



Deep Dive:
**Solana
Onchain
Activity**

// June 2025



Part I

Network

Validators and Block Production

A **validator** is a computer or node that verifies the accuracy of transactions, creates new blocks, and participates in consensus.

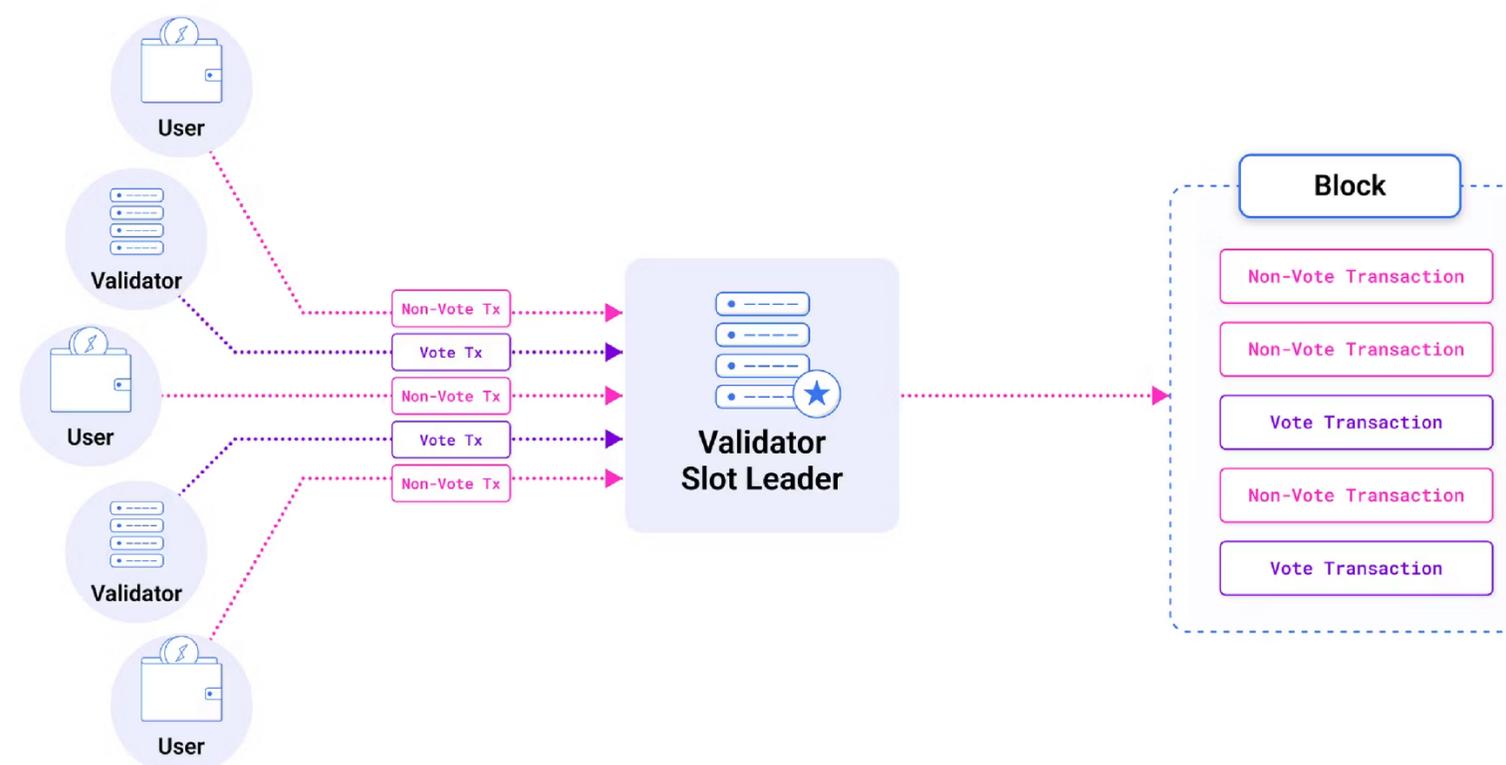
A **slot** represents an allotment of time for which a block may be produced. Validators are assigned slots, and those chosen to produce a block in this assigned slot are called **slot leaders**.

Slot leaders create blocks by bundling hundreds to thousands of transactions. These transactions can be either vote or non-vote transactions.

Validators submit **vote transactions** to reach consensus. One can understand it as validators casting votes to agree on what is happening within the Solana blockchain and what the correct order of events is.

Non-vote transactions are any other kind of transaction, like a swap, a token transfer, etc.

Block Production by Slot Leader



Measuring Network Performance

We will use three main metrics to measure Solana's network performance:

- Block time
- Blocks produced
- Skip rate

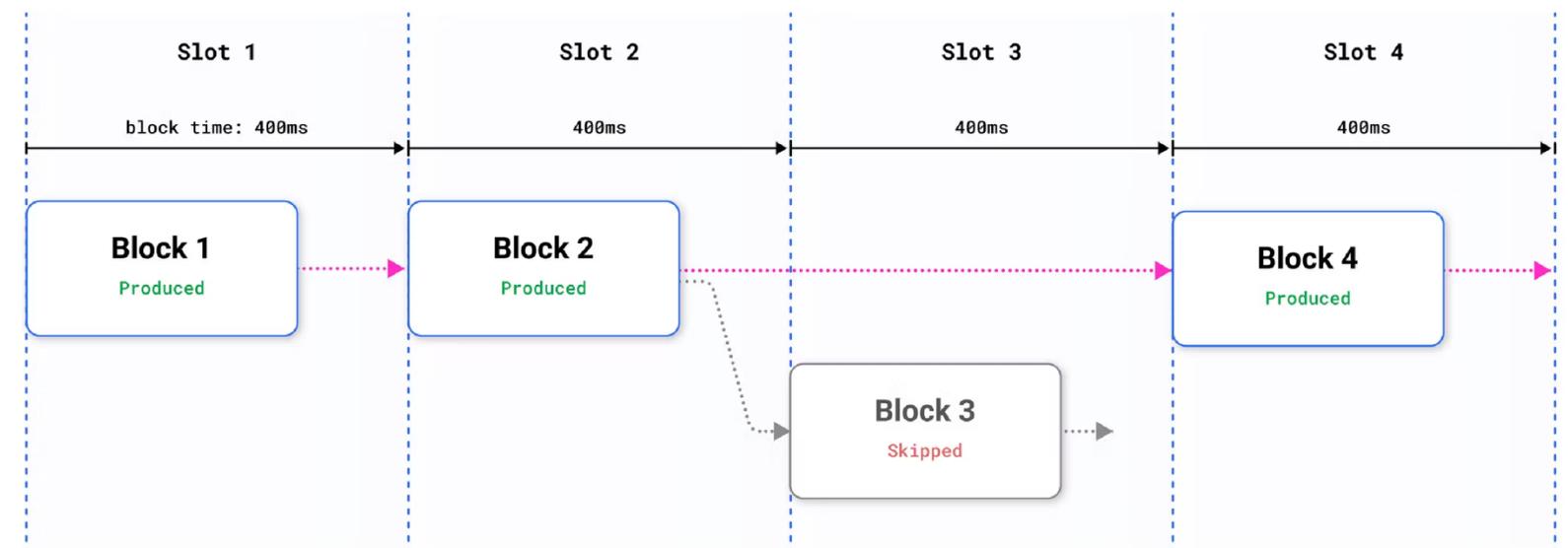
Block time measures how quickly blocks are created, with Solana aiming to produce one block every 400ms.

Blocks produced measures how many successful blocks Solana outputs, targeting 216,000 blocks per day.

When a slot leader fails to produce a block in their assigned slot, the block gets skipped. **Skip rate** tracks the ratio of skipped versus total slots.

Lower skip rates and block times increase bandwidth and reduce latency.

Block Production: Success vs Skip



Agave 2.0 marked a turning point

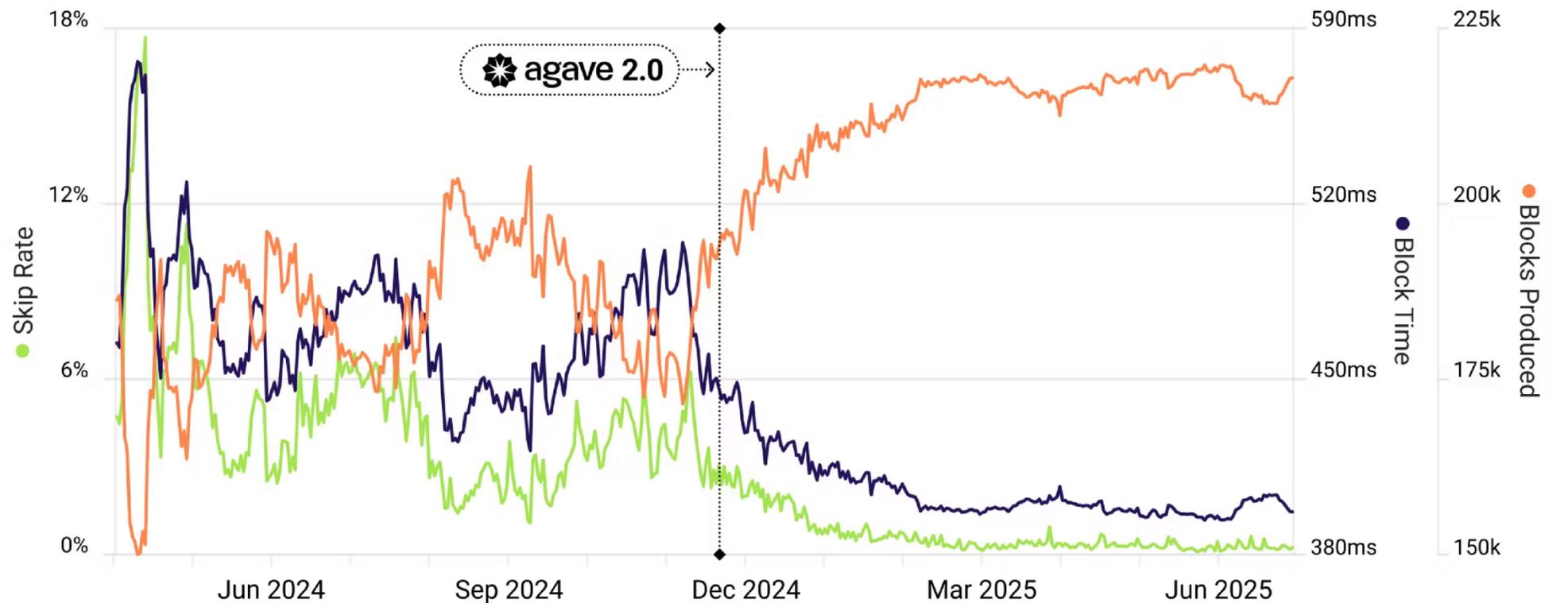
Agave 2.0 was the first major release from Anza, founded by Solana Labs' core team members.

The changes introduced in Agave 2.0 (released November 20th, 2024), and since, have greatly reduced block time and skip rate, increased block production, and made these metrics more predictable with less variation.

Solana Network Metrics

By Day

● Skip Rate ● Block Time ● Blocks Produced



Solana skip rate dropped sharply over the last 3 years.

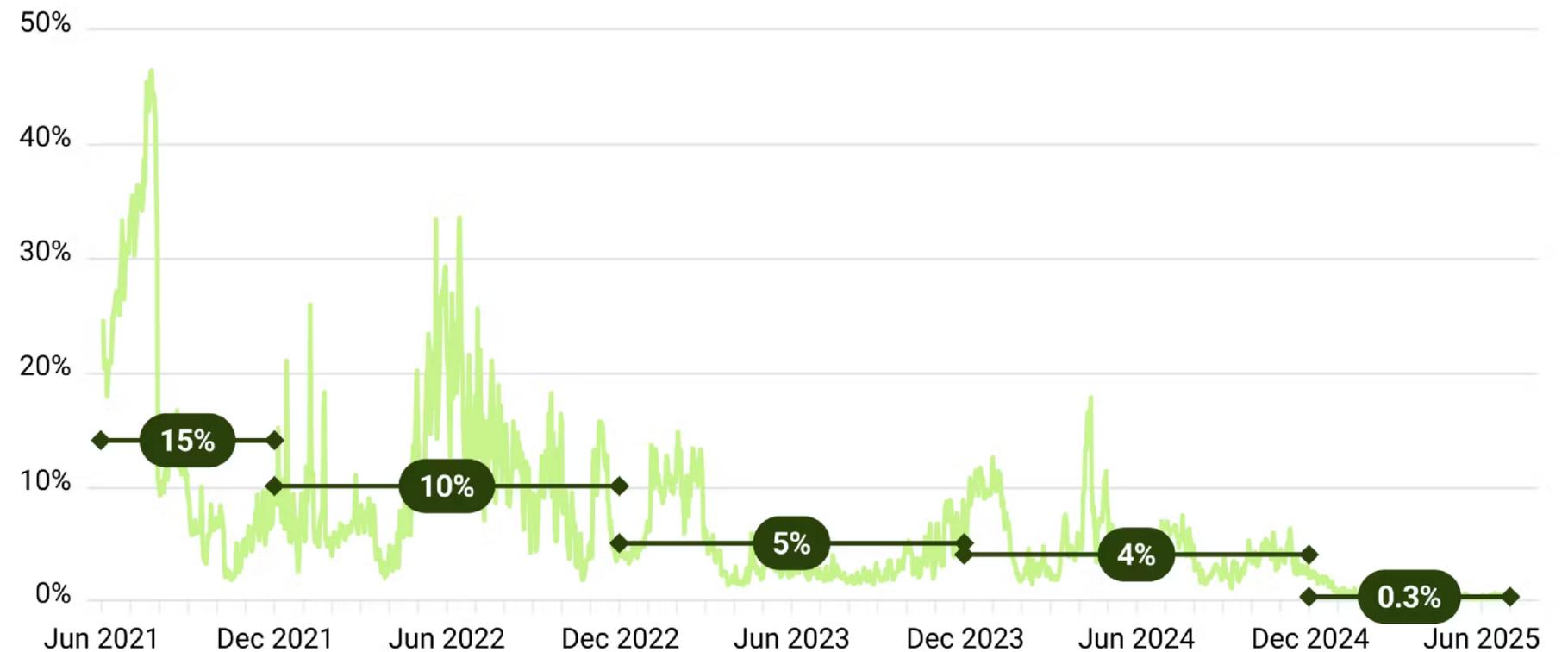
Since 2021, Solana's average daily skip rate has plummeted from 15% to 0.3% in 2025.

Skip rates used to hit double digits regularly; in 2025 the max daily skip rate sits at 1%.

Block Skip Rate

By Day

● Block Skip Rate — Average



Block time and block production have hit their targets.

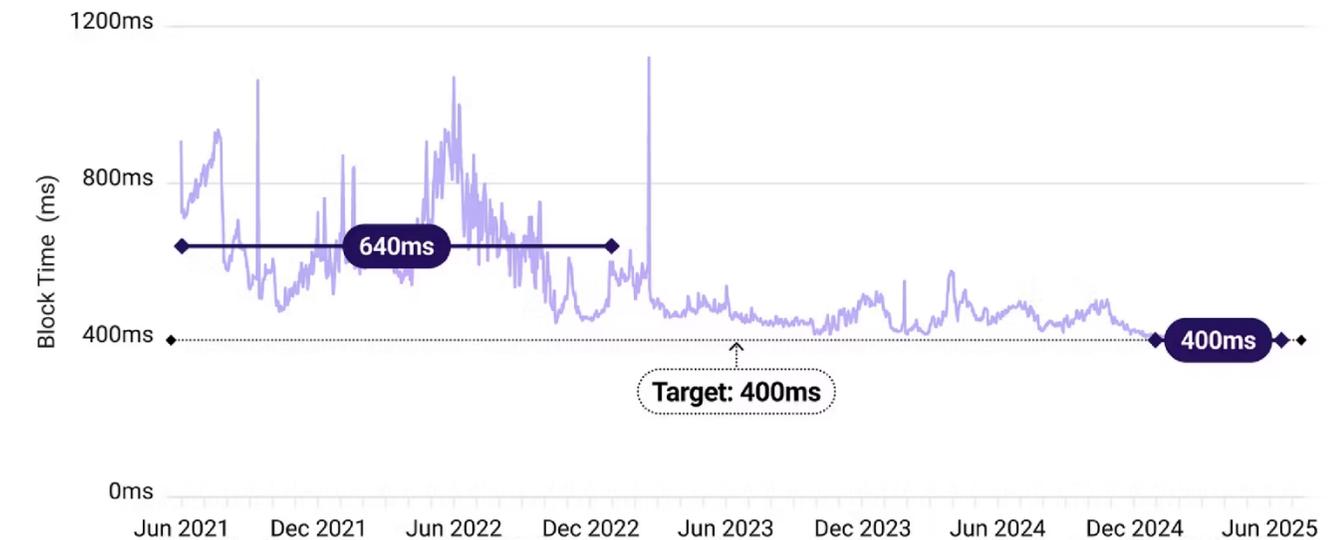
Block production has improved dramatically since 2021-22, when block times averaged 640ms (60% above target) and only 140,000 blocks were produced per day, or two-thirds of the target throughput.

By H1 2025, block time had dropped to 400.1ms, while block production reached 215,960 daily.

Average Block Time

By Day

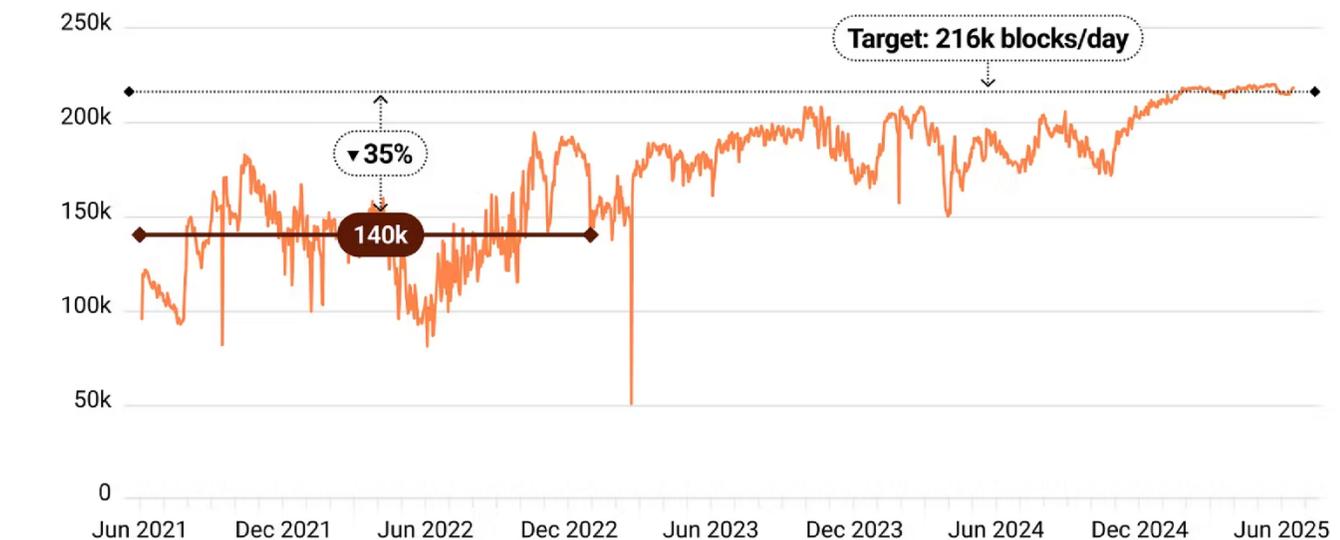
● Average Block Time — Average



Blocks Produced

By Day

● Blocks Produced — Average



Agave 2.0 and Timely Vote Credits led to skip rate reduction.

Skip rate variance dropped significantly this year: the spread between upper and lower bounds (one standard deviation, where most data falls) narrowed from 1.4% to 0.3%

The likely main drivers were Timely Vote Credits (TVC) and Agave 2.0.

With TVC, votes within two slots of the voted-on slot earn bonus transactions, and votes cast later than four slots afterwards lose rewards. This incentivizes validators to cast votes quickly, reducing forks and reaching consensus faster, which results in a lower skip rate and improved latency.

Skip Rate 7-day Average

— Skip Rate ● 1-Std Dev



Note: We highlight the likely primary driver for each metric, but with multiple changes introduced in each software upgrade, concurrent feature activations, and fluctuating on-chain activity, it is difficult, if not impossible, to isolate exact effects.

Block metrics became more stable and predictable post-Agave 2.0.

Block time variance dropped over 75% from 17ms to 4ms, while variance for block production fell from 6.5k to 2k blocks a day.

A key driver of this improvement was the Central Scheduler, which reduces scheduling conflicts.

The old scheduler let four threads pull from a shared queue, causing lock conflicts and wasted compute. The new Central Scheduler uses a dedicated thread to map non-conflicting transactions, ensuring faster block packing.

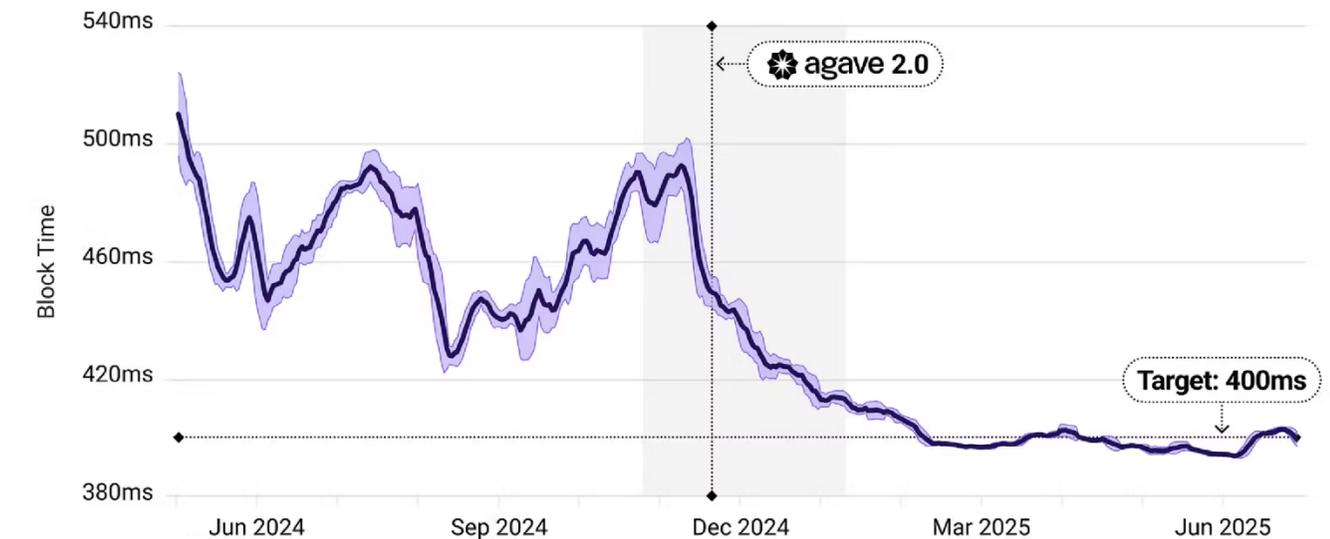
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Block Time

7-day average

— Block Time ● 1-Std Dev

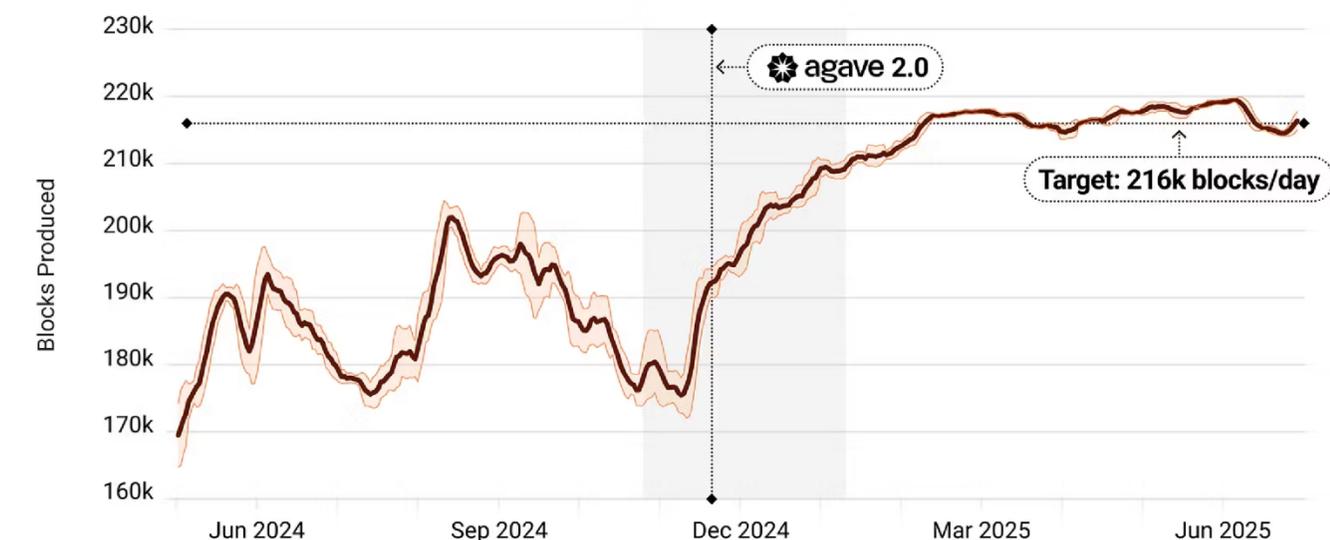


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Blocks Produced

7-day average

— Blocks Produced ● 1-Std Dev



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Non-vote transaction CU became more stable in 2025.

Variation in CU for p90 non-vote transactions dropped by over two-thirds, and for p99 by more than half, comparing early 2024 to 2025.

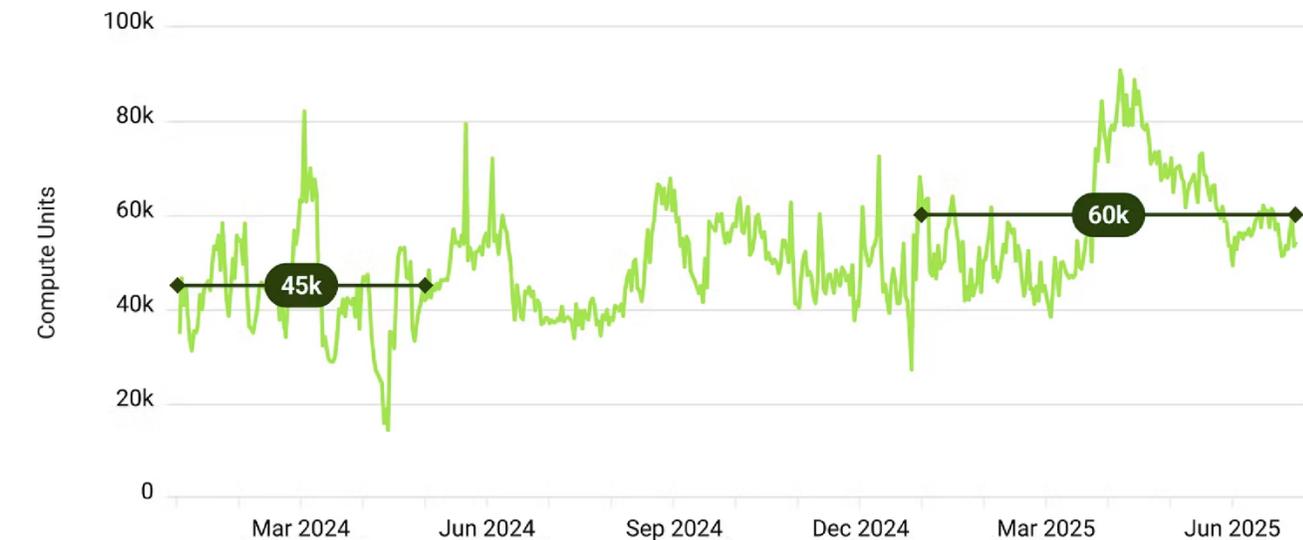
H1 2025 also saw p50 CU climb from 45k to 60k year-over-year.

The increase in volatility and CU spent at top percentiles was due to the increased popularity of onchain PoW mining programs, which were very compute-heavy.

Individual Non-Vote Transaction CU

By Day

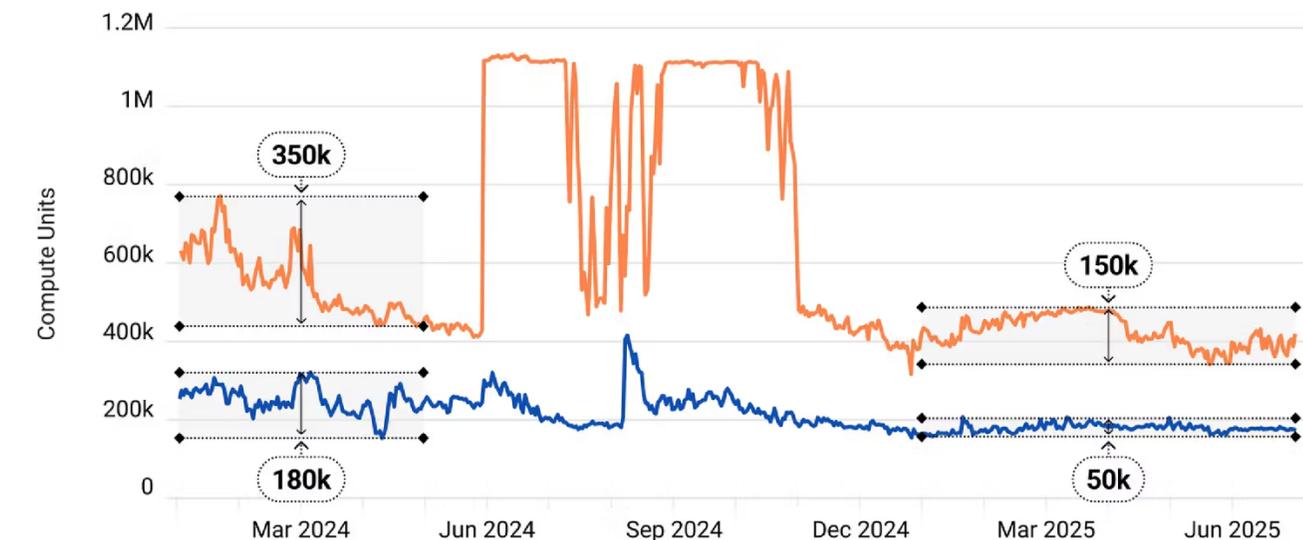
● p50 (Median)



Individual Non-Vote Transaction CU

By Month

● p90 ● p99



Throughgput has recovered through gradual network and infrastructure improvements.

After peaking in November 2021, successful non-vote transactions declined as growing activity strained the network infrastructure, bottoming out at 80 per block (September 2023) and achieving 30% success rates (April 2024).

Progressive infrastructure and client improvements, along with a rebound in activity, have since restored the number of successful non-vote transactions to the November 2021 peak. The success rate of non-vote transactions has returned to 70%, although it remains below its peak levels.

Successful Non-Vote Transactions By Week



Success Rate of Non-Vote Transactions By Week



Each block packs more successful transactions than failed since mid-2024.

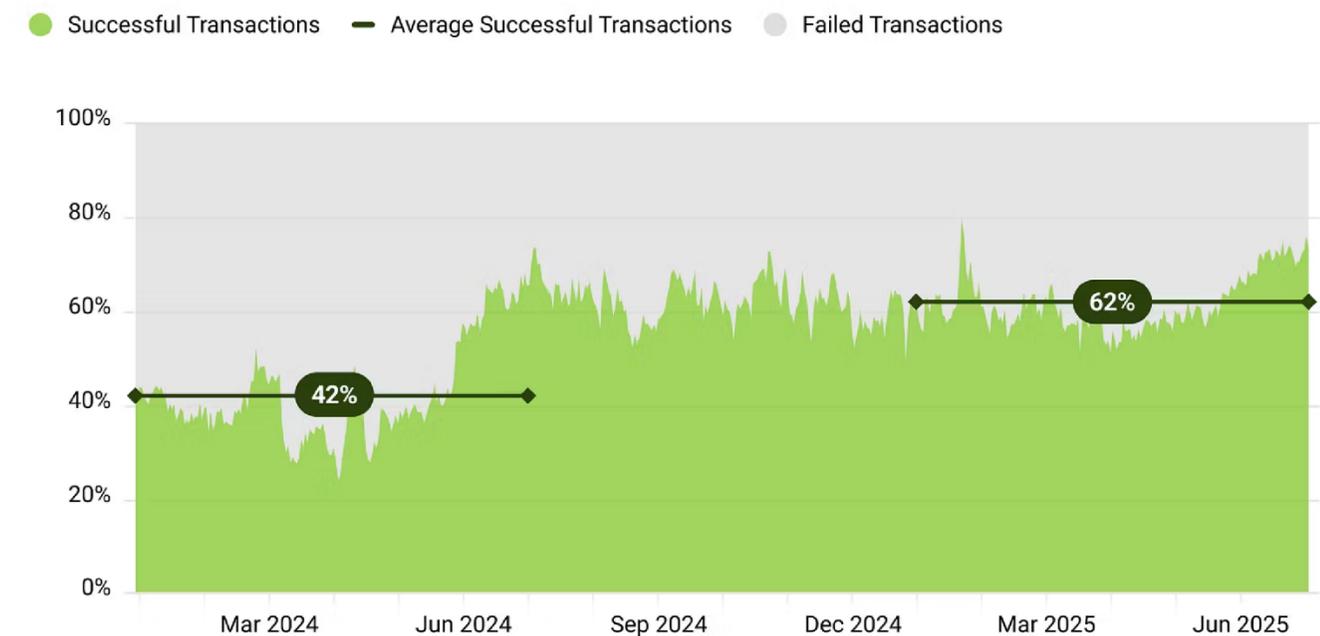
Successful transactions per block grew from an average of 150 in H1 2024 to 280 in H1 2025.

Since June 2024, there have been more successful non-vote transactions than failed ones. The average success rate grew from 42% in H1 2024 to 62% in H1 2025.

Successful Non-Vote Transactions per Block By Week



Non-Vote Transactions Success Rate By Week



Part II

Validator Clients

Agave versions are adopted and phased out faster.

Since Agave 1.18, new versions reach supermajority faster: 250 days for 1.18; 240 for 2.0; 230 for 2.1; and just 200 for 2.2.

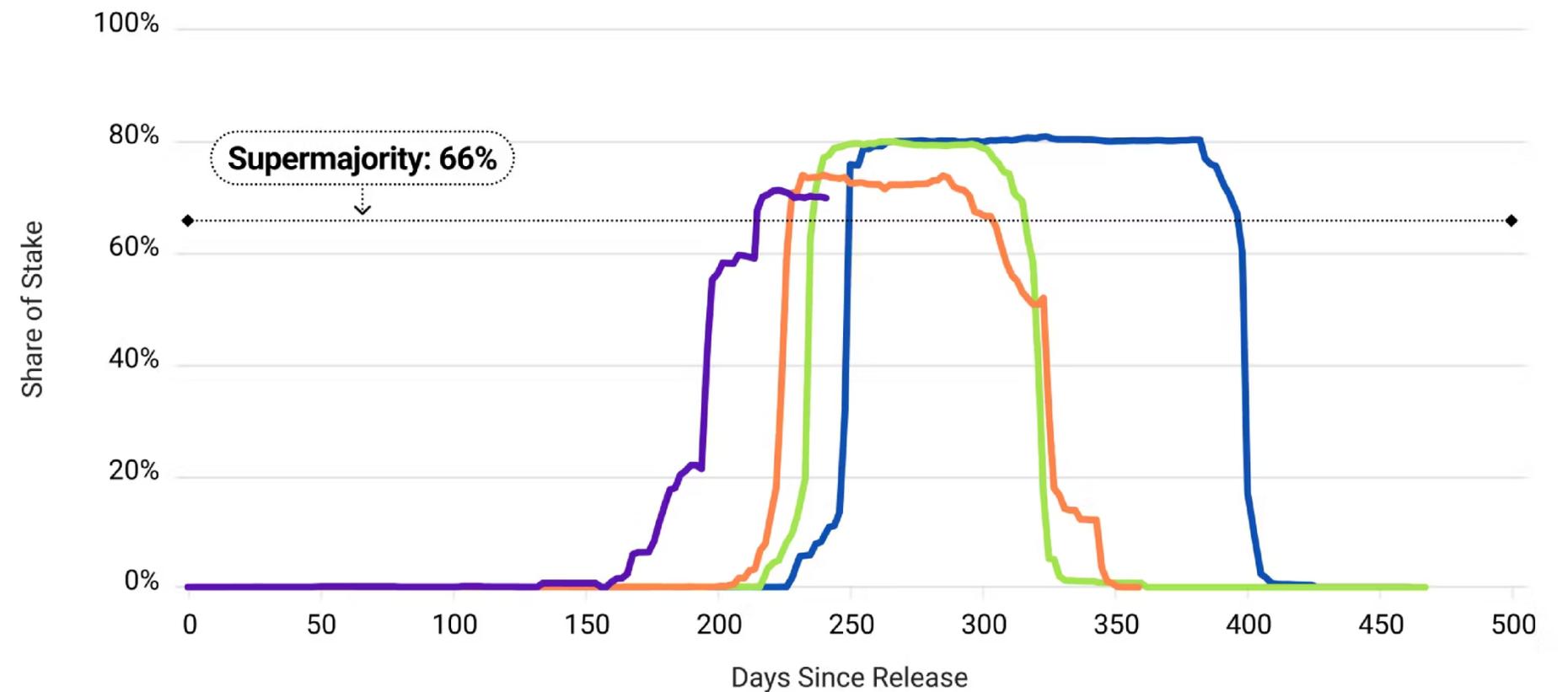
Phase-out times have also shortened from over a year for 1.18 to around 300 days and increasingly less for recent versions.

Agave Version Adoption Velocity (since 1.18)

By Days Since Release

● 1.18 ● 2.0 ● 2.1 ● 2.2

Note: The displayed percentages exclude validators for which we lack historical client data, so actual stake adoption by client is higher.



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Frankendancer adoption reaches 9% of stake.

Frankendancer is a hybrid validator client on Solana that blends Firedancer's networking logic with Agave's runtime and consensus.

Starting at less than 0.1% stake in September 2024, its adoption has soared to almost 9% by June 2025.

Validators Running Frankendancer By Day as a Percentage of Total Stake



Frankendancer adoption grows beyond early adopters.

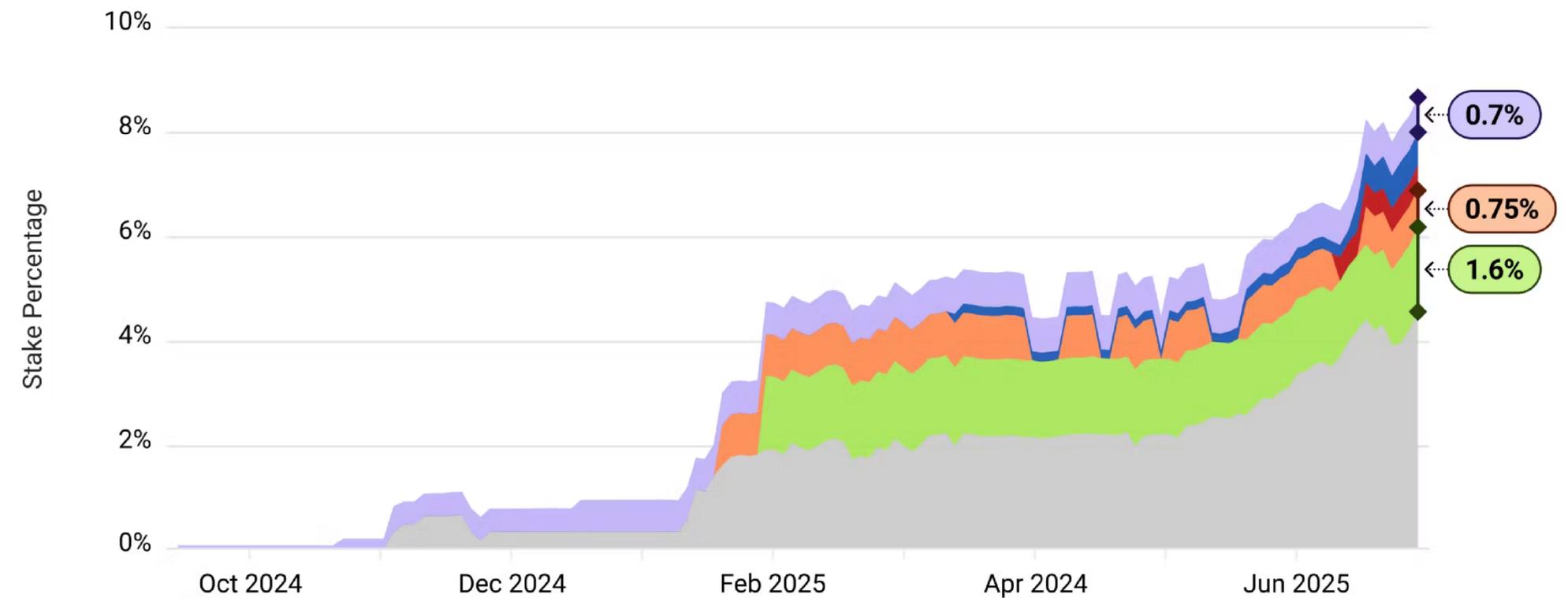
From a single validator (9Diao4uo), Frankendancer grew in early 2025 with major joiners including Asymmetric Research (0.7-0.8% stake) and HZKopZYv (1.6% stake).

The top 3 then controlled 60% of stake running Frankendancer, but today the top 5 hold less than half of Frankendancer stake as smaller validators have driven growth since May 2025.

Frankendancer Stake Distribution - Top 5 Validators vs Others

By Epoch

● HZKopZYv
 ● Asymmetric Research
 ● 9Diao4uo
 ● AS3nKBQf
 ● 9jYFwBfb
 ● Others



Part III

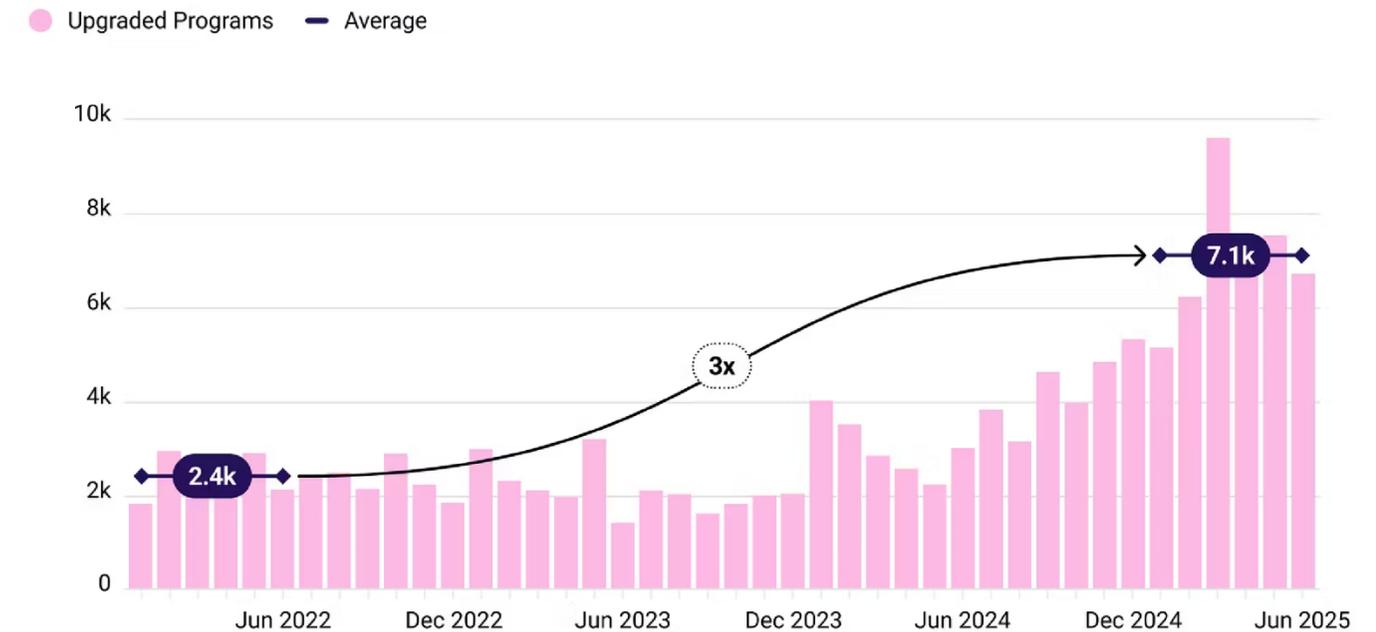
Programs

Program activity has soared since 2022.

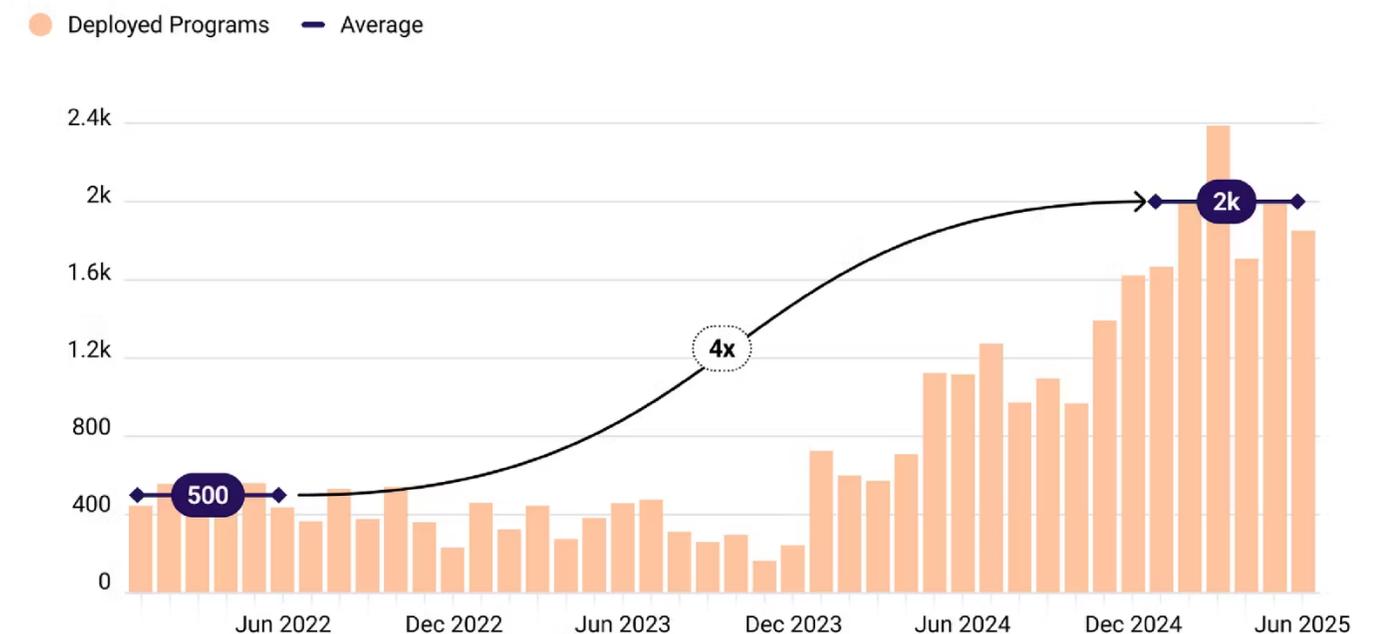
Since 2022, Solana's monthly program deployments have grown four times, from 500 to 2,000 in 2025. Program upgrades have increased threefold from 2,400 to 7,100.

March 2025 marked the highest month for program activity, with 12,000 programs being deployed or upgraded. Since then, activity has dipped but remains higher than any month before March 2025.

Solana Program Upgrades By Month



Solana Program Deployments By Month



CU spent shifted slightly across sectors from H1 2024 to H1 2025.

Traditional sectors lost compute share from H1 2024 to H1 2025: NFTs fell from 3% to 0.5%, oracles from 5% to 3%, gaming from 2% to 1%. Bots surged from 2% to 8%, led by MEV-as-a-service platforms.

Note: Program (and aggregate categories) compute usage includes double-counting. Example: When Jupiter calls Raydium, Raydium's compute is counted under both protocols.

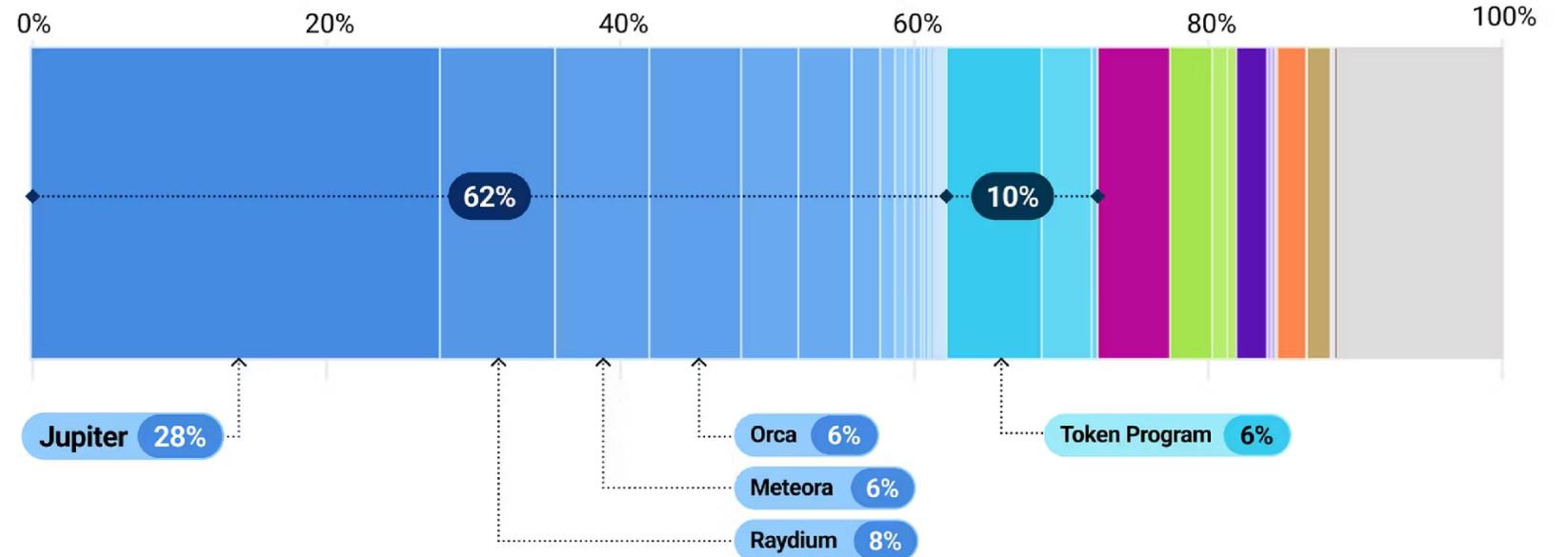
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CU Spent per Block

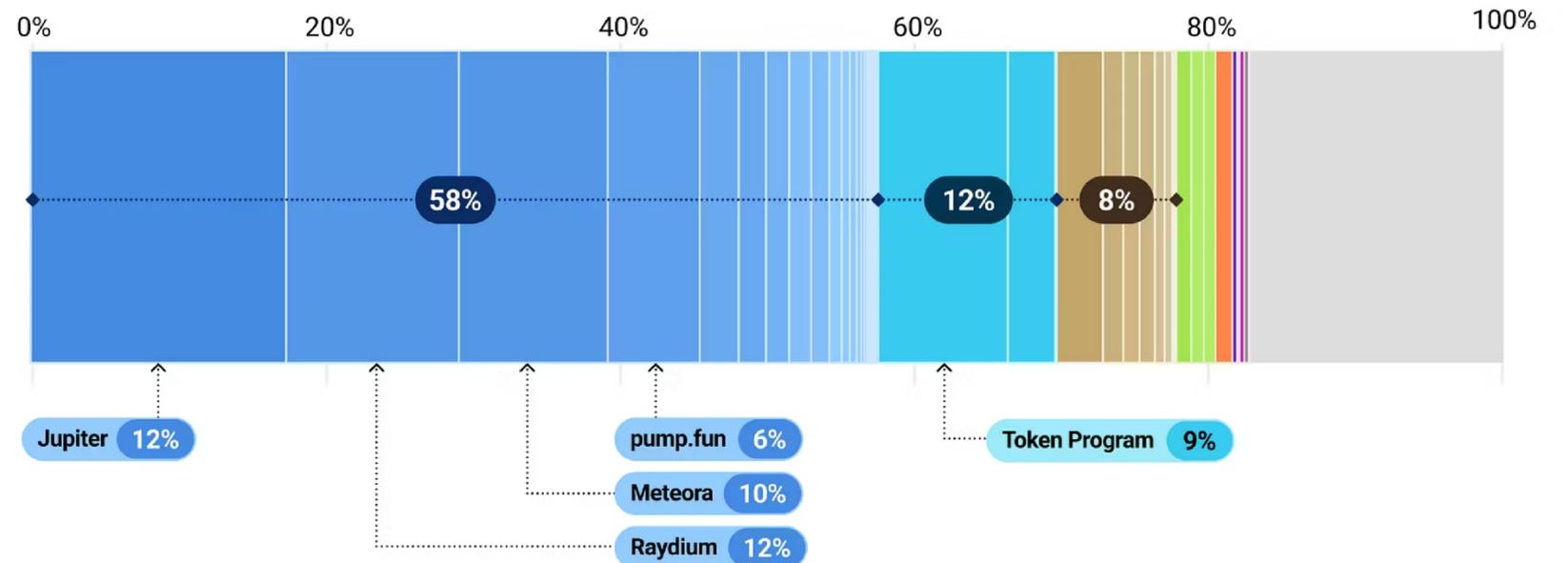
By Project, H1 2024 vs H1 2025

DeFi Solana Program Library On-chain PoW Oracle NFT Gaming MEV/Arbitrage Bots Other

H1 2024



H1 2025



Note: We are consolidating all programs associated with each project. For example, for Jupiter we aggregate data for all versions of the aggregator program, DCA program, perpetuals, etc.

Invoke frequency remained stable across sectors from H1 2024 to H1 2025.

Aside from an uptick in the number of invocations for the SPL token program and pump.fun, invoke frequency remains stable across both sectors and programs year-over-year.

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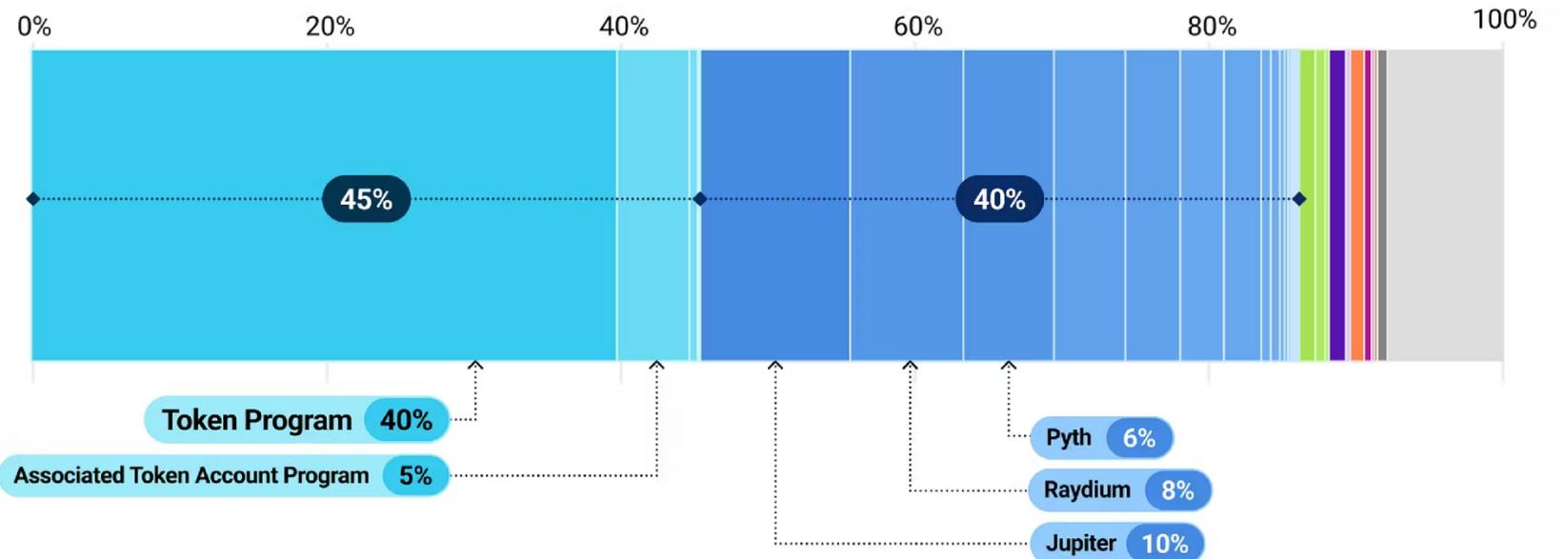
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Invocations per Block

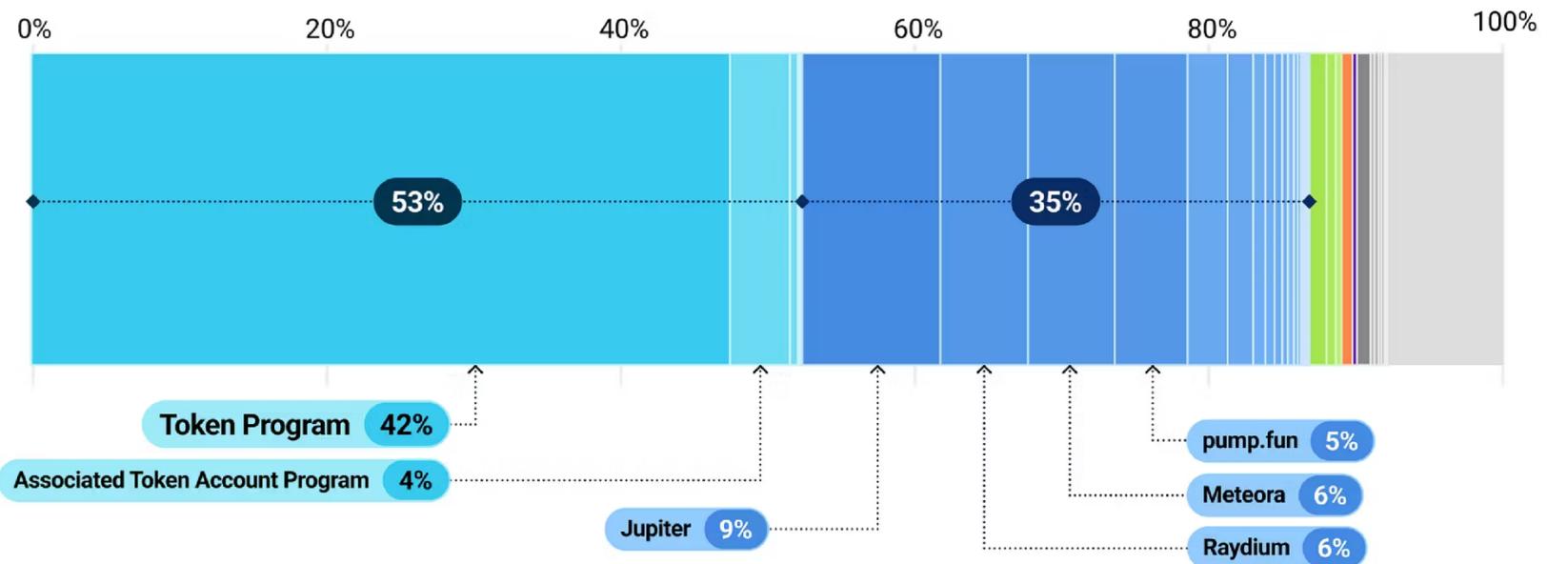
By Project, H1 2024 vs H1 2025

● Solana Program Library ● DeFi ● Oracle ● Gaming ● NFT ● On-chain PoW ● MEV/Arbitrage Bots ● Other

H1 2024



H1 2025



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