



Avalanche C-Chain Throughput Increases as Validators Signal Higher Gas Targets

Avalanche validators increase the C-Chain's target gas consumption by 30% thanks to the Octane upgrade, paving the way for higher throughput and future scaling optimizations.

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Quick Take

- Positions Avalanche well to become one of the lowest latency, highest throughput EVM L1 experiences in the ecosystem.



- Avalanche validators increased the C-Chain's target gas consumption by 30 % from 1.6 M to 2.1 M gas/sec.
- The dynamic adjustments were enabled by the Octane upgrade, activated on April 6, 2025.
- The Avalanche Foundation plans to continue signaling incremental increases as network metrics allow.
- Future improvements like Continuous Execution (formerly SAE) and Firewood Database integration aim to enable even larger increases.

Avalanche's C-Chain has seen its throughput capacity increase by over 30% following validator action to raise the target gas consumption from 1.6 million to 2.1 million gas per second. The increase was made possible by the Octane upgrade that went live on April 6th, 2025.

The gas target determines how much computational work the network can process per second, directly affecting how many transactions and smart contract operations can be executed. For users of the chain, higher gas targets mean higher potential transactions per second, and also lower transaction fees. For validators and node operations, higher gas targets can mean increased demands on hardware and network infrastructure, which is closely monitored to ensure stability and reliability. The dynamic adjustments were enabled by the Octane upgrade, activated on April 6, 2025. Future improvements like Continuous Execution and Firewood Database integration aim to enable even larger increases.

Dynamic Gas Target Adjustment

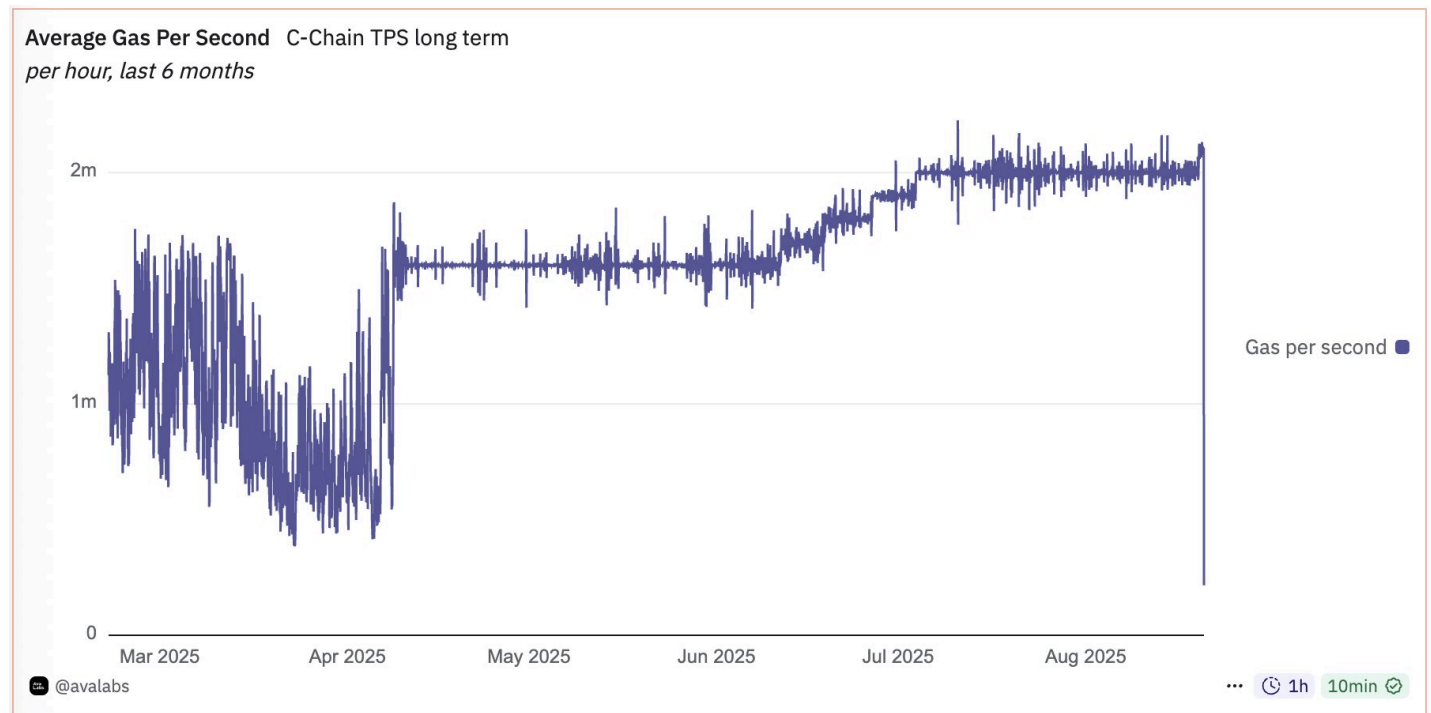
The Octane upgrade introduced the ability for Avalanche Primary Network validators to dynamically update the network's target utilization through signaling their preferences. This mechanism allows the network to adjust capacity parameters without requiring hard forks or governance votes.

How Validator Signaling Works

Under the new mechanism, validators can explicitly set their preferred gas target values.  Validators that do not set a preference effectively abstain from influencing the network's gas

target by defaulting to whatever the current value is. The network calculates the effective gas target based on the preferences of participating validators.

Since the upgrade's activation, validators run by the Avalanche Foundation have iteratively increased their gas target preferences, resulting in the 30% throughput increase observed across the network.



The Avalanche Foundation plans to continue gradually increasing their validator preferences while monitoring network performance metrics. This approach aims to maximize C-Chain utilization within current infrastructure constraints. Upcoming optimizations like Continuous Execution and the Firewood Database integration are expected to enable further increases.

Other validator operators can set their gas target preferences to participate in determining the network's effective throughput capacity. This allows scaling decisions to reflect the technical assessment of the broader validator community.

Network Health Monitoring



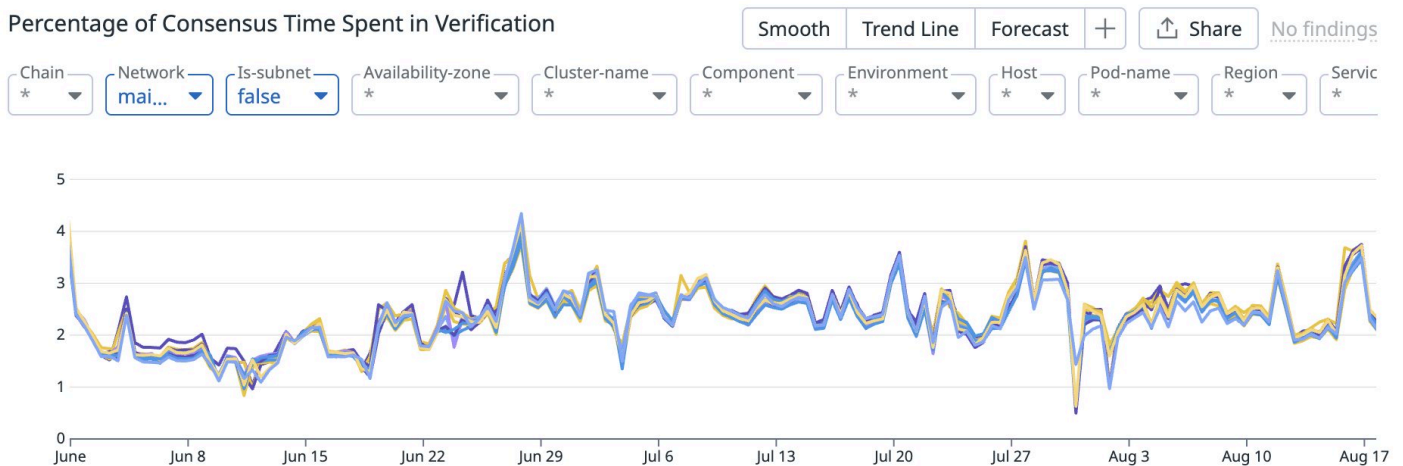
Several key performance indicators are closely monitored consistently through changes to the target gas consumption to ensure network stability:

- Block verification times - to ensure consensus remains stable

As the gas target increases, so does the maximum amount of gas able to be consumed in a given block. The more gas in a block, the longer time that block will potentially take to execute. It's important that block execution times remain within an acceptable range to ensure that consensus is able to proceed successfully.

Because blocks can have significantly different sizes depending on the time they are produced and gas capacity available at that instant, a holistic way of viewing the amount of time spent in block execution is by looking at the percentage of time that a node uses to execute blocks during consensus. We had earmarked less than or equal to 5% of time spent in block execution as a key performance indicator of consensus, and though a small initial increase was observed, validator nodes were able to stay below that threshold.

Percentage of Consensus Time Spent in Verification



- Disk usage and state growth rates - to monitor storage requirements

The higher the gas usage, the higher potential for state growth, and because all validators currently must maintain the full state of the chain on disk, the more storage validators may need to have available to use.

Of course the larger the chain grows, the more disk space it will require to store it, but in increasing the gas target we wanted to ensure that the rate of disk growth didn't become

unsustainable, and in fact observed that disk usage continued to grow at a relatively constant rate of around 3 to 4 GB per day.

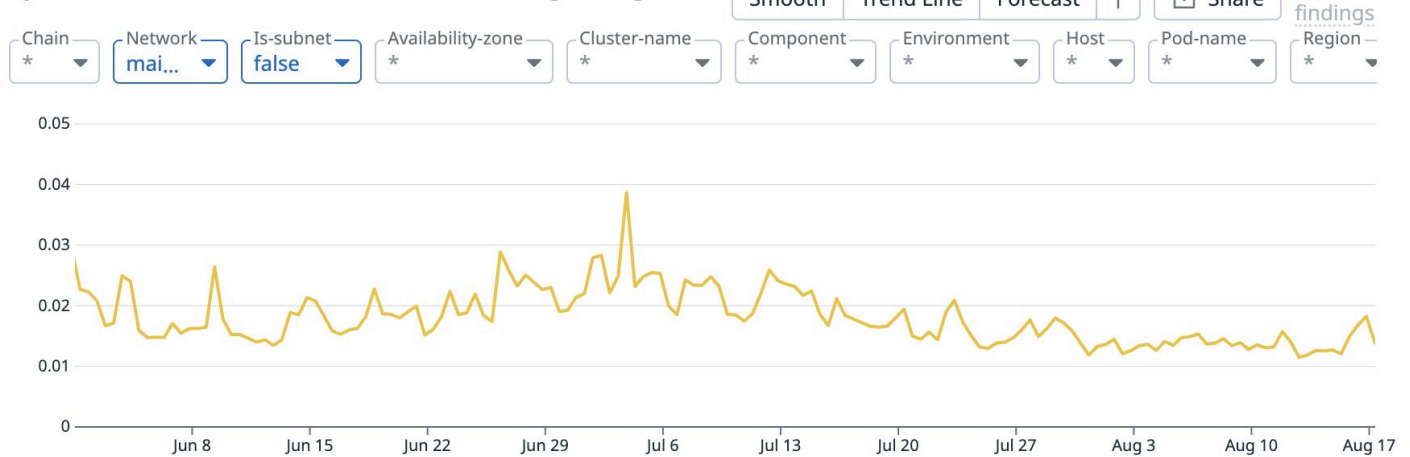


- Peer-to-peer network health - to monitor connectivity between all validator nodes

A key indicator of the health of the network as a whole is the percentage of successful queries made to peers. If any significant number of validator nodes were to not be able to process the increased utilization level of the chain, they would not be able to respond to their peer's queries about block proposals. Throughout the iterative increases to the gas target in June and July, we did not observe any noticeable decrease in the observed percentage of successful queries, indicating that on the whole, the vast majority of nodes are still stable and able to keep up with the increased processing demands created by the higher gas targets.



Bytes Added to Disk Per Gas Used (20 min rolling average)



These metrics remained within acceptable parameters throughout the increase, indicating the network can handle the higher throughput without stability issues.

Scaling Optimization Ahead

The 30% increase represents just the beginning of Avalanche's throughput expansion plans. Two major technical upgrades are in development that could enable even more significant capacity improvements:

Continuous Execution

As outlined in Avalanche Community Proposal ACP-194, Continuous Execution introduces a fundamental architectural change by separating block execution from the consensus process. This allows for a continuous execution thread that operates independently of consensus, enabling gas targets to align with average-case execution times rather than being constrained by worst-case scenarios.

The separation means the network can maintain higher throughput targets without risking consensus delays during computationally intensive blocks.

Firewood Database Integration



The upcoming Firewood database integration is designed to significantly improve performance of blockchain database operations, and also reduce validator node storage requirements through optimized data layout and state pruning. By maintaining only recent state data and improving storage efficiency, Firewood will reduce the operational burden on validators, potentially enabling support for higher gas targets.

Looking Ahead

A combination of upcoming performance improvement efforts as well as continued iteration to dynamically determine the maximum chain capacity possible at any given point in time positions Avalanche well to become one of the lowest latency, highest throughput EVM L1 experiences in the ecosystem.

Head to the Builders Hub to access everything you need to know about building on Avalanche: <https://build.avax.network/>

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On

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