

How Solana Achieves High Throughput

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Solana is a layer-1 blockchain capable of processing thousands of transactions per second under real-world conditions. This performance stems from several interlocking architectural decisions made at the protocol level, rather than from a single silver-bullet feature. Understanding how these mechanisms work together explains why Solana performs differently from earlier chains like Ethereum or Bitcoin.

Proof of History: A Cryptographic Clock

The foundation of Solana's throughput is a mechanism called Proof of History (PoH). Traditional blockchains require validators to communicate with each other to agree on the order and timestamp of transactions, which introduces latency. PoH sidesteps this by embedding a verifiable sequence of time directly into the ledger.

PoH uses a sequential SHA-256 hash function where each output becomes the input to the next iteration. Because each hash depends on the previous one, the chain of hashes encodes a verifiable passage of time. Validators can confirm the order of events without waiting for a consensus round to establish timestamps. This allows the network to pipeline work aggressively, with validators processing new transactions before the previous block is fully confirmed.

Gulf Stream and Turbine: Forwarding and Propagating Data

Solana's mempool replacement, called Gulf Stream, pushes transaction forwarding to the edge of the network before a block is even produced. Because validators know in advance which node will be the next leader — the block producer — they can forward transactions directly to that node. This reduces the time transactions spend waiting in a queue and lowers memory pressure on the network.

Block propagation uses a separate protocol called Turbine. Rather than broadcasting a full block to every validator at once, Turbine breaks blocks into smaller packets and distributes them through a tree-like structure of validators. Each validator receives a chunk, retransmits it to a subset of peers, and so on. This reduces the bandwidth each validator needs to handle while allowing the entire network to receive block data quickly. The approach borrows from BitTorrent-style data distribution and scales well as validator count increases.

Sealevel: Parallel Transaction Execution

Most blockchains execute transactions sequentially, one after another, within a block. Solana's runtime, called Sealevel, executes non-conflicting transactions in parallel across multiple cores. Transactions on Solana must declare in advance which accounts they will read from and write to. The runtime uses this information to identify which transactions touch overlapping state and which do not. Transactions that access different accounts can run simultaneously on separate threads.

This parallel execution model maps well to modern multi-core hardware. A validator running on a machine with dozens of CPU cores can process many transactions concurrently, multiplying throughput without requiring changes to the consensus layer.

Practical Limits and Trade-offs

Solana's design involves real trade-offs. The hardware requirements for validators are significantly higher than on other chains, which has contributed to a more centralized validator set. The network has also experienced several outages caused by transaction floods overwhelming the scheduler. Engineers have addressed some of these issues through fee market changes and QUIC-based transaction ingestion, but the system continues to evolve. The throughput Solana achieves is genuine, but it comes with architectural choices that differ meaningfully from chains that prioritize decentralization above raw performance.

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ENTROPY-GENERATED WORD LISTS

For reference, 48 sample BIP39-style phrases are printed below, each combining 12 words from the standard list.

- | | |
|--|--|
| 1) honey receive glide exact announce
slice swear catch pull second release
degree | 2) focus record idle frown average
emotion business dad potato execute
maid type |
| 3) door athlete write rate gym theme
stumble sentence approve fossil sound
surround | 4) cluster nature grain little garment
pave circle age patient figure useless
answer |
| 5) orient planet review raise produce
eager unlock phrase crack ankle remove
produce | 6) edit tape limb between spider junior
spy draft champion gather copper meadow |
| 7) canyon destroy mansion narrow
vintage candy crowd announce hour aunt
miracle bargain | 8) adjust essence hello frame picnic
symbol improve child tuition panda
brass arrest |
| 9) relief extra chaos baby wonder grass
erupt smoke rail resist kiss dwarf | 10) flag accuse radar jump visa bulb
member become tape lunar coffee jungle |
| 11) predict tooth embark tray mail
liquid young top else differ absorb
firm | 12) adapt fiction envelope voyage heart
funny buddy hybrid valid capital tired
rate |
| 13) brisk sustain dad often stone
process depth arrive various ability
gossip erosion | 14) exact cannon later loop misery
company cross hire word smooth eagle
year |
| 15) teach ready ability ribbon guilt
oxygen disorder when subway retreat
betray bone | 16) fold plug upper foam adapt ski news
hospital hope detail ten disease |
| 17) brass fluid model vacant worry
spoon good exercise giraffe exit
orchard expire | 18) safe surface exit nation digital
online law deny estate sentence surge
comfort |
| 19) floor wood half engine hurt appear
hawk apple wide stick able margin | 20) wrap visa goat employ despair
regular feel tiger same autumn lava
welcome |
| 21) spatial express shed cheap waste
today truck differ curve panel attitude
grow | 22) praise change raccoon balcony
execute day account resource luggage
holiday assault fruit |
| 23) stumble turn merit people express
response rule pelican success february
entire melody | 24) essay can trash service casual
prize boss gadget merit arrest pyramid
soon |
| 25) finger hawk loyal word top front
amused swarm lab payment initial volume | 26) ivory eternal boy jeans twin vanish
amazing dutch clean network economy
want |
| 27) conduct announce trumpet ten oyster
rival chase sunny swarm topic snack fly | 28) kid fog cycle future vanish velvet
diet boost twenty output truly odor |

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ENTROPY-GENERATED WORD LISTS

29) reunion clerk clump riot equal
drink doctor design ranch symptom verb
enlist

31) venue impact dash educate odor
lottery female fragile exotic arm catch
person

33) fade tone cloth screen pet dolphin
extra army people burden rebuild
buffalo

35) monitor fly theme pilot elder grief
total enlist poem size remove naive

37) phrase divert talk trip relief
lecture hard picture talk picnic
digital siren

39) history profit demand random coach
crew recipe mass relief vicious toward
quality

41) matrix harsh uphold liar vibrant
hand juice token metal canoe autumn
fantasy

43) analyst labor calm uncover clump
someone pilot hover laptop merry topple
sugar

45) auto elephant during bike marble
tube settle squirrel kingdom beyond
squeeze coral

47) current satisfy mystery chronic
actor reduce sword surge few napkin
design hill

30) world door alter junior pelican
ticket odor vivid mom phrase brush
unfair

32) wash very tail month few question
shock online wrap outer pioneer plate

34) throw liberty wasp estate balcony
bleak warm scatter want seek hungry
focus

36) entire scorpion captain huge bunker
finger sea marine orange web isolate
kitchen

38) afford funny dress north join smile
science because play wrap panda unique

40) civil loan later deer pepper camera
speak prize blood poet company dwarf

42) flavor repeat wine universe laptop
letter book snap gown employ chest bulk

44) fence parade key innocent simple
slender list still funny hobby adult
flavor

46) first morning boil weird pulse
midnight crack unique general face
notice youth

48) device hen side innocent check
perfect legal gown artwork cushion
legend flag

SEE ALSO

– [How Solana Achieves High Throughput — BIP39 Seed Phrases \(May 27, 2026\) \(2026-05-27\)](#)

– [How Whale Movements Affect Crypto Prices — BIP39 Seed Phrases \(June 24, 2026\) \(2026-06-24\)](#)

– [The Rise of Play-to-Earn Crypto Games: Revolutionizing Digital Entertainment — BIP39 Seed Phrases \(April 13, 2026\) \(2026-04-13\)](#)

– [what-is-infura-bip39-phrase_2025-11-12.pdf \(bip39-phrase_2025-11\)](#)

Educational examples only. Randomly generated, not valid wallet phrases - never use them to store funds. Details: bip39-phrase.com/security/

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