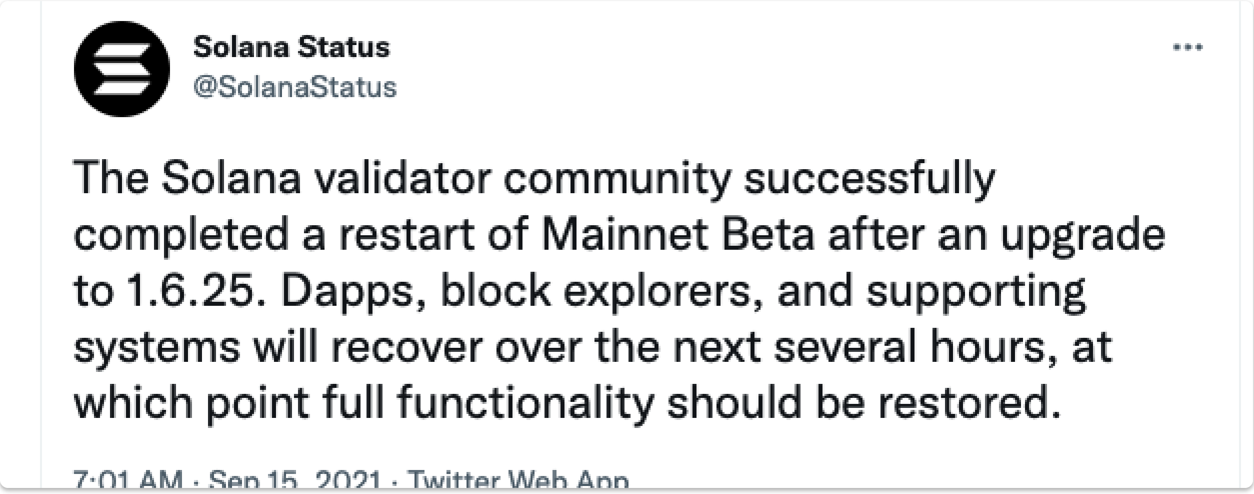
Lesson 16 Extra notes

Network Outages

Date	Duration	Reason
14/09/21	18h	Bots flooding raydium (DDoS)
04/12/20	6h	Validator was transmitting multiple blocks for same slot
04/01/22	48h	Excessive duplicate transactions (DDoS)
21/01/22	20h	Bots flooding the network (DDoS)
01/06/22	4h	Network failed to reach consensus.
01/10/22	6h	Degraded Performance.

Solana Status (@SolanaStatus) September 14, 2021

With Solana's engineers unable to stabilize the network, its validator community opted to coordinate a restart of the network. Solana's community is currently preparing a new release, with further information expected to be released soon.


Solana Status
@SolanaStatus

The Solana validator community successfully completed a restart of Mainnet Beta after an upgrade to 1.6.25. Dapps, block explorers, and supporting systems will recover over the next several hours, at which point full functionality should be restored.

7:01 AM · Sep 15, 2021 · Twitter Web App

From incident report
One of the biggest benefits of blockchains is that, even in complete liveness failure for any reason, the validators are individually responsible for recovering the state and continuing the chain without relying on a trusted third party. On a decentralized network, each validator works to bring it back and has their work guaranteed and verified by everyone else. This was a coordinated effort by the community, not only in creating a patch, but in getting 80% of the network to come to consensus.

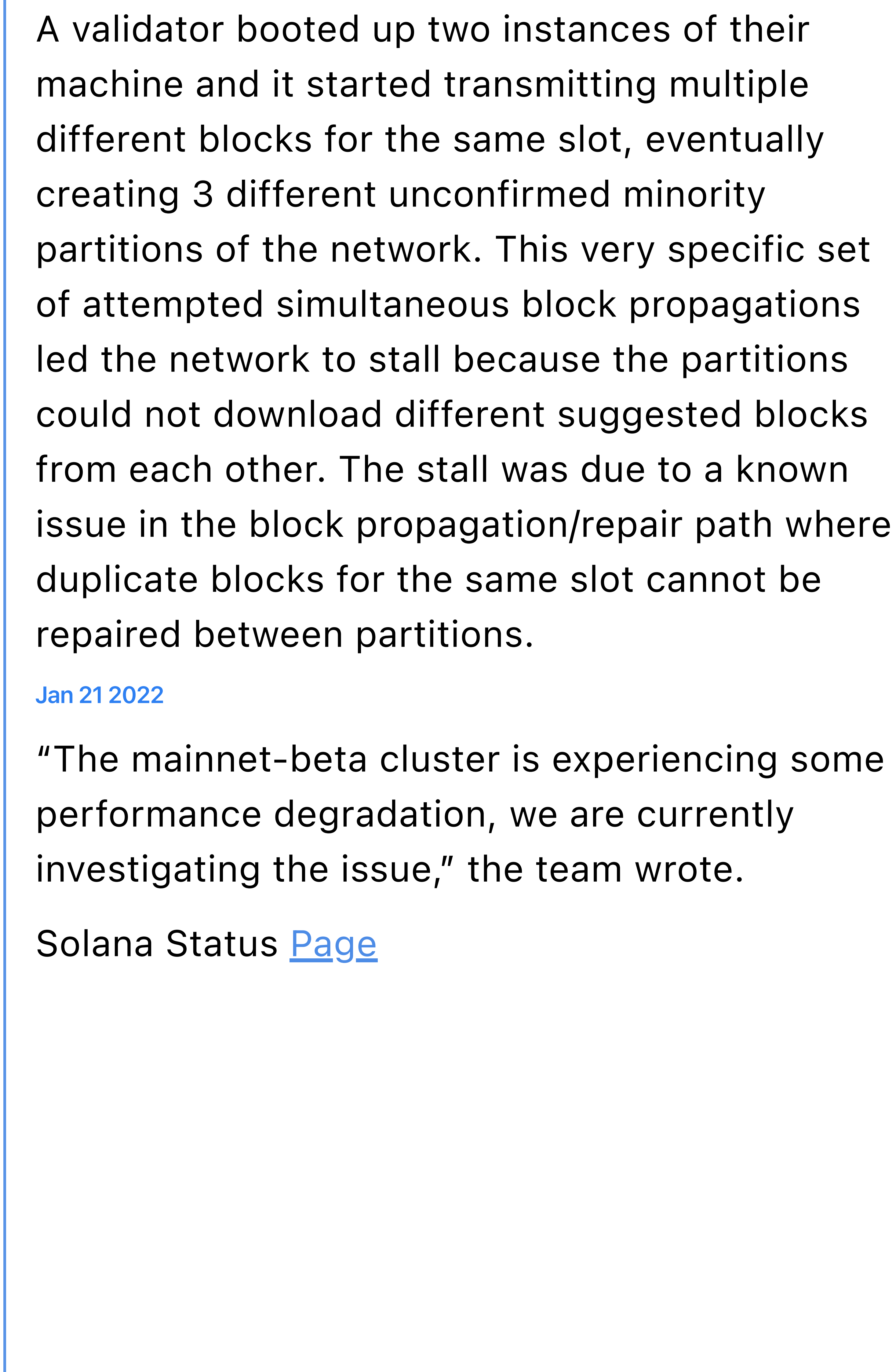
From write up
On 09.14 there was a spike in proposed transactions, on the order of 300k / second. This overloaded the “forwarders” (part of the

Gulf Stream protocol that pushes transactions to validators), which resulted in validators crashing from memory overload. To mitigate this, block producers started to automatically propose a number of forks - what they are supposed to do. The challenge was that validators could not agree on a fork, which is a byproduct of the parallelization because validators are trying to reconcile varying states. With this overload, the automatic system of forking came to a halt with <80% consensus on a proposed fork. A bug related to transaction prioritization was found and addressed, and the network was “restarted” after 80% of validators agreed on a state of the chain and did a manual hard fork.

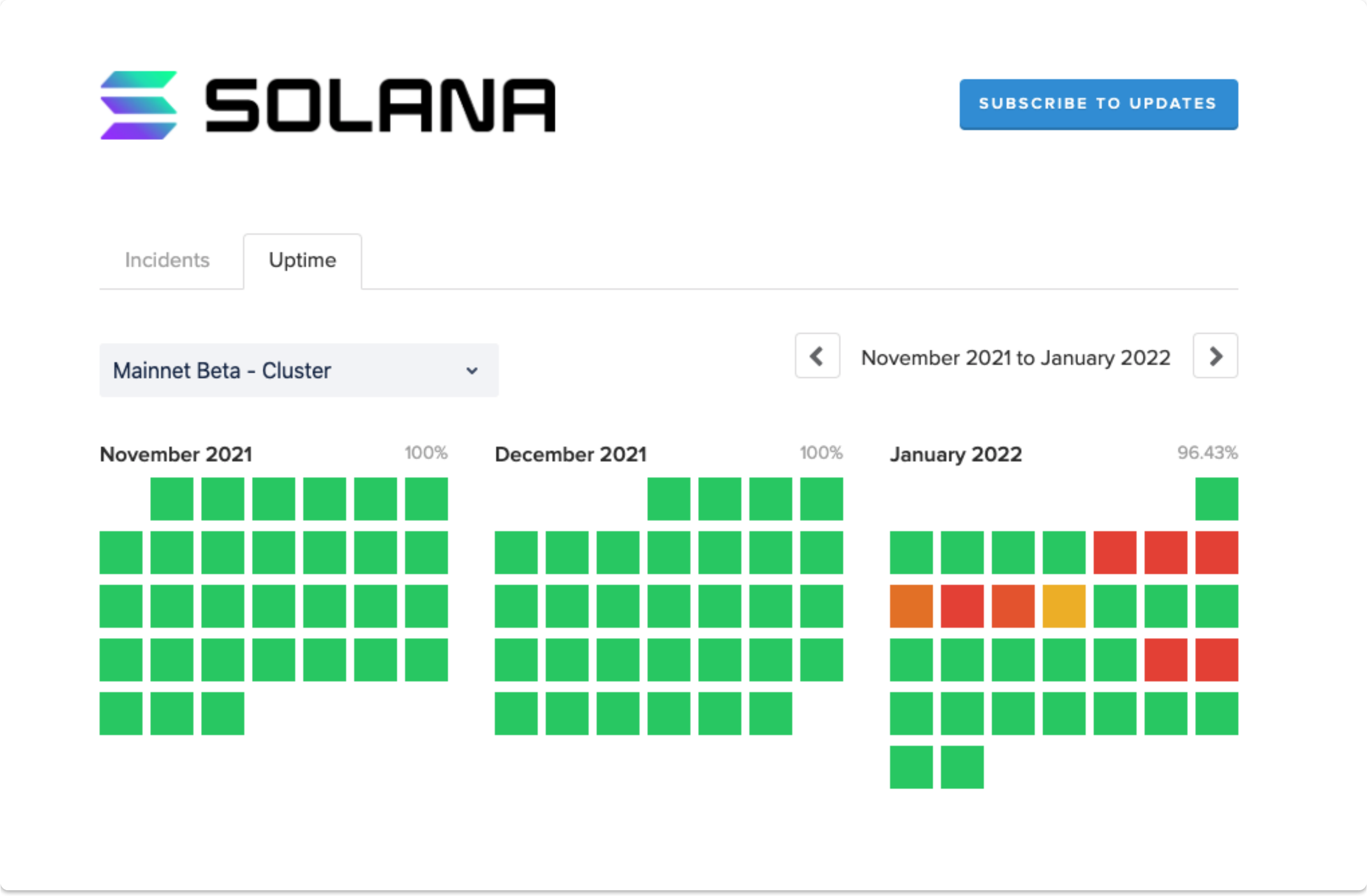
On a technical level, the network is still up -- it's just that nothing important is being processed.

Solution - The basic solution seems to just set a limit to how much can be forwarded when a node gets behind.

Dec 04 2021



> A validator booted up two instances of their machine and it started transmitting multiple different blocks for the same slot, eventually creating 3 different unconfirmed minority partitions of the network. This very specific set of attempted simultaneous block propagations led the network to stall because the partitions could not download different suggested blocks from each other. The stall was due to a known issue in the block propagation/repair path where duplicate blocks for the same slot cannot be repaired between partitions.
>
> Jan 21 2022
>
> “The mainnet-beta cluster is experiencing some performance degradation, we are currently investigating the issue,” the team wrote.
>
> Solana Status Page



Incident Report

Solana Mainnet Beta encountered a large increase in transaction load which peaked at 400,000 TPS.
The current issue experienced by validators is due to excessive duplicate transactions. Engineers have just released 1.8.14, which will attempt to mitigate the worst effects of this issue.

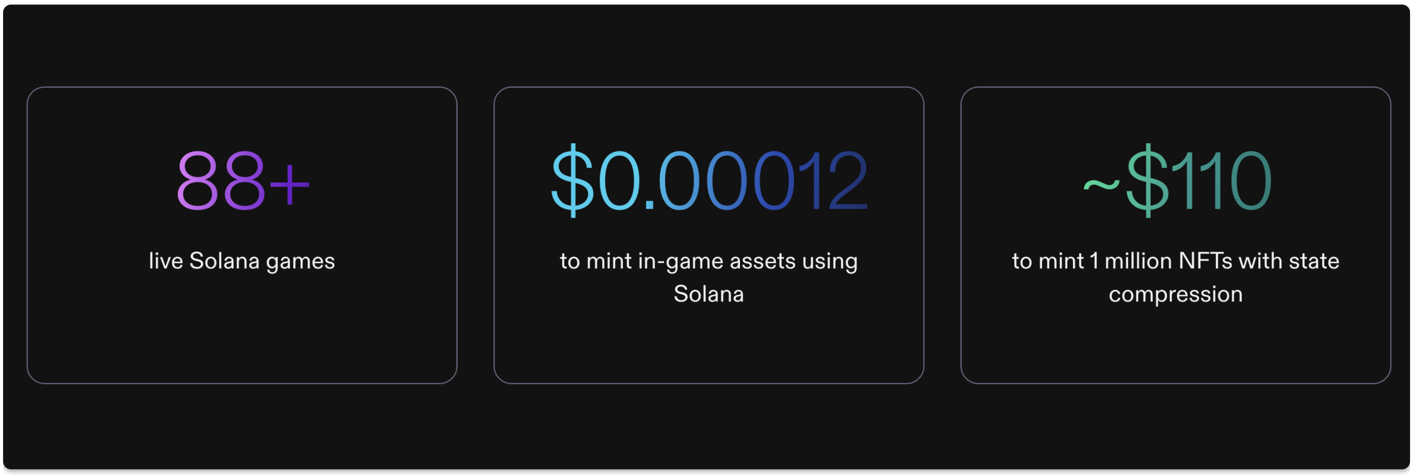
Cryptoeconomics of the attack

If SOL fees are $0.000005 then 400k transactions ~ $2

> Essentially what it has shown is that it cost $ ~$7000 an hour to cause the outage.
>
> Compare this to the cost of a 51% attack on PoW chains
>
> (This shows the role of transaction fees in preventing sybil / DOS attacks)
>
> In an interview in Sep 2022 Anatoly Yakovenko said that the network outages had been Solana’s “curse,” but said the outages have resulted because of the network’s low-cost transactions.

> **Solana Auditing and Security Resources**
>
> See Repo
>
> - Solana Auditing Workshop Slides
> - Overview of Solana security from Kudelski Security

Game Development on Solana



88+

live Solana games

$0.00012

to mint in-game assets using Solana

~$110

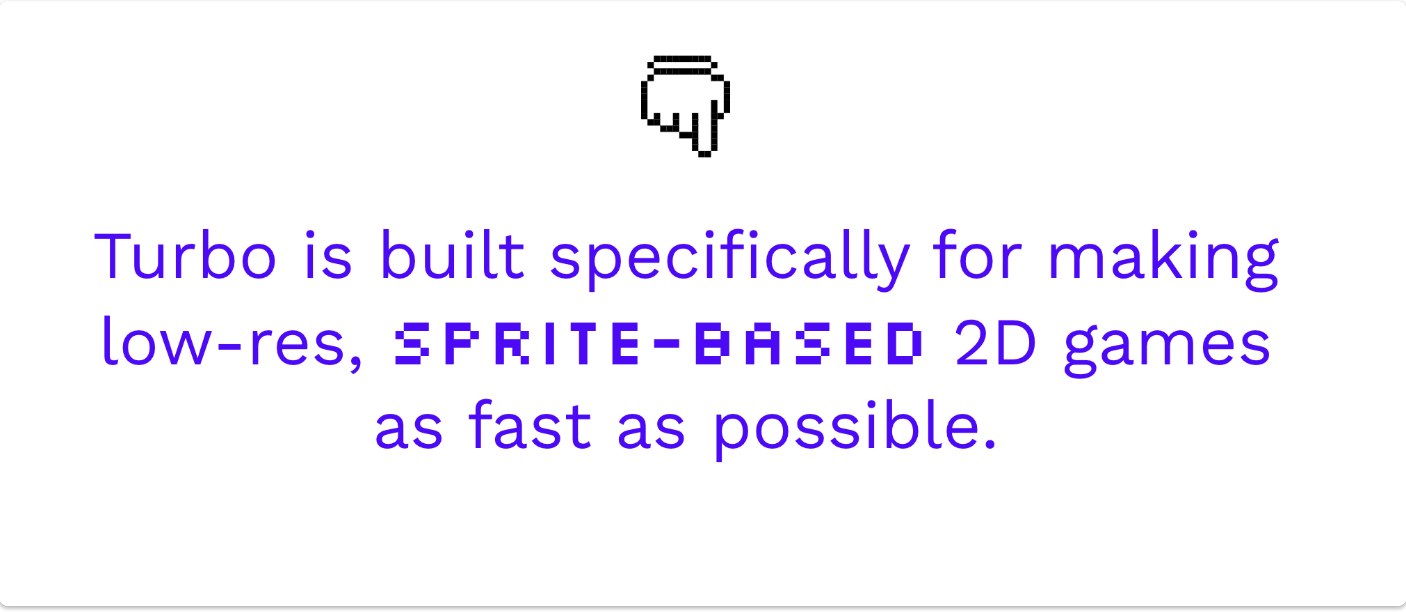
to mint 1 million NFTs with state compression

See [Guide]

See [Example Games]

Turbo Game Engine

See [site]



Turbo is built specifically for making low-res, SPRITE-BASED 2D games as fast as possible.

SOLANA SUPERPOWERS

Want to make an on-chain game? We got you! Read and write data to the blockchain through the SDK's Solana RPC APIs. Turbo games can connect to Solana wallets in the browser.

Synchronising game state

See [article]

Access patterns

- Pull - Clients have certain triggers that will trigger the RPC call
- Live update - Typically done through [webhooks] or websocket connection that streams data from the network
- Push - Server has some logic that will trigger based on chain or client activity that will update itself and all clients attached to that server.