Sui Gas Pricing

The Sui gas-pricing mechanism achieves three outcomes: delivering low, predictable transaction fees, incentivizing validators to optimize their transaction processing operations, and preventing denial of service attacks.

This enables you to focus on using the Sui network to provide the best user experience without needing to forecast the current market price of gas fees. Since validators agree on a network-wide reference price at the start of each epoch, you can use the reference price as a credible anchor when submitting transactions. Moreover, the price setting mechanism rewards good validator behavior, thus aligning incentives between SUI token holders, the network's operators (validators), and its users.

A unique feature of the Sui gas price mechanism is that users pay separate fees for transaction execution and for storing the data associated with each transaction. The gas fees associated with an arbitrary transaction τ \tau τ equal:

The gas functions $ComputationUnits[\tau]$ ComputationUnits[\tau] $ComputationUnits[\tau]$ and $StorageUnits[\tau]$ StorageUnits[\tau] $StorageUnits[\tau]$ measure the amount of computation and storage resources, respectively, required to process and store the data associated with τ \tau τ. The gas prices $ComputationPrice[\tau]$ ComputationPrice[\tau] $ComputationPrice[\tau]$ and $StoragePrice$ StoragePrice StoragePrice translate the cost of computation and storage, respectively, into SUI units. The decoupling between gas units and gas prices is useful since SUI market price will fluctuate over time in accordance with supply and demand.

The computation gas price $ComputationPrice[\tau]$ ComputationPrice[\tau] $ComputationPrice[\tau]$ captures the cost of one unit of computation in SUI units. This price is set at the transaction level and submitted by the user as the transaction's gas price. Conceptually, it is useful to think about this gas price in two parts:

On the Sui network, a single $ReferencePrice$ ReferencePrice $ReferencePrice$ exists throughout each epoch, with Sui validators updating the $ReferencePrice$ ReferencePrice $ReferencePrice$ at each epoch boundary. Hence, in practice, when a user submits a gas price above the $ReferencePrice$ ReferencePrice $ReferencePrice$, it is useful to think of the difference as a tip paid to the network in order to get higher priority. During moments of regular network operations, users are not expected to pay tips and the vast majority of transactions have gas prices equal to $ReferencePrice$ ReferencePrice $ReferencePrice$.

More generally, the Sui gas price mechanism makes the $ReferencePrice$ ReferencePrice $ReferencePrice$ a credible anchor for you to reference when submitting transactions to the network. Providing reasonable confidence that transactions submitted with gas prices at or close to the reference price are executed in a timely manner. This is achieved through three core steps:

In sum, the gas price mechanism has two main forces: the tallying rule incentivizes validators to honor the quotes submitted during the gas survey, while the distribution rule incentivizes validators to submit low reservations prices. The interaction of these two forces delivers a mechanism encouraging validators to set a low network-level reference gas price - but not too low, because they face penalties if they cannot honor their quotes. In other words, the gas price mechanism encourages a healthy competition for fair prices.

The storage gas price $StoragePrice$ StoragePrice StoragePrice captures the costs of covering one unit of storage in perpetuity, in SUI units. This price is set through governance proposals and is updated infrequently. The goal is to ensure Sui users pay for their use of on-chain data storage by depositing these fees into the storage fund and then redistributing these fees to future validators. In contrast to the computation gas price, storage prices are fixed and common for all transactions both within an epoch and across epochs until the storage price is updated.

The $StoragePrice$ StoragePrice StoragePrice is set exogenously through the governance proposal with the goal of targeting the off-chain dollar cost of data storage. In the long run, as the costs of storage fall due to technological improvements and the dollar price of the SUI token evolves, governance proposals will update the price in order to reflect the new dollar target price.

Overall, when you submit transactions with computation gas prices at or close to the current epoch $ReferencePrice$ ReferencePrice $ReferencePrice$ and storage gas prices at the targeted $StoragePrice$ StoragePrice StoragePrice, you have the best user experience. The Sui gas price mechanism provides you with credible reference prices for submitting your transactions. By incentivizing validators to elicit their true reservation prices and honor these quotes, you can credibly assume your transactions are processed in a timely manner.

After Sui enables horizontal scaling, validators can add more workers as demand for on-chain activity scales. This increases their costs linearly at the same pace of network activity and lets them process more transactions at the same low gas prices. In cases of extreme network congestion where validators cannot scale fast enough, the tip presence provides a market-based congestion pricing mechanism that discourages further demand spikes by increasing the cost of transacting on the Sui platform.

In the long run, the Sui gas price mechanism creates incentives for validators to optimize their hardware and operations. Validators that invest in becoming more efficient are able to honor lower gas prices and obtain a stake reward boost. Sui validators are thus encouraged to innovate and improve the experience of end users.

Computation gas prices

The computation gas price C o m p u t a t i o n P r i c e [τ] ComputationPrice[\tau] C o m p u t a t i o n P r i c e [τ] captures the cost of one unit of computation in SUI units. This price is set at the transaction level and submitted by the user as the transaction's gas price. Conceptually, it is useful to think about this gas price in two parts:

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The storage gas price S t o r a g e P r i c e StoragePrice St or a g e P r i c e captures the costs of covering one unit of storage in perpetuity, in SUI units. This price is set through governance proposals and is updated infrequently. The goal is to ensure Sui users pay for their use of on-chain data storage by depositing these fees into the storage fund and then redistributing these fees to future validators. In contrast to the computation gas price, storage prices are fixed and common for all transactions both within an epoch and across epochs until the storage price is updated.

The S t o r a g e P r i c e StoragePrice St or a g e P r i c e is set exogenously through the governance proposal with the goal of targeting the off-chain dollar cost of data storage. In the long run, as the costs of storage fall due to technological improvements and the dollar price of the SUI token evolves, governance proposals will update the price in order to reflect the new dollar target price.

Overall, when you submit transactions with computation gas prices at or close to the current epoch R e f e r e n c e P r i c e ReferencePrice R e f e r e n c e P r i c e and storage gas prices at the targeted S t o r a g e P r i c e StoragePrice St or a g e P r i c e , you have the best user experience. The Sui gas price mechanism provides you with credible reference prices for submitting your transactions. By incentivizing validators to elicit their true reservation prices and honor these quotes, you can credibly assume your transactions are processed in a timely manner.

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Gas prices as a coordination mechanism

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