While Ethereum's original core vision has endured, its wider purpose has evolved significantly. With recent technological advances (i.e., rollups) and a modularized future likely being a dominant reality, it is likely that Ethereum is becoming THE marketplace for secure blockspace.

As the Merge approached, a crucial race commenced—who would become the dominant block builder. Most of this rush was in the guise of extracting MEV. However, we think that MEV is just the tip of the proverbial iceberg and that the greater opportunity for block building will be about products that optimize and provide access to blockspace. This post aims to provide a mental model for the potential role of block building in the future of applications and Ethereum.

About Block Building

On Ethereum, validators are elected to select transactions for the next block. While blocks can be built via a local node, most blocks are currently externally built through MEV-Boost. MEV-Boost is software that separates the block builder role from the validator.[1] Block builders in MEV-boost are responsible for aggregating, ordering, and optimizing data in blocks and proposing those blocks to validators.

Block Building Since the Merge

While it has only been five months since the Merge, there have been multiple developments in the block builder market. Initially, Flashbots' block builder controlled the market with their share excluding "vanilla builders" (this is essentially internal builders) sitting around 80% right after the Merge, 40% one month after the Merge, and eventually oscillating around 20% into February. It is also worth noting that we are already seeing a few dominant block builders who own nearly 75% of the builder market.[2]

Another dynamic that has shifted is profitability. While it is difficult to measure for a variety of reasons, it appeared that immediately post-Merge, most builders were likely passing all extracted value / revenue to validators to select and include the builder's blocks. However, there have been periods where block builders do appear to be extracting value that is not fully paid to validators (there are also some builders who might be paid off-chain). As time passes, we expect block builders as a whole to continue to carve out profit on MEV, but the margins should compress as more sophisticated actors and technologies come to market. We expect this to create even more competition and more MEV mitigation strategies to capture / reduce the MEV (Dune and Relayscan).

Block Building in the Future

Right now, the block builders are geared towards competing on extracting MEV. However, as margins decrease and the opportunity to profit for optimizing blockspace for other use cases emerges, we expect block builders to shift from solely focusing on MEV to including other products and services. This was first introduced by Vitalik back in March of 2021, and then by Alex Stokes who is driving research around the concept of a "generalized block builder" (first at SBC 2022 and another at Devcon Bogota). The two approaches we see block builders focusing on are:

Block Builder as a Bundler

Most building on blockchains today separates the application from the blockspace, causing economic models, user experiences, and developer flexibility to be constrained. We believe that block builders are in a great position to develop specialized products and services that allow teams and developers to more closely align the application with blockspace. Below are a few ideas where block builders could focus:

- Innovation around gas: While there are efforts outside of block building to reduce the frictions around gas, a block builder could be in the perfect position to provide both technical (i.e., account abstraction) and financial engineering (i.e., selling future blockspace) reducing frictions from gas. For futures on blockspace, we imagine the wallet / application to be natural buyers of fixed gas fees, while speculators / block builders who are exceptional at managing variable blockspace risk, to be sellers of fixed gas fees. With applications and wallets being able to pay fixed gas fees that are predictable, they can create user experiences that manage to a constant expense versus a variable expense and could even subsidize the fixed fee as a customer acquisition cost. Further, with EIP-4844 and the potential for new multi-dimensional fee markets, as well as the importance of cheap transactions at the L2, we also expect fixed gas fees to be attractive to stakeholders such as L2s submitting blob data to L1.[3] Another idea is the block builder can offer services to align transaction costs with economic models of an application. For example, some NFT platforms take a fixed percentage on the notional of the NFT traded, regardless of the gas costs. This is great for large transactions, but may not be economic on smaller transactions (i.e., the percentage charged on the notional of a NFT sale may not even cover gas costs), which one day in aggregate could consume considerable blockspace through gaming / social applications. A block builder could create a transaction market or offering to closely align gas paid with the economics of the application (i.e., gas is paid based on notional traded irrespective of network congestion).
- Conditional transaction execution: There are likely to be countless use cases around submitting transactions with logic supported by a block builder. One example is ensuring a transaction is submitted and included within a parameter of a DeFi position (i.e., when a LP's position in a pool reaches a certain threshold, on-chain transactions are executed). While we expect more sophisticated use cases to come to market (i.e., limit orders, option pricing, and many others), another example could be products that allow users to set certain liquidation levels and have the ability to automatically post collateral ahead of any liquidations / price updates from an oracle.

- Security built into builder logic / runtime monitoring: There are various approaches to security at every layer (i.e., in the wallet or application), but block builders could also develop services where only transactions with an expected outcome are included in a block.[4] This idea of simulation / automated analysis was conceptualized in the paper on Clockwork Finance. While we already see versions of transaction simulation in the market, block builders are in a unique position to go a step further. Not only will they simulate transactions, but if they gain enough market share, they could help ensure that there is some time before a transaction is included in the next block. We imagine this type of service being a fixed fee to monitor for transactions paid by a protocol (i.e., similar to retainers paid by protocols to smart contract auditing firms today), but block builders could also layer in a bug bounty type payout for losses that are averted.

Block Builder as an Abstractor

Abstracting consumers from the complexity of accessing and optimizing blockspace is another key area where we expect block builders to provide services. Through this, block builders will not only streamline product development, but in some cases could play and become a fundamental part in Ethereum's infrastructure and scalability roadmap. Specific examples include:

- Seamless integration with L2s / roll-ups / cross chain: Due to the near-term potential of cross chain MEV, the most robust block builders will develop cross chain / network infrastructure to route assets and data. In addition to capturing that MEV, the block builder can also offer other products such as new transaction types and pooled liquidity. The block builder could also offer seamless cross chain integrations to wallets / broadcasters (i.e., the wallet or application only integrates with a block builder instead of with all the various chains / bridges).
- Data blobs on-chain / products for a different set of users: As the users on L1 shift from individuals to other types of consumers of blockspace (i.e., roll-ups), block builders can create infrastructure and abstract those users from having to manage interactions with and submitting data / any information to the L1. One example that has been highlighted is data blob management by builders for roll-ups.
- Block level customization / UX improvement: Alex Stokes at Devcon brought up EIP-1559-like mechanics at the block level that spreads the burn across all transactions in the block instead of at the transaction level. In this instance, the block builder abstracts users from transaction level burn and instead pays the block builders a fee who spreads the cost of the ETH burned across the whole block. We believe ideas like this will be developed for better user experiences, to support selling futures on blockspace, and for customization to unlock more flexibility.
- MEV smoothing: Given the uncertainty around MEV at the block level, block builders could add a product that provides off-chain smoothing. If there is a set of stakeholders who coalesce around trusted block builders then block builders could place the MEV into a pool and at some point that pool would be distributed across stakeholders (i.e., similar to what we see in LSTs today) instead of paying MEV to a single downstream participant.[5]
- Danksharding: Given the increased compute (i.e., from data availability sampling) and networking infrastructure (i.e., for block propagation tasks) requirements for full danksharding—as well as keeping in the spirit of low barriers to entry for validators—we believe these tasks are likely to be outsourced to stakeholders like block builders who are well positioned to handle the increased technical requirements.[6]

The Future

What do all these opportunities lead to: we believe that block building, as a general idea, is only going to grow in importance for both the user and developer experience as well as the future of scaling Ethereum. We also acknowledge that some of these products and services will be enshrined in the long run (and should be!) and will need to be decentralized to ensure Ethereum continues to achieve its purpose in the crypto ecosystem. With that said, we are already engaging with / keen to meet teams researching and building around this part of the tech stack and are excited to work with them over the years to come.

Disclosures and References

[1] Longer-term there are efforts to enshrine parts of this infrastructure, also known as proposer builder separation.

[2] Give Toni a follow and thanks for creating this for the community.

[3] One area currently underdeveloped is products for block builders to hedge their risk for selling fixed prices on future blockspace given the various risks of the realized costs for future blockspace. We expect more innovations around this, likely starting on the cash settled side.

[4] We acknowledge that this type of service is a form of censorship and should be balanced with other potential downsides that come with censorship.

[5] We note that there is active research into on-chain, permissionless MEV smoothing schemes.

[6] Also see Barnabe Monnot's talk: https://www.youtube.com/watch?v=175fuv2RJUo