instead.

With this feature, validators can help increase Ethereum's censorship resistance by foregoing a small amount of profit – the price of resilience

, while still being able to capturehigh block rewards. The post by @elainehu @hasu and @fiiiu expands on the implication of this feature in terms of network resilience.

It's currently not possible for nodes to calculate the value of locally built blocks before they are proposed. However, during the Nov 17th CL call, developers discussed and reconfirmed their plan for implementing a method for calculating the value as the sum of included transactions priority tips.

Being able to compare the value of a locally built block with thevalue of a block from a third-party builderwould open up new possibilities that give proposers greater flexibility in how they operate. Research on inclusion lists, crLists and partial block auctions are ongoing as potential longer-term solutions.

If you're interested in discussing how the -min-bid

parameter impacts network resilience and validator behavior, visit the forum thread and initiate a conversation!

Open sourcing the Flashbots block builder

A healthy Ethereum ecosystem relies on a competitive, geographically diverse and transparent community of builders. Competition among builders maximizes validators' rewards and improves censorship resistance for users. To support this growth, we have open-sourced our leading block builder.

By open-sourcing our work, we aim to accelerate the development and maturity of the builder market. We encourage all teams to develop their builders in the open and for the community to only trust builders who demonstrate a commitment to transparency and free software.

[Cancellations

](https://collective.flashbots.net/t/bundle-cancellations-testing/605/13)Canceling transactions is now possible in both our builder and relay on our mainnet staging environment at relay-staging.flashbots.net. The staging environment is only for simulating the sending and canceling of bundles and will only affect currently built and upcoming blocks. If you use our builder at 0x81babe, you should be able to see the effects of your bundles on the mainnet as if you were using a production endpoint.

[Flashbots Bundle Relay API Upgrades

](https://collective.flashbots.net/t/flashbots-bundle-relay-api-upgrades/896)A handful of important upgrades are coming to the Flashbots Bundle Relay API including new methods with PoS related fields: flashbots_getBundleStatsV2

and flashbots_getUserStatsV2

, bundle cancellations and a switch from HTTP to JSON-RPC standards. Upgrades have been deployed toGoerli Testneti, Sepolia Testnet and Mainnet Staging and will be deployed to Mainnet Production next week.

Diversification in the relay market

On November 30th, two new permissionless and content agnostic relayers were announced and began operation –Agnostic Relay by Gnosis and Ultra sound relay by Ultrasound.money. The total amount of active MEV-Boost relayers is now 10. To support the initial growth of these new relayers the [Flashbots builders are sending them blocks.

](https://collective.flashbots.net/t/the-flashbots-builder-is-now-sending-to-external-relays/898)

To help further bootstrap a diverse relay market @bert initiated a thread regarding which relays the Flashbots builders should send blocks to and which criteria to use when evaluating relays. @metachris also published a technical guide and knowledge base for running a MEV-Boost relay at scale, which includes learnings from operating the Flashbots Relay. Additionally, MEV-Boost Relay API specs are now documented in OpenAPI format thanks to Justin Traglia!

The Flashbots Relay remains the most connected, with87% of all validators having added it to their MEV-Boost configuration. However, its share of MEV-Boost blocks is decreasing, from 80% a month ago to 76% today.

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From

[mevboost.pics

](https://mevboost.pics/)

The percentage of blocks sourced from OFAC-compatible relayers has declined over the last month, from70% to 66%. This is likely partially due to the emergence of these new, content agnostic relayers as well as proposers using of the min-bid

parameter to a greater extent.

After the merge, less than 1% of blocks contained one or more of these transactions. On average, these blacklisted transactions will have to wait for two additional blocks before being included. This is still concerning and as mentioned above, various ways to mitigate this are actively being discussed and researched.

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From

[mevwatch.info

](https://www.mevwatch.info/)

Towards a competitive global builder market

The block builder market continues to diversify as more builders enter the space and gain market share. With the open-sourcing of our builder, we hope to see an even greater number of independent actors starting to compete. The Flashbots builder is currently in the lead by a slight margin, producing approximately 25% of the winning blocks.

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From the

[MEV-Boost Dashboard

](https://dune.com/ChainsightAnalytics/mev-after-ethereum-merge) by ChainsightAnalytics

The profitability of block builders can be tracked onRelay Scan for various time spans. Even though the competition is fierce and a handful of builders subsidize their blocks, we begin to seeprofitable block builders emerging.

Other development

[Prio-load balancer

](https://github.com/flashbots/prio-load-balancer)The prio-load balancer which enables relayers to handle permissionless builder submissions through high and low-priority queues has been open-sourced under MIT license. By utilizing two queues for block submissions, relayers can mitigate spam attacks from less trusted builders. Requests in the high-priority queue will be proxied before any request in the low-priority queue. Potential spam attacks on the low-priority, permissionless queue would not impact uptime of the relay as the high-priority queue would be unaffected.

[Relay scan

](https://www.relayscan.io/)New features have been added torelayscan.io, including the ability to view builder profits for different time periods and export tables as markdown. It's also possible to see builder metrics for each relay by hovering over a specific relay. The site has also received a general design update.

[MEV-Explore

](https://explore.flashbots.net/)MEV-Explore has received a series of updates and now displays metrics post-merge as well. The dashboard is planned to get a more extensive overhaul in the coming months.

Research and discussions

[FRP-20: An Initial Approach to Order Flow Auction Design

](https://collective.flashbots.net/t/frp-20-an-initial-approach-to-order-flow-auction-design/789) by @pgarimidi presents work under FRP-20 from March to May 2022. The post describes key properties when designing mechanisms for order flow auctions (OFA). OFA could be used as a mechanism to redistribute some of the profits from searchers and builders back to the users whose transactions are being exploited.

A proposed solution is presented where a second price auction would be run, the winning searcher gets sole rights to use the transaction in the blockspace auction and pays the second highest bid to the user who created the transaction. If no searchers bid on the auction, the transaction would be forwarded to Flashbots Protect. This mechanism is not necessarily final but provides insight into the challenges of the space.

[FRP-23: Constant Function Market Making, Social Welfare and Maximal Extractable Value

](https://collective.flashbots.net/t/frp-23-constant-function-market-making-social-welfare-and-maximal-extractable-value/752) by Nicolás Della Penna (@nikete) and Bruno Mazorra present initial results looking at welfare and MEV from constant function market maker (CFMMs). The paper describes how social welfare provided by a CFMM can be approximated when enough liquidity is available.

The paper shows that if the liquidity available to the CFMM increases relative to the wealth of traders, it can approximate optimal social welfare when all user transactions are executed. Furthermore, when one agent has the ability to censor transactions, they can obtain higher utility than other agents when blockspace is scarce.

[Decentralized order flow distributer (DOFD

)](https://collective.flashbots.net/t/decentralized-order-flow-distributer-dofd/731) by @josojo argues that by decentralizing the order-flow-management a fair builder's market can be achieved without the need to decentralize block building.

The proposed system would allow users to post transactions in an encrypted mempool, encrypted with a network of distributed keys managed by DOFD nodes. The DOFD would select a subset of builders to see the encrypted transactions and participate in an auction using the provided order flow. If a builder misbehaves they would be slashed by the DOFD-network and not get any future order flow.

[Notes On PBS

](https://collective.flashbots.net/t/notes-on-pbs/723) by @Quintus aggregates internal discussion on@barnabemonnot post Notes On Proposer-Builder Separation (PBS) and invites to an open discussion. The summary gives an overview of how block construction can be designed to avoid "bad" MEV while enabling the extraction of the "good" forms and potential challenges in achieving this goal.

[Workshop about dream economies in circles of trust [work in progress]

](https://collective.flashbots.net/t/workshop-about-dream-economies-in-circles-of-trust-work-in-progress/812) by @chayoterabit are draft notes from an initial workshop on theredistribution experiment. The facilitators of the workshops guide participants through a series of activities, including a collective drawing exercise and discussions about participants' experiences with money.

[Retroactive funding for block building

](https://collective.flashbots.net/t/retroactive-funding-for-block-building/854) by @chayoterabit introduces the Coalition for the optimization of block building algorithms in Ethereum

– a coalition that would be responsible for maintaining and reviewing new submissions to ouropen source block builder. The initial members would be the Flashbots mates that developed the builder and new members would be invited based on their contributions to the codebase. The goal would be to have many members, with a healthy development process so that the block building can continue improving.

[Bookmarks relevant for cross-domain researchers

](https://collective.flashbots.net/t/bookmarks-relevant-for-cross-domain-researchers/753) by @alex aggregates resources on the topic of cross-domain MEV. The links are categorized into essential, Cosmos, L2s, oracles & cross-chain communication, bridges and misc. Feel free to expand the lists with additional resources!

Public appearances, podcasts and events

- Columbia University and the Ethereum Foundation hostedColumbia CryptoEconomics Workshop on December 1st. The workshop brought together practitioners, researchers, and academics to discuss challenges, recent progress, and opportunities in the economics of blockchain protocols, with an emphasis on the problems currently faced by the Ethereum ecosystem.
- MEV Desiderata: Selected trillion dollar questions? by @phil
- MEV and Credible Commitment Devices (slides) by @sxysun

Recordings and slides of these talks will be added here if made available.

- MEV Desiderata: Selected trillion dollar questions? by @phil
- MEV and Credible Commitment Devices (slides) by @sxysun
- On the Brink: Robert Miller on Decentralizing Block Building with SUAVE (EP.378)covers the MEV supply chain post-Merge, censorship resistance, exclusive order flow, cross-domain MEV and of course, SUAVE.

In order to stay up to date on any upcoming events, feel free to subscribe to theFlashbots Collective calendar!

Resources

Below is a collection of publications and dashboards from the broader community posted during the last month on the topic of MEV, PBS and Flashbots. Make sure to also check out the list from previous months for more fantastic resources!

Articles, papers and posts

- The Merge series (part 3): MEV landscape by Rated looks at the adoption of MEV-Boost, key metrics, and how the builder and relay markets are evolving.
- Validators or value-takers? by Metrika takes a deep dive into MEV on Ethereum post-merge and what validators can expect to gain from running MEV-Boost.
- 50,000 blocks and small new feature by builder0x69 celebrates 50,000 blocks proposed and introduce a new feature for searchers to send bundles without having sufficient gas fees at the start of the transaction.
- MEV Resources - Ethereum by @apriori is a collection of MEV resources, summaries, and excerpts of various research papers.
- All is Fair in Arb and MEV on Avalanche C-Chain by Daniel McKinnon describes how they, during the last couple of years, ran one of the dominant MEV bots on Avalanch.
- MEV Driven Centralization in Ethereum: Part 2 by Simon Brown takes a look at what transpired in the months just after the merge, the state of the ecosystem today, and where we go from here.
- Aestus: A Neutral Relay by @austonst introduce a new un-censored relay that is currently undergoing testing for a mainnet launch.
- @ralexstokes describes how EIP4844 will impact block builders with regard to the addition of data gas, blobs, and KZG commitments.

- 0xthewolf describes their journey as a searcher over the last year and how they made, and lost 9 figures.
- My MEV story by etherael describes their experience building liquidation bots, success during the market downturn last December and how the landscape has evolved since.
- SalomonCrypto published a thread that gives backstory to how censorship on Ethereum has evolved since the Merge and what it means for users.
- OurNetwork #148 by Spencer Noon includes a segment by @elainehu on The Flashbots MEV-Boost Transparency dashboard and our efforts to provide transparency to the MEV ecosystem.
- MEV Resources is a list of articles, papers, podcasts and other resources related to Flashbots and MEV.
- Terence.eth gives an overview of how the upcoming Capella hard fork will affect block building.
- The Future of MEV, ft SUAVE, ATOM 2.0, and Manifold Financeby NatPDeveloper gives an overview of MEV, Flashbots, SUAVE, SGX and more.
- @Quintus gives a recap of the talk by Justin Drake at Columbia CryptoEconomics Workshop that outlined an approach to building encrypted mempools to deal with sandwiches and censorship (slides & recording will be added here if made public).
- @hasu published a Twitter thread on “Things that Flashbots has done in the last quarter to protect Ethereum from the centralizing forces of MEV”.
- @sxysun experiments with giving ChatGPT MEV-related promts and get surprisingly good results.

Dashboards

- MEV Relay Landscape by Rated gives an overview of MEV-Boost relays and how rewards from blocks sourced from MEV-Boost compare to locally built blocks.
- Relay monitor by Metrika monitor the bids, blocks and latency of MEV-Boost RelaysForum conversation.

Other

- 0xpo: Crossroads 2022 - Let’s Talk MEV Roundtable featuring Alex Vinas, Matt Cutler, Robert Paluba and Jessica Lin talks about MEV post Merge and ways to reduce MEV through application design.
- Proposer-Builder Separation from the protocol’s perspectiveslides and recording from @barnabemonnot talk during Columbia CryptoEconomics Workshop.
- Toni Wahrstätter produced an animation of how the top 10 block builders have evolved since the Merge.

Get involved

At Flashbots, we research and build systems around MEV, and we would love to collaborate with you. We are a distributed organization with the principles of a pirate hacker collective, and we have several [open positions

](https://boards.greenhouse.io/flashbots). We also issue grants to external researchers doing work aligned with ours, please find out more in our Research repository.

Make sure to also look around on our forum and join the conversations!

Previous Transparency reports

Feedback on Transparency Report structure & content