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Deep Dive: Solana On-Chain Activity

//February 2025

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Part I

Network Capacity & Compute Efficiency

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What is compute? What are compute units (CU)?

When you execute an on-chain transaction, it uses up computational resources or compute. Compute is measured in compute units (CU).

Block Compute Budget

- Each block: 48M CU total
- Divided across transactions
- Transactions are split into instructions

Instruction Limits

- Default: 200k CU per instruction
- Maximum: 1.4M CU per instruction
- Each instruction deducts CU from block budget

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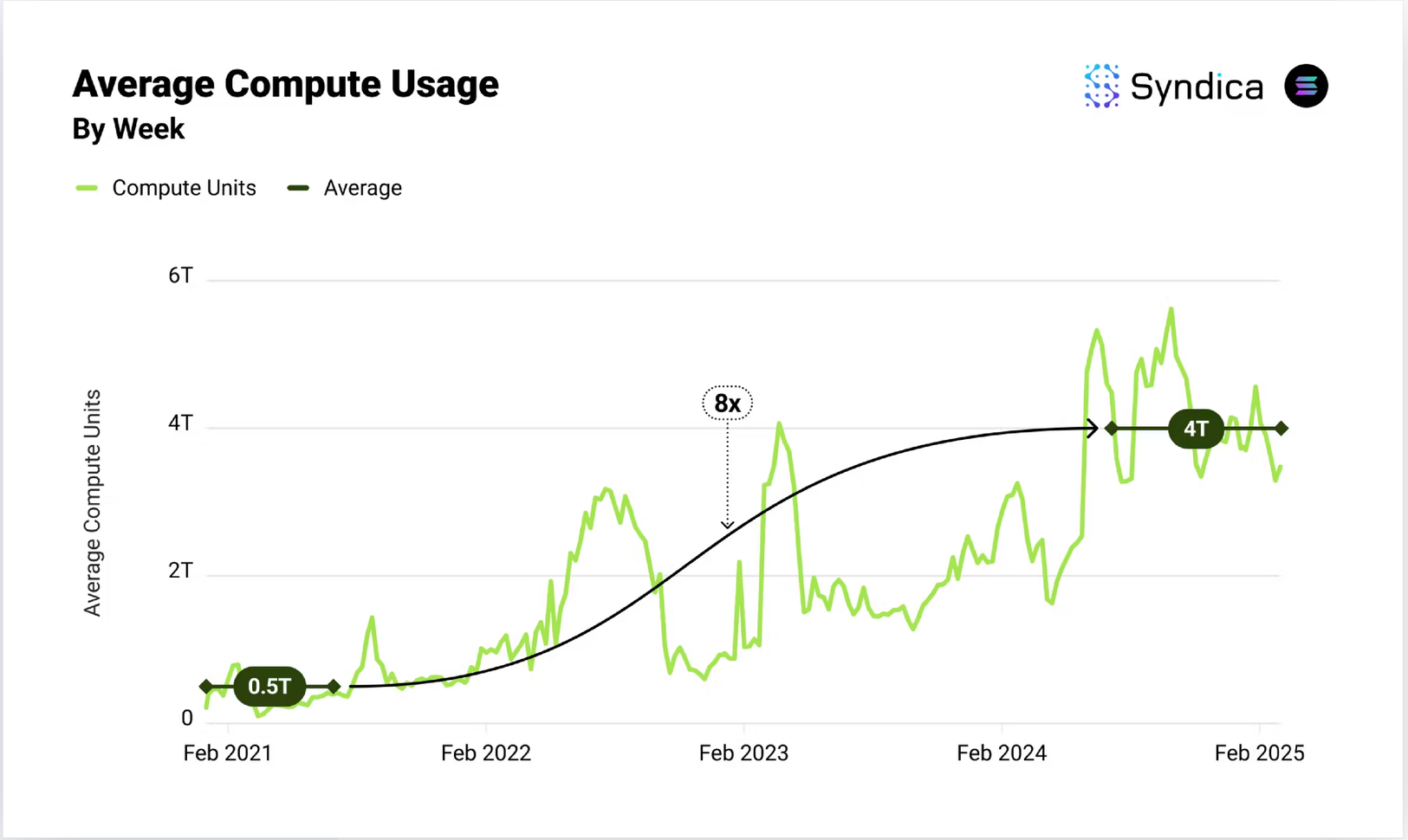
2024 marked the highest sustained compute usage in Solana's history.

Network usage has grown dramatically since early 2021, when daily compute averaged 0.5T CU.

By early 2025, daily usage stabilized around 4T CU, and 2024 summer mining waves drove activity to even higher peaks.



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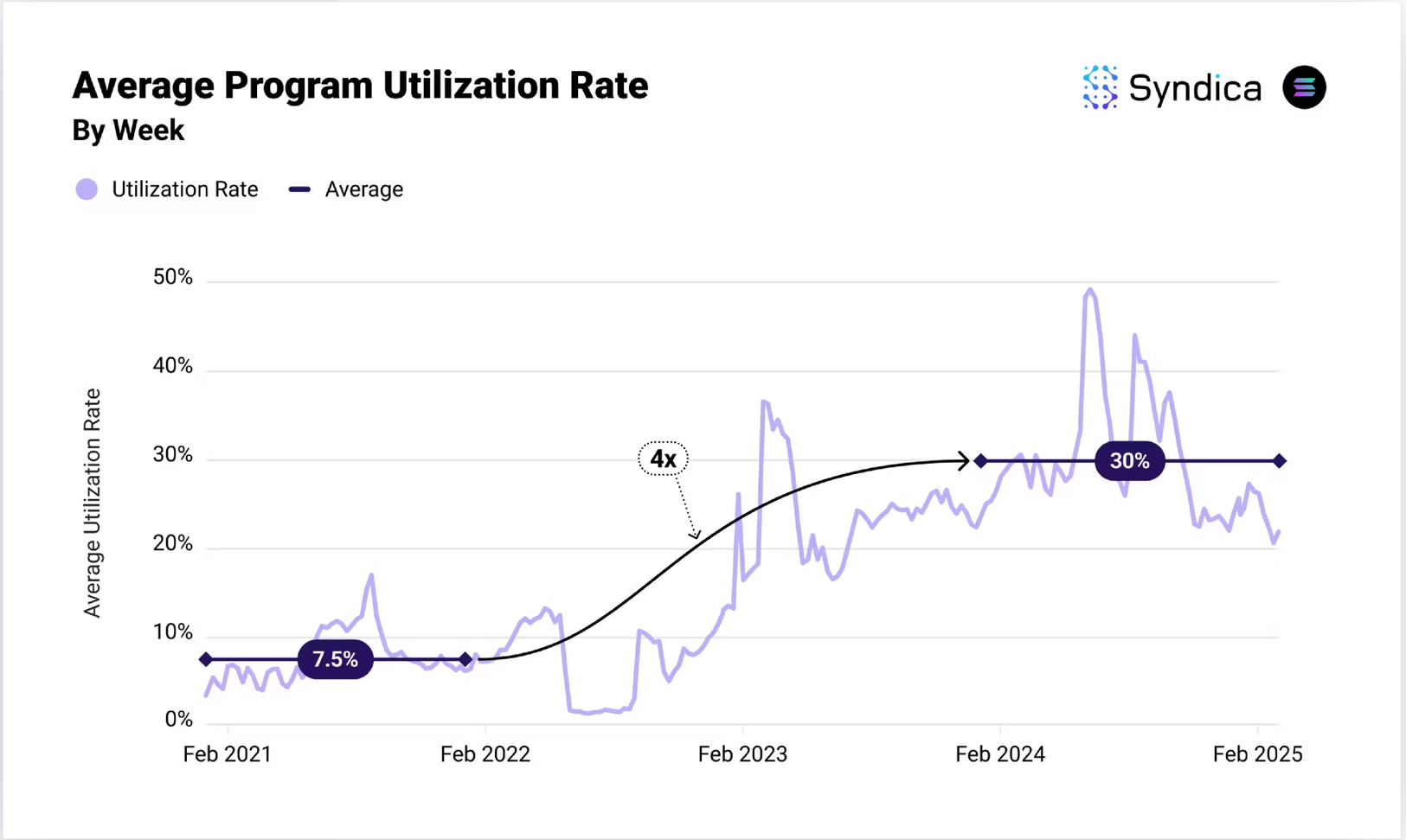
Programs have grown 4x more efficient since Solana's early days.

Programs request compute units upfront when executing transactions.

Utilization rate measures efficiency—compute actually used divided by compute requested.

Programs have become 4 times more efficient since 2021, going from a 7.5% average utilization rate to a 30% rate through 2024 and early 2025.

With 70% of requested compute still going unused, there remains significant headroom for developers to optimize their programs.



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Since 2024, users overpaid ~70% ($1.6M daily) for compute.

Solana transactions incur two types of fees: a base fee and optional priority fees for faster processing.

While the base fee does not depend on compute, priority fees do.

Priority fees are calculated as CU requested times a user-defined price for compute.

The higher this compute price, the faster the processing.

Validators benefit from overpayments, but with programs using just 30% of requested compute, users overpaid 8,600 SOL (~$1.6M) daily in 2024.

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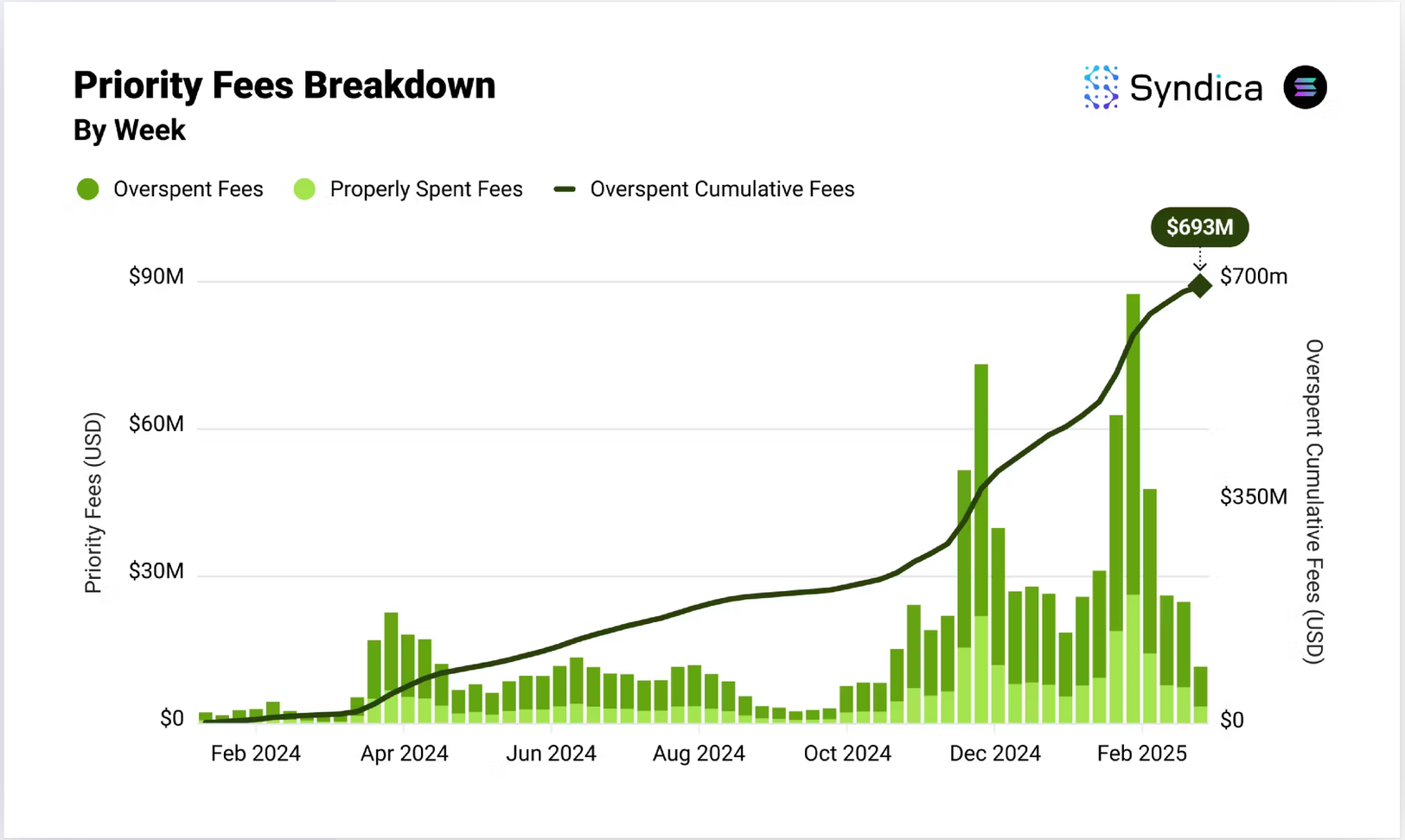
Since 2024, users spent $690M on unused compute.

Overspending on unused compute reached $23M (~85k SOL) in a single day at its peak amid the Trump and Melania memecoin craze.

Since 2024, users spent a total of $693M, or almost 3.7M SOL, in unnecessary priority fees.



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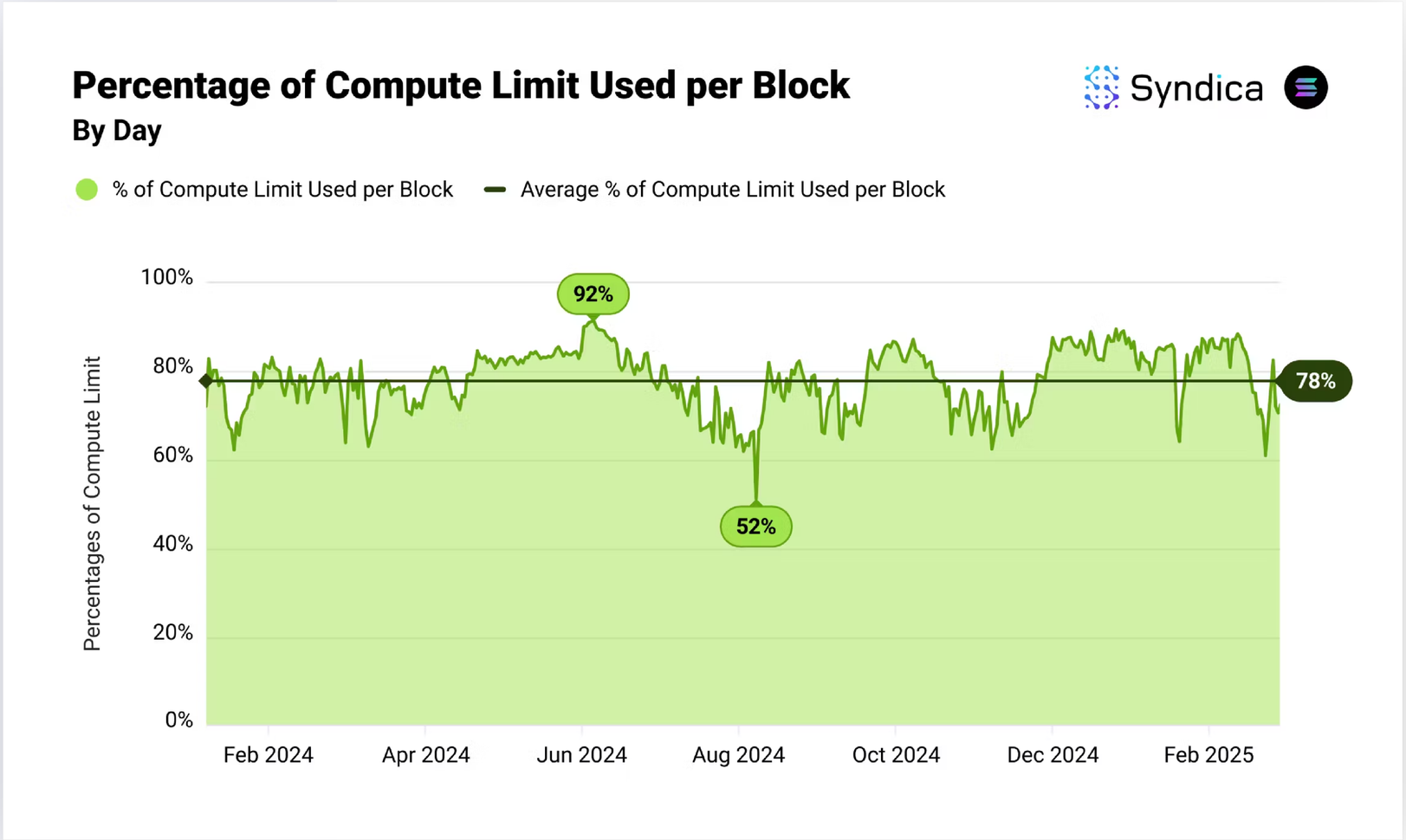
Solana blocks run at 78% compute capacity.

Since 2024, Solana blocks averaged 37M compute units out of the 48M maximum capacity.

Network capacity peaked at 92% in early June and reached its lowest point of 52% in August.

The network ran above 80% capacity for more than 40% of the year, with monthly averages ranging from 70% to 86%. December saw the highest mean utilization rate.



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Part II
Program Activity: Who's Using Solana?

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Solana DeFi commands compute.

DeFi protocols held, on average, 62% of holistic compute on Solana.

System programs consumed around 6% of compute through Solana's history and over 12% in 2025.

Other sectors saw their relevance fade: oracles' share collapsed from 25% in 2021 to <2%, while NFTs declined from their 2022-2023 peak of 13% to <1%.

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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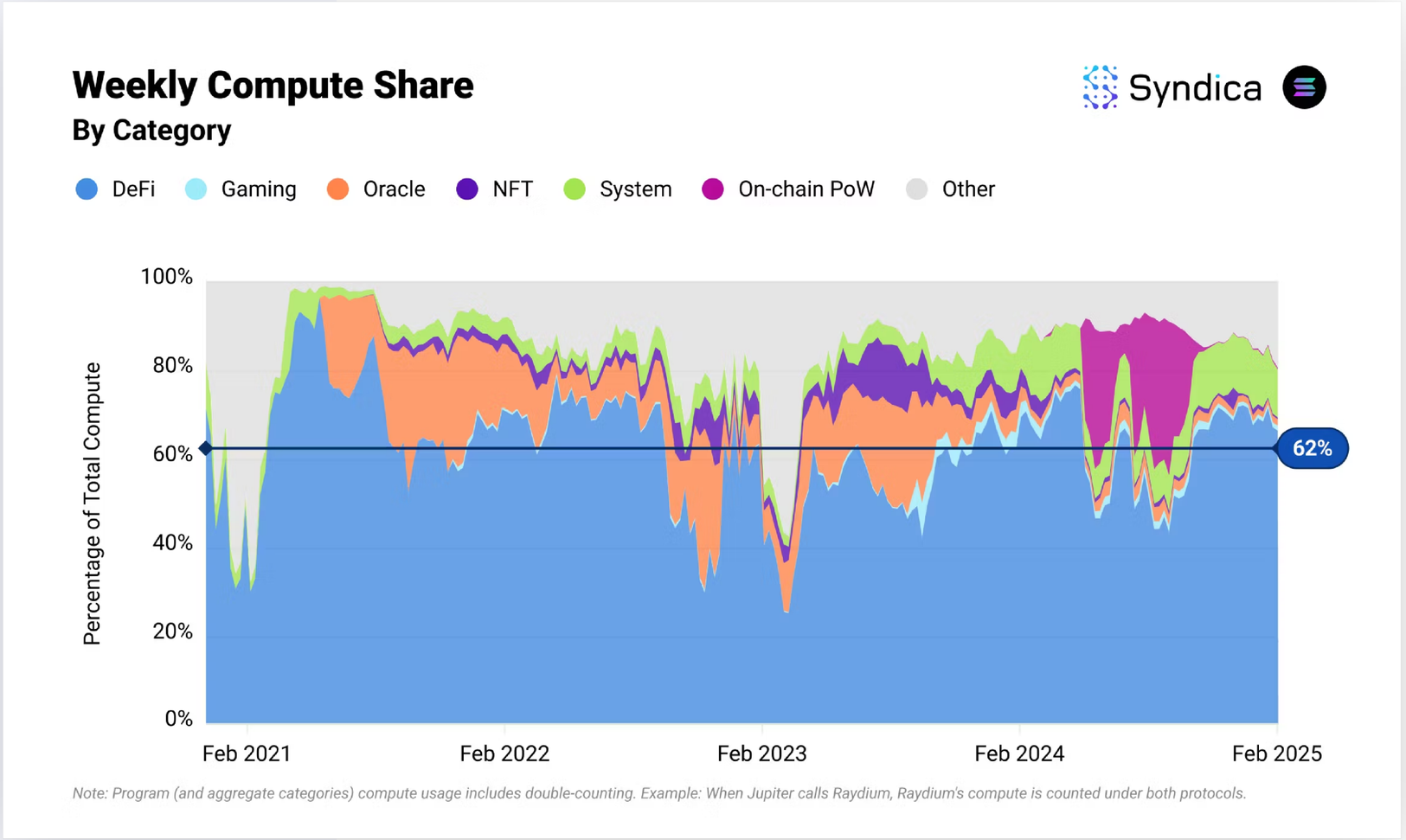

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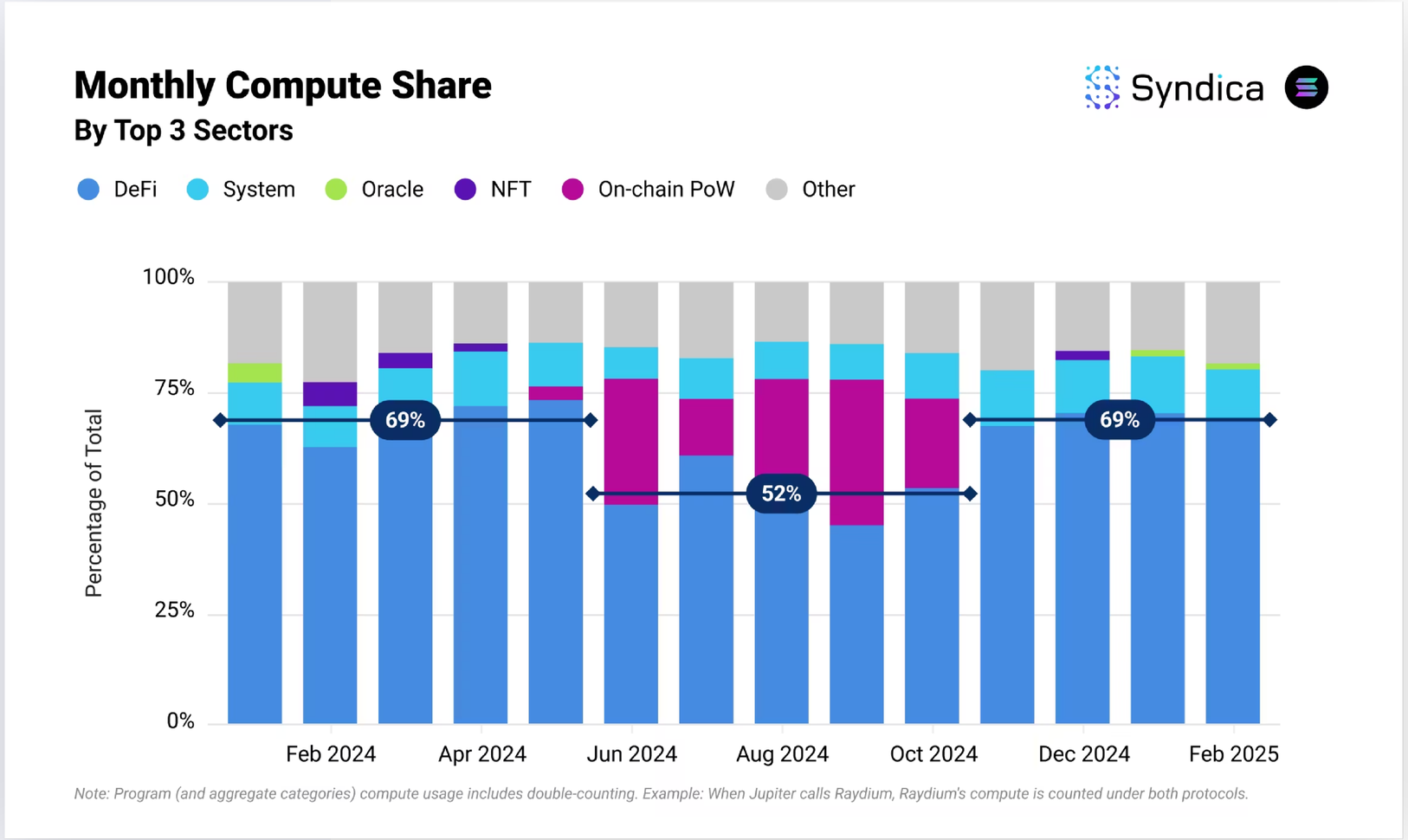
On-chain PoW briefly challenged DeFi supremacy last year.

A surge in On-chain PoW activity in 2024 that lasted from June until October captured nearly a third of Solana's compute, briefly pushing DeFi's share to 52%.

Year-end saw DeFi's dominance return to ~69%. System operations, oracles, and NFT related programs form the rest of Solana's core compute consumers.



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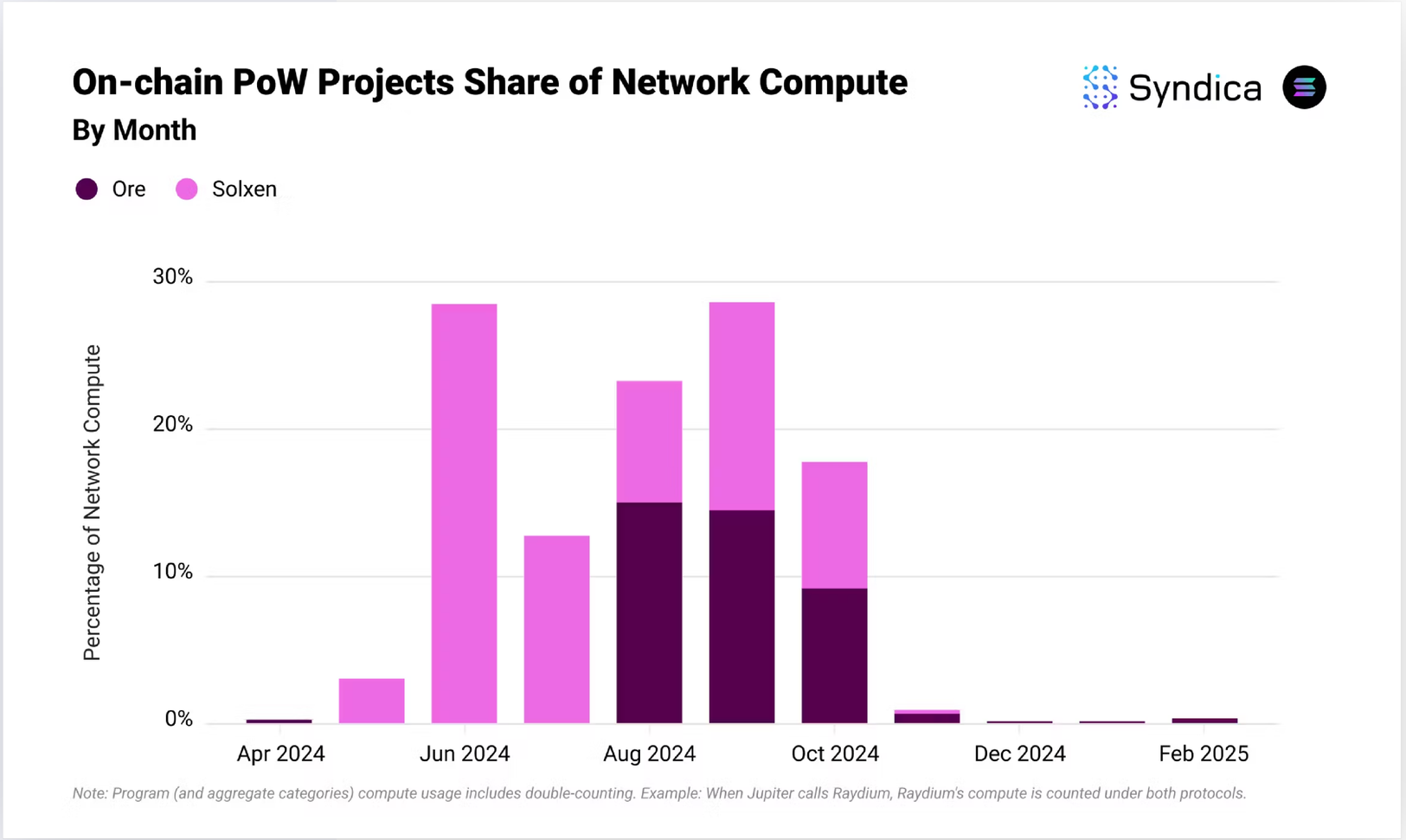
On-chain PoW fever gripped Solana then vanished.

On-chain PoW activity exploded mid-year, capturing nearly 30% of all network compute, driven by just two projects: Ore and Solxen.

The frenzy was short-lived. By early 2025, On-chain PoW consumed less than 1% of compute.



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DeFi has taken the lion's share of Solana compute since 2024.

DeFi protocols constitute almost two-thirds of any given block, with system programs adding another 10%.

Since system compute is mainy due to SPL token operations from swaps and transfers, DeFi's actual share of network activity approached 75%.

This DeFi dominance is reflected in the top programs: Jupiter v6 alone uses 23%, followed by the SPL token program (7%), Raydium v4 (7%), Meteora DLMM (6%), and Orca's Whirlpool (4%).

Mining had a significant but temporary impact mid-year, taking up almost 8% of compute since 2024.

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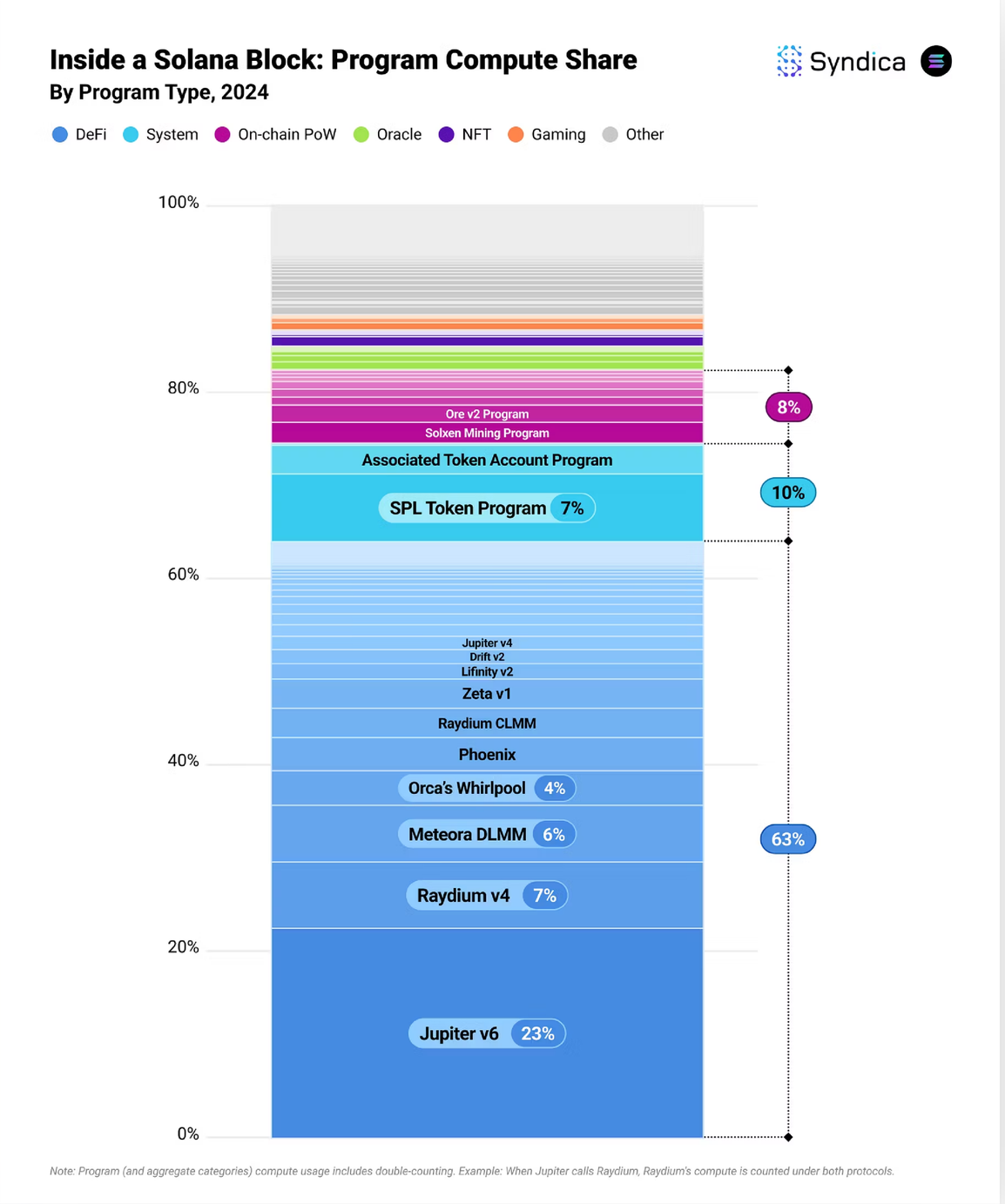

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System and DeFi programs handle over 80% of all Solana instructions.

The SPL and Associated token programs account together for 48% of all program invocations on Solana.

DeFi accounts for 38% of all invocations, with Jupiter v6 (10%), Raydium v4 (7%), and Phoenix (5%) leading the pack.

Oracle services demonstrate significant activity, with Pyth and Chainlink collectively processing 5% of all program calls.

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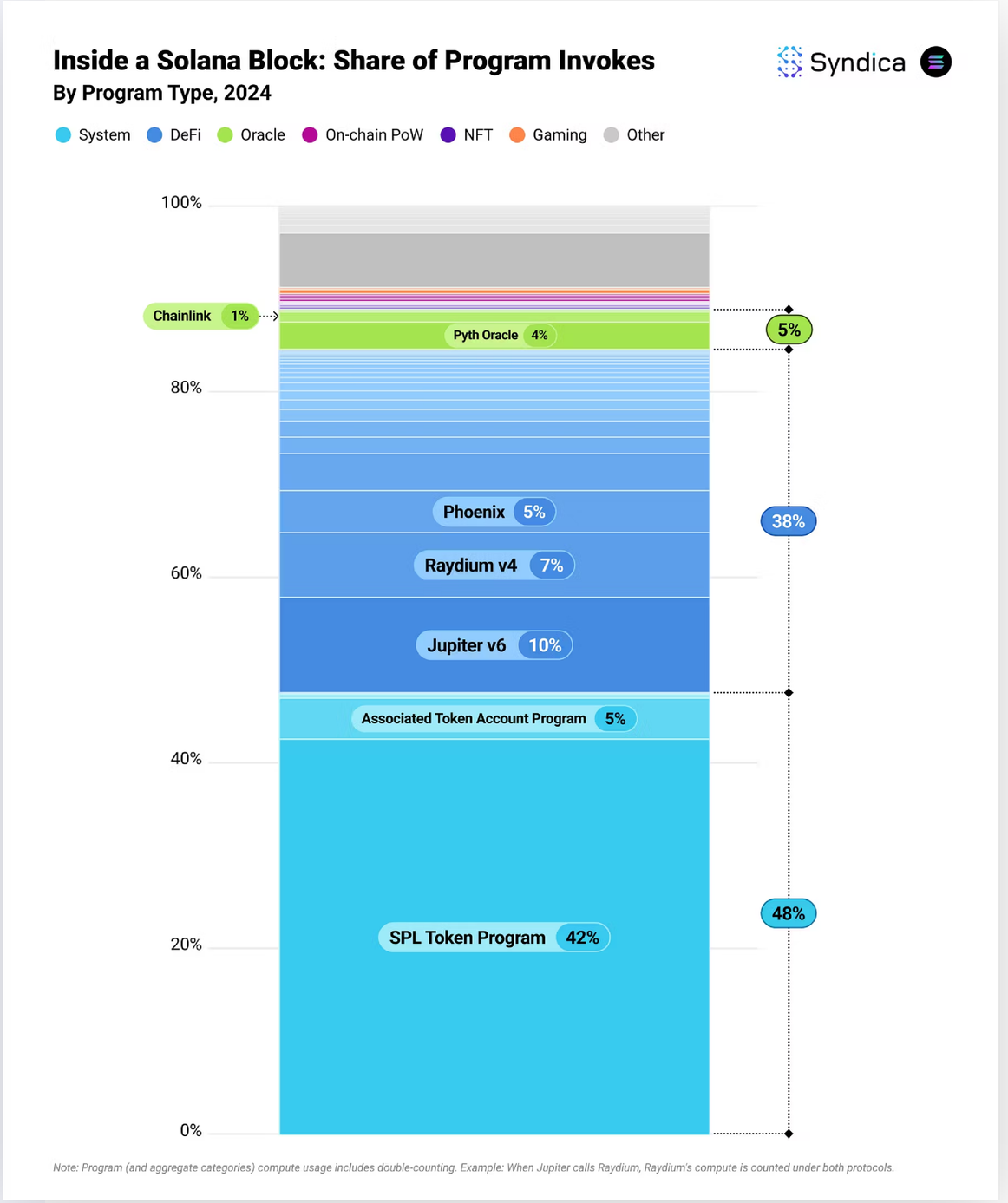
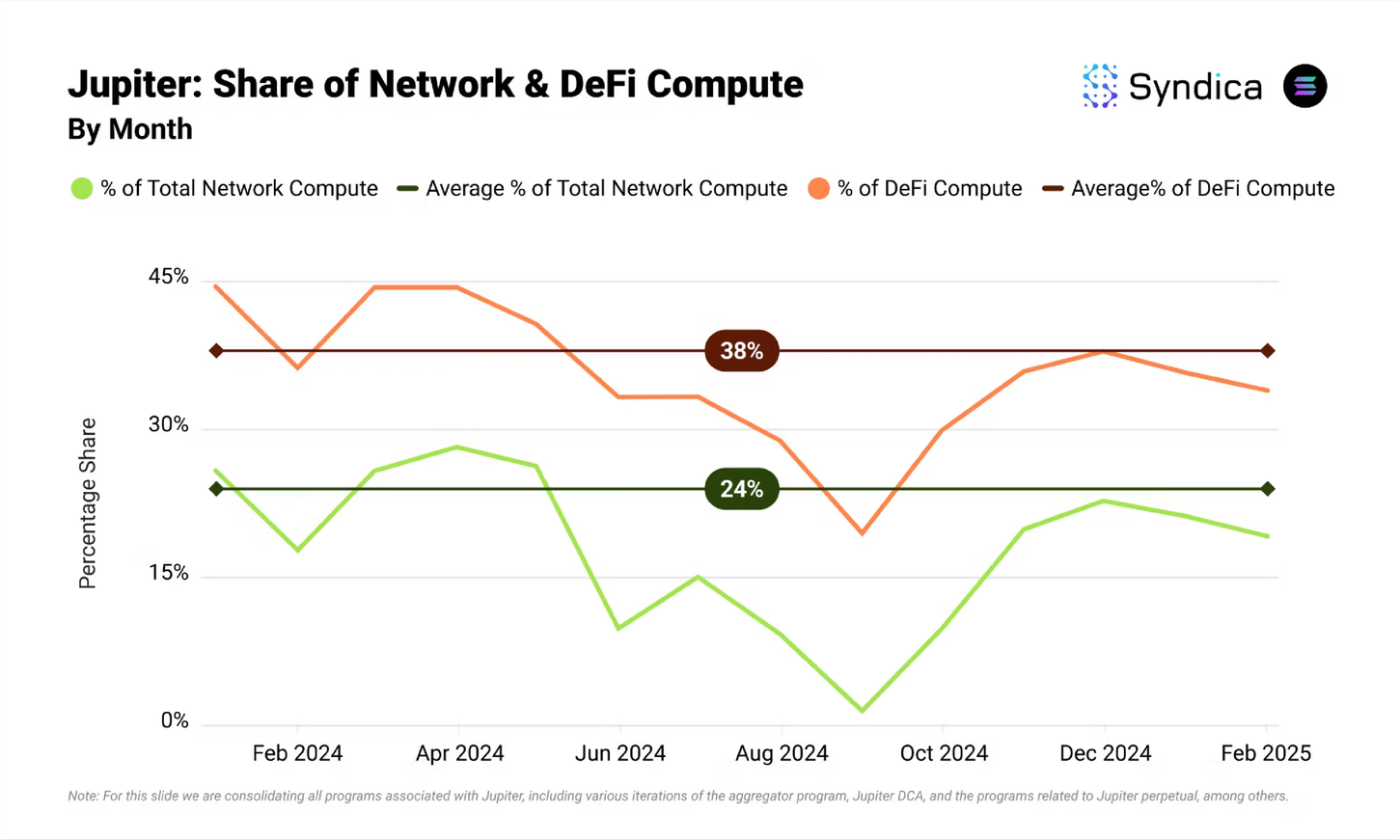


Note: For this slide we are consolidating all programs associated with Jupiter, including various iterations of the aggregator program, Jupiter DCA, and the programs related to Jupiter perpetual, among others.

Jupiter consumed a quarter of Solana's compute.

On average, Jupiter programs consumed 24% of all Solana compute in 2024.
Jupiter's share of DeFi compute averaged 38% and reached as high as 45%, highlighting their dominance in the ecosystem.



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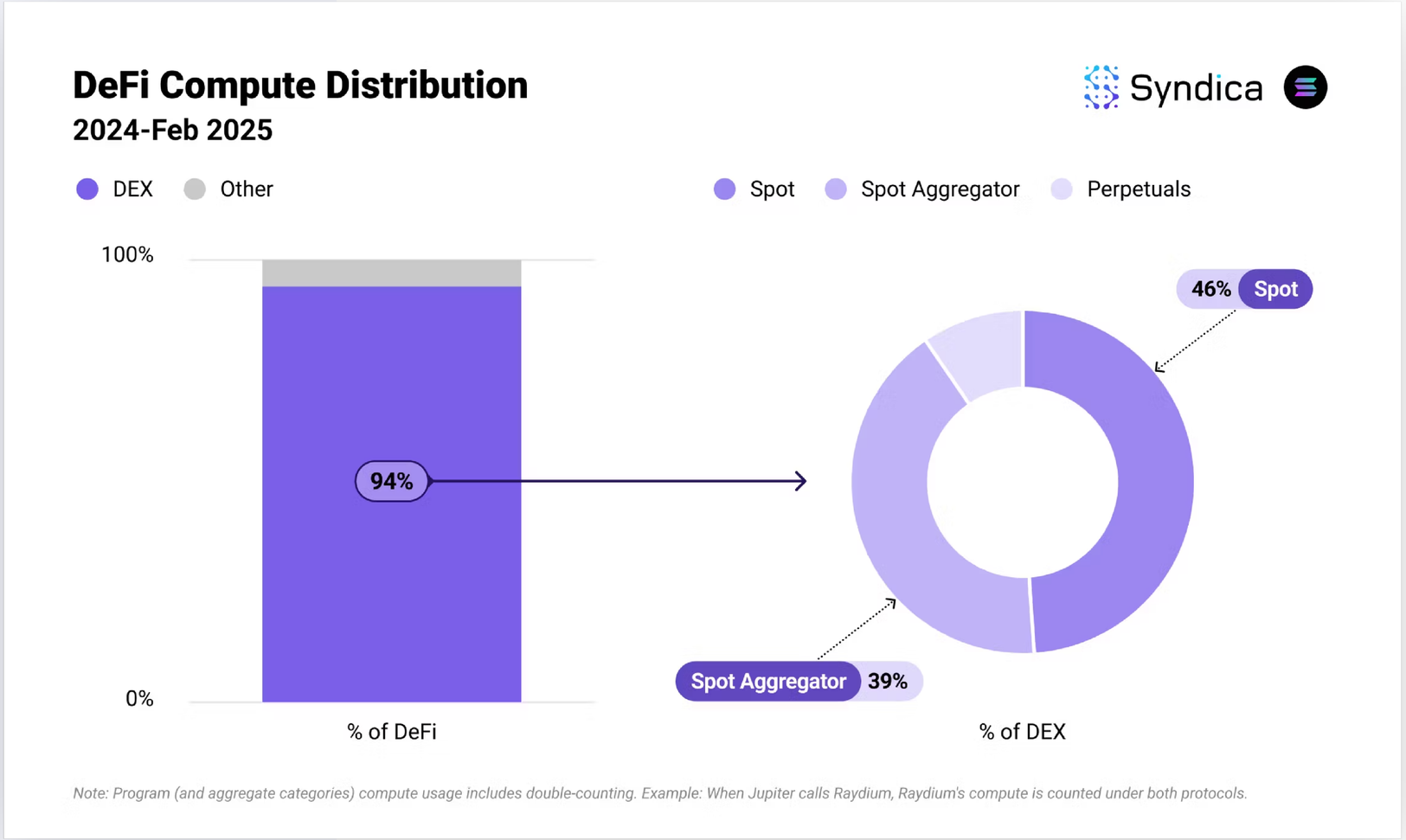
Token swaps ruled Solana DeFi in 2024.

DEXes consume 94% of all DeFi compute, with spot trading and aggregation accounting for 85% of total DeFi activity.

Perpetual trading remains a minor player, using only 9% of DEX resources.



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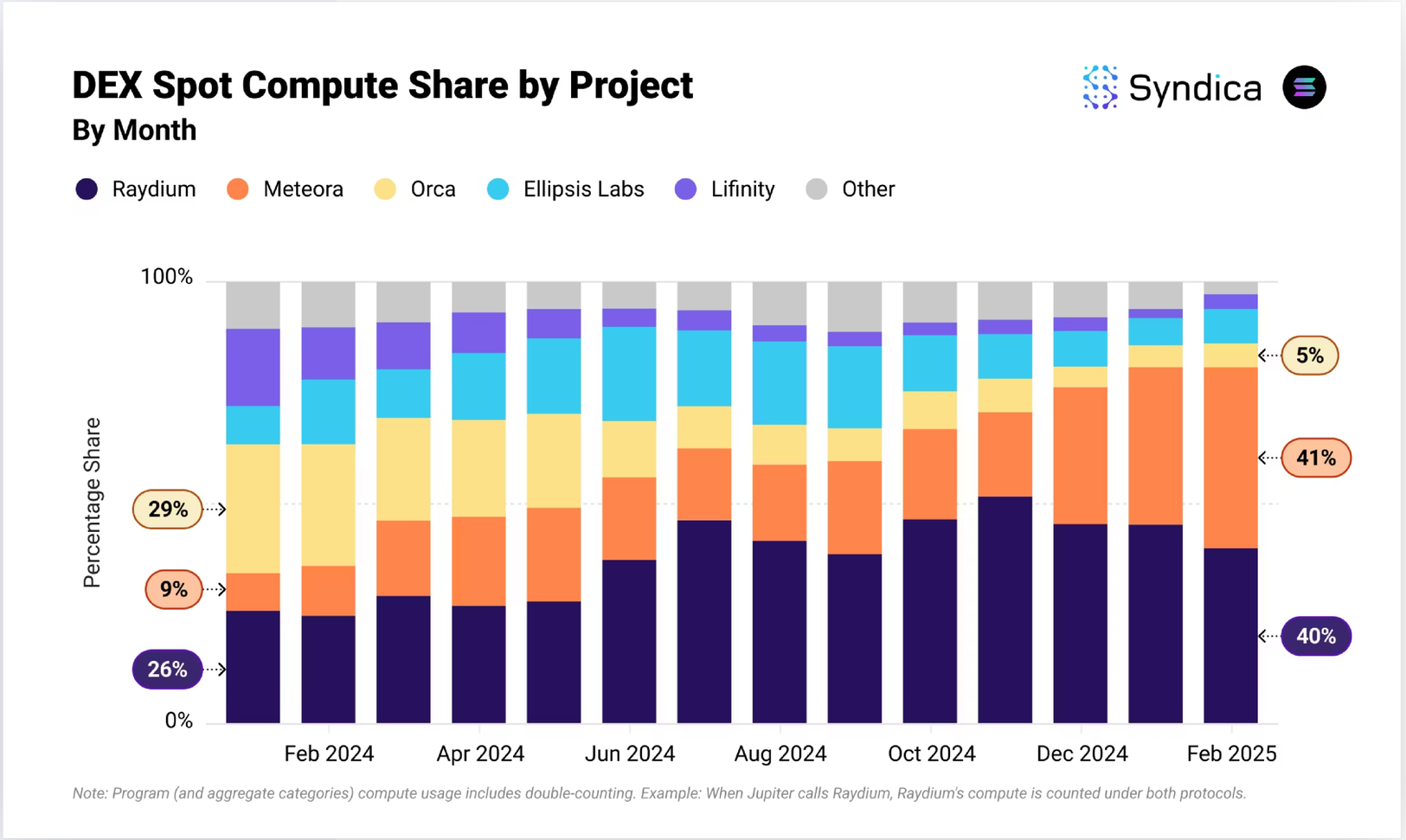
Raydium and Meteora dominate in DEX compute.

Raydium saw its DEX compute proportion climb steadily from 25% at the start of 2024 to 40-45% by the end of 2024 and into early 2025. Its partnership with pump.fun was a major catalyst for this growth.

Meteora surged dramatically from 9% to 41% by February 2025, driven by its Dynamic Liquidity Market Maker (DLMM) becoming a go-to venue for memecoin launches like $TRUMP.

Meanwhile, Orca went from the the top DEX by compute in early 2024 to #4 in 2025 as its share of compute plummeted from 29% to under 5%.



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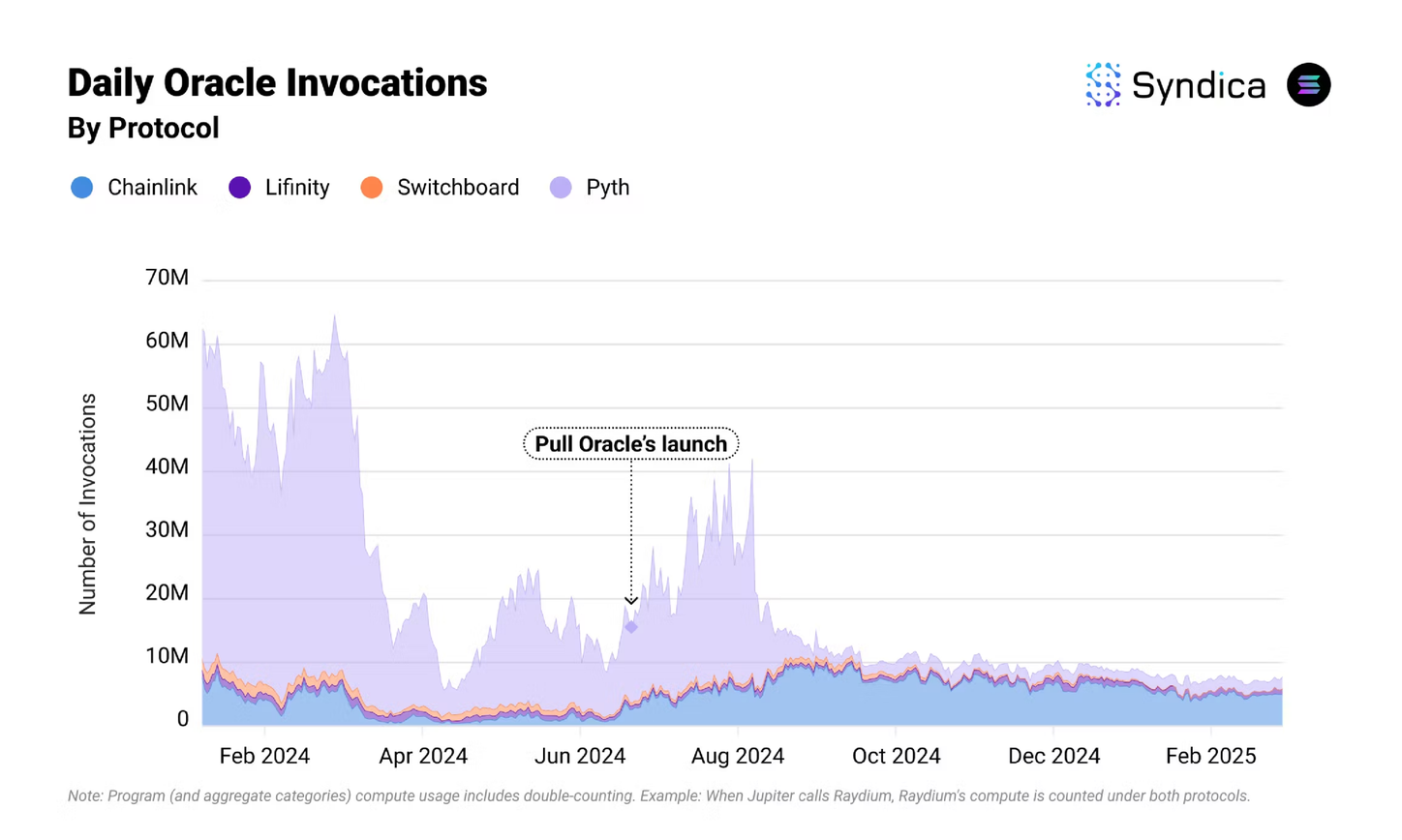
Pyth dramatically reduced network usage with its new oracle.

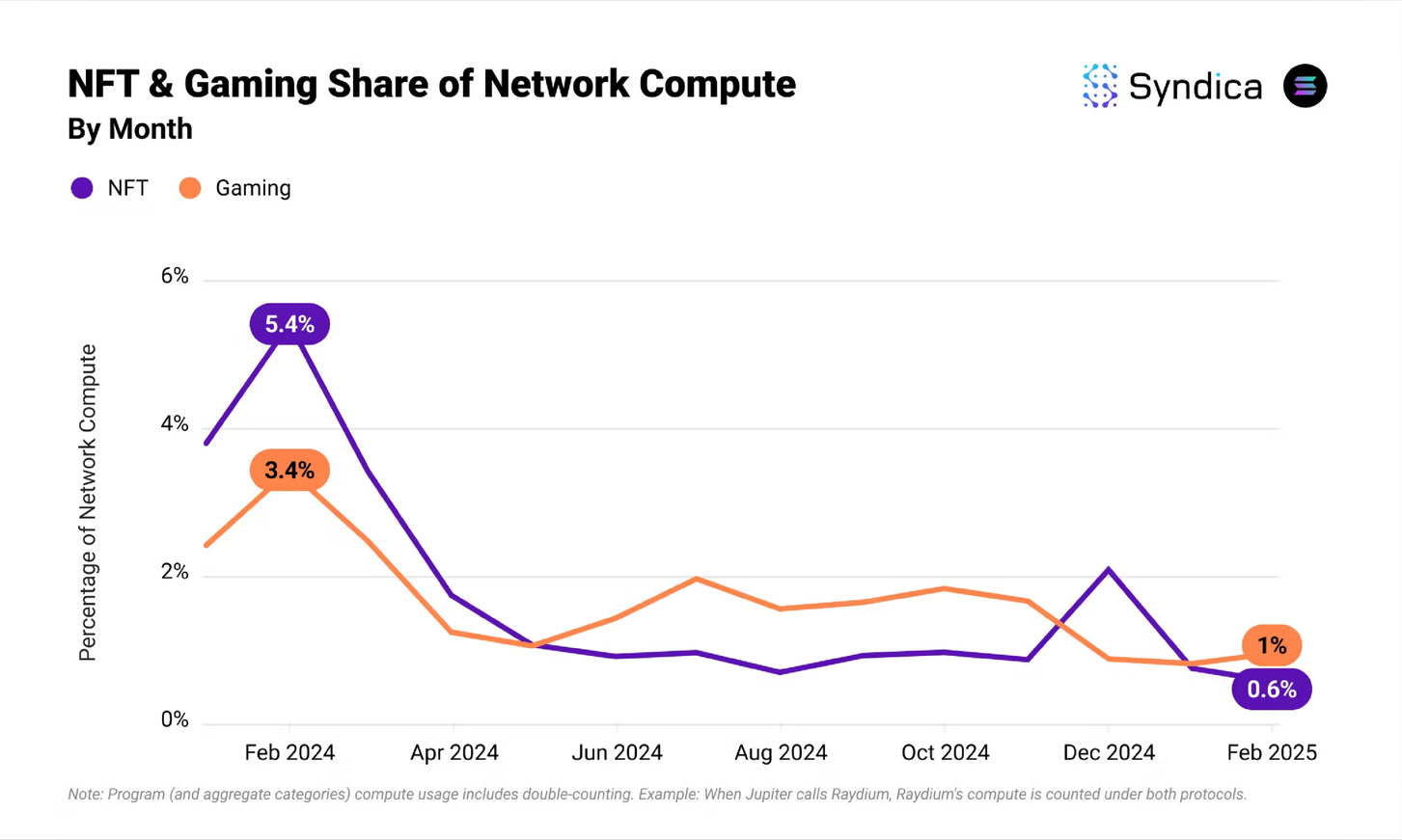
Pyth push oracles were phased out for pull oracles starting mid-2024 and entirely replaced by year-end. This shift cut daily Pyth oracle invocations by 98% and compute usage by 70%. Moving price aggregation off-chain to Pythnet boosts reliability during congestion and reduces Solana network resource use.



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

NFTs and Gaming lost their shine.

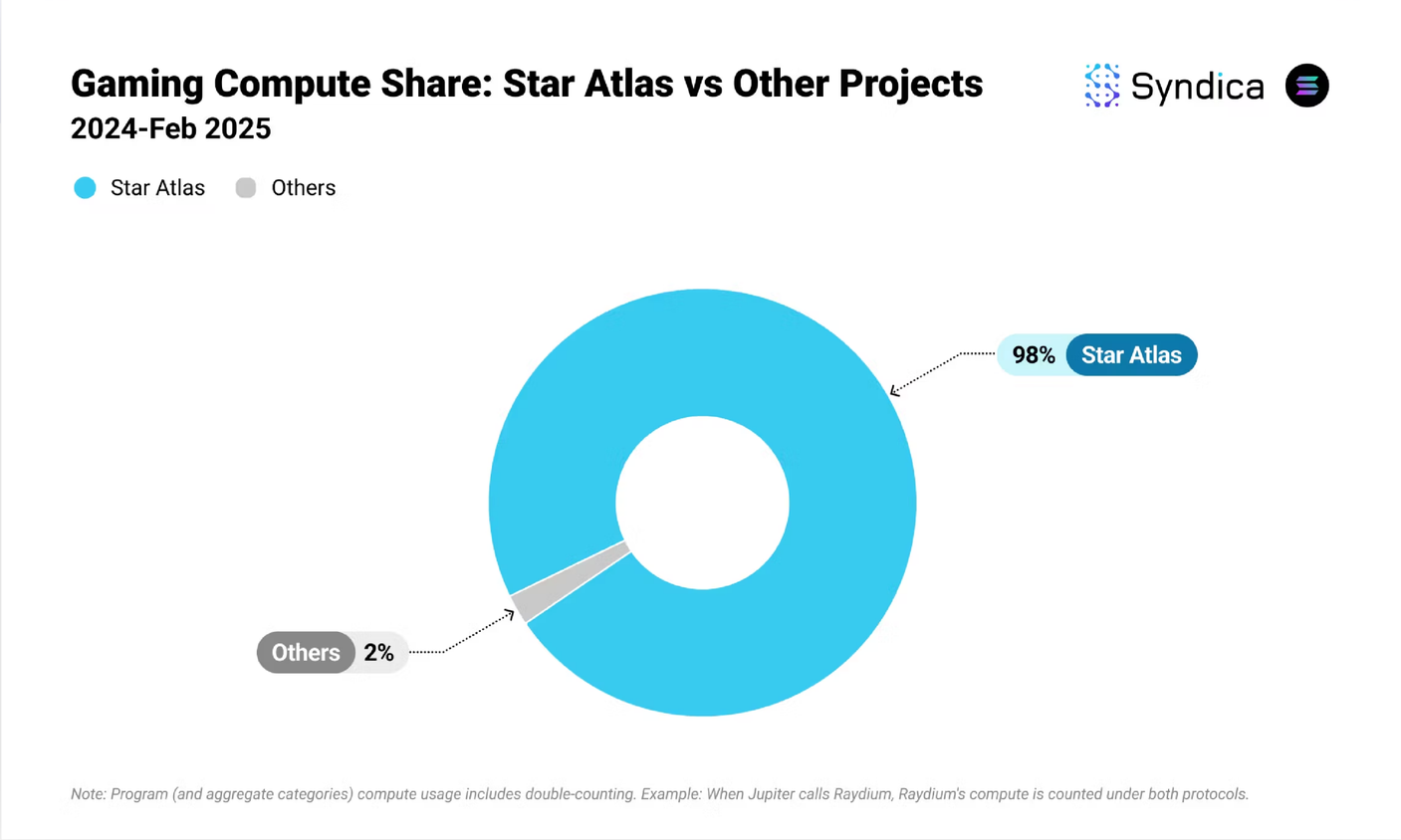
The two sectors combined now account for less than 2% of Solana's compute, down from 6-9% at the start of 2024.



In Solana Gaming, Star Atlas stands solo.

Since 2024, the interstellar MMO consumed 98% of all gaming-related compute on Solana, dwarfing all other projects.

While Star Atlas ranks among Solana's most popular games, its overwhelming share of compute usage stems from running most gameplay mechanics directly on-chain. Most other games run primarily off-chain.



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Part III

Developer Tooling: IDLs and Token Standards

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Most programs on Solana remain opaque.

Close to half of Solana's top 100 programs by compute usage in 2024 have published their Interface Description Language (IDL). The number goes down to around 20% for the top 1000.

IDLs map out the structure of a given Solana program and describe how to interact with it - they are like instruction manuals for programs. Without these public IDLs, programs remain black boxes, making it impossible to fully understand or verify their behavior and functionality.

Note: The top 100 programs represent almost 95% of all compute spent on Solana in 2024; the top 1000 programs represent over 99.9% .

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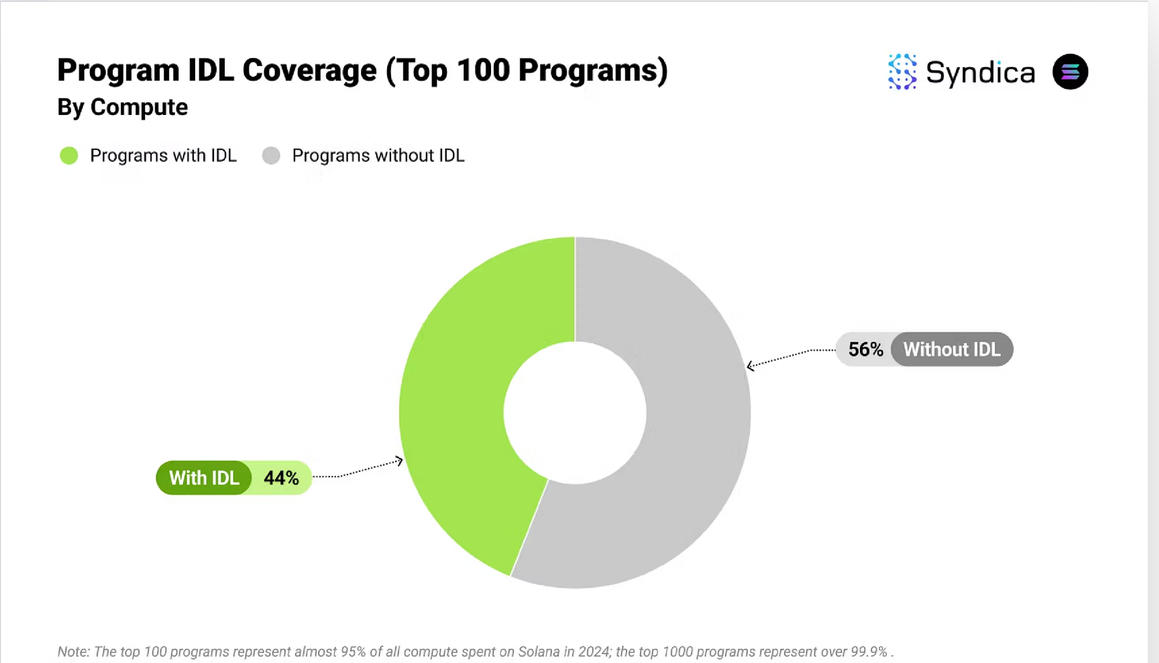

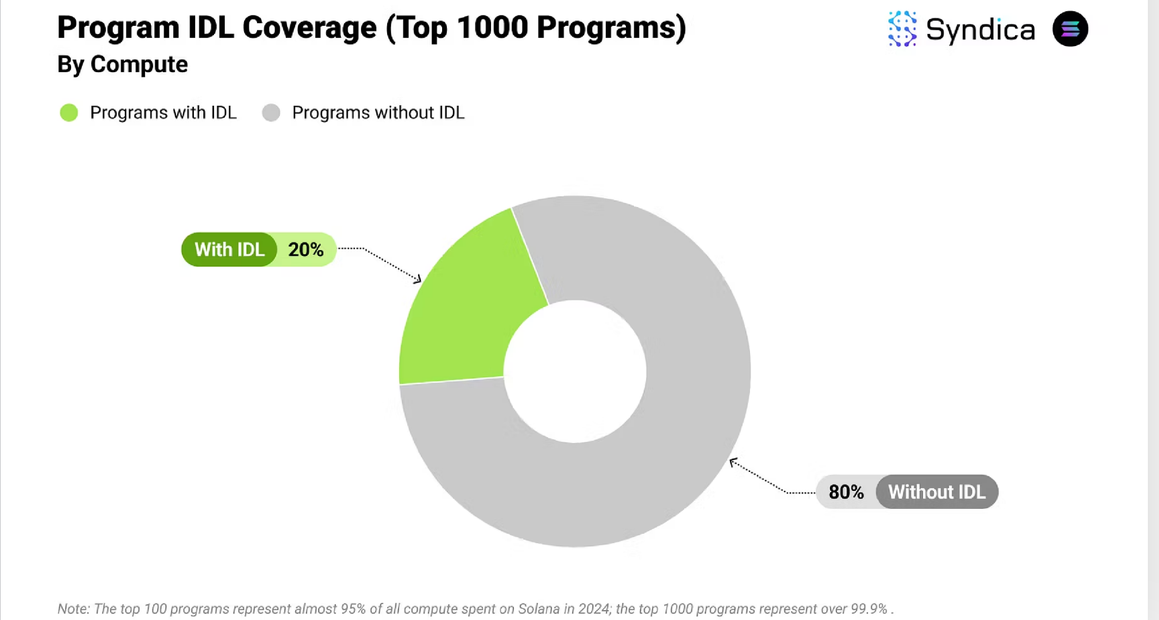

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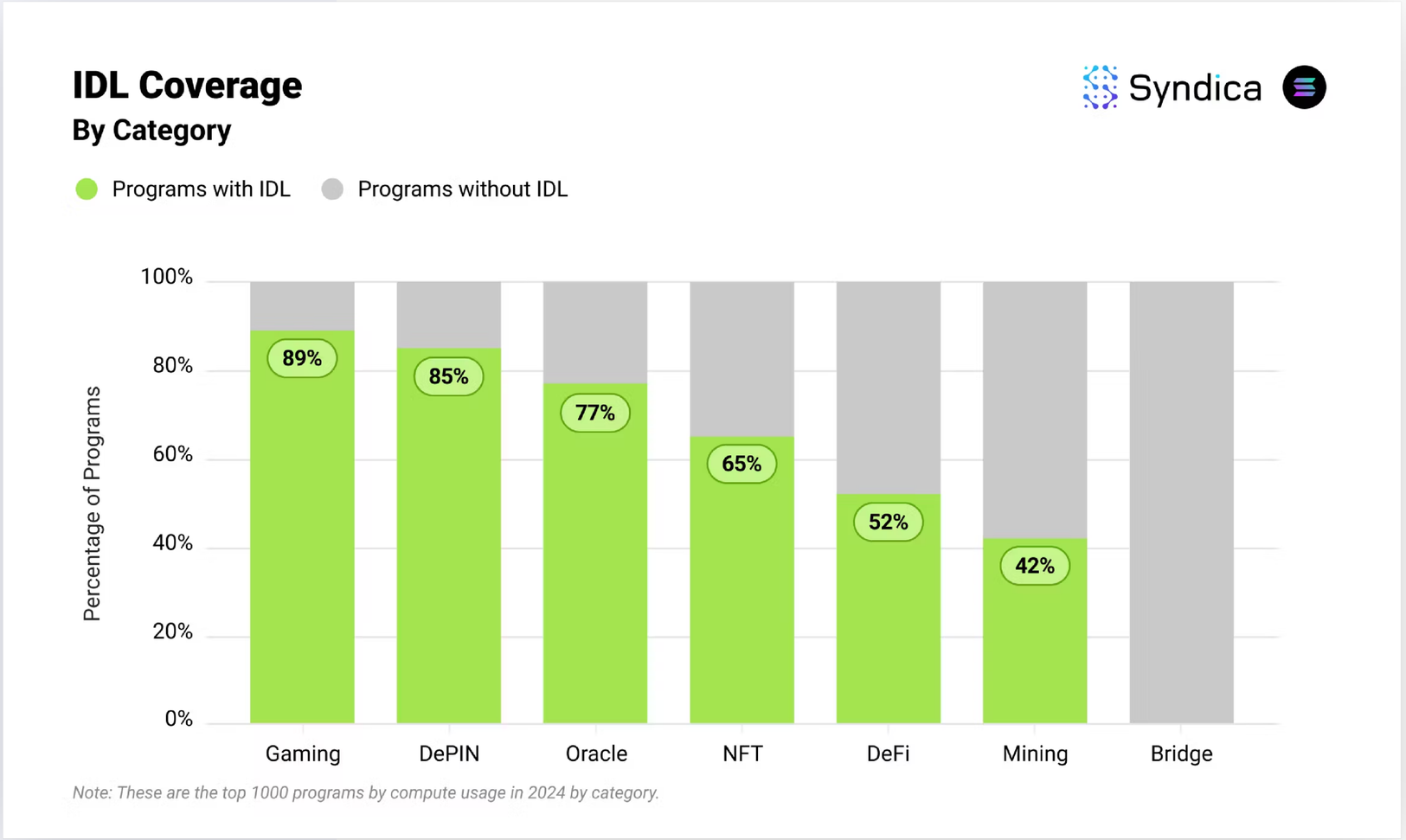
Gaming and DePIN set the transparency bar.

Gaming and DePIN programs lead in transparency in 2024, with ~85-90% IDL coverage in 2024.

DeFi and mining fall short, with only about half their IDLs being public, and bridges rank last—not a single one has published its IDLs.



Note: These are the top 1000 programs by compute usage in 2024 by category.

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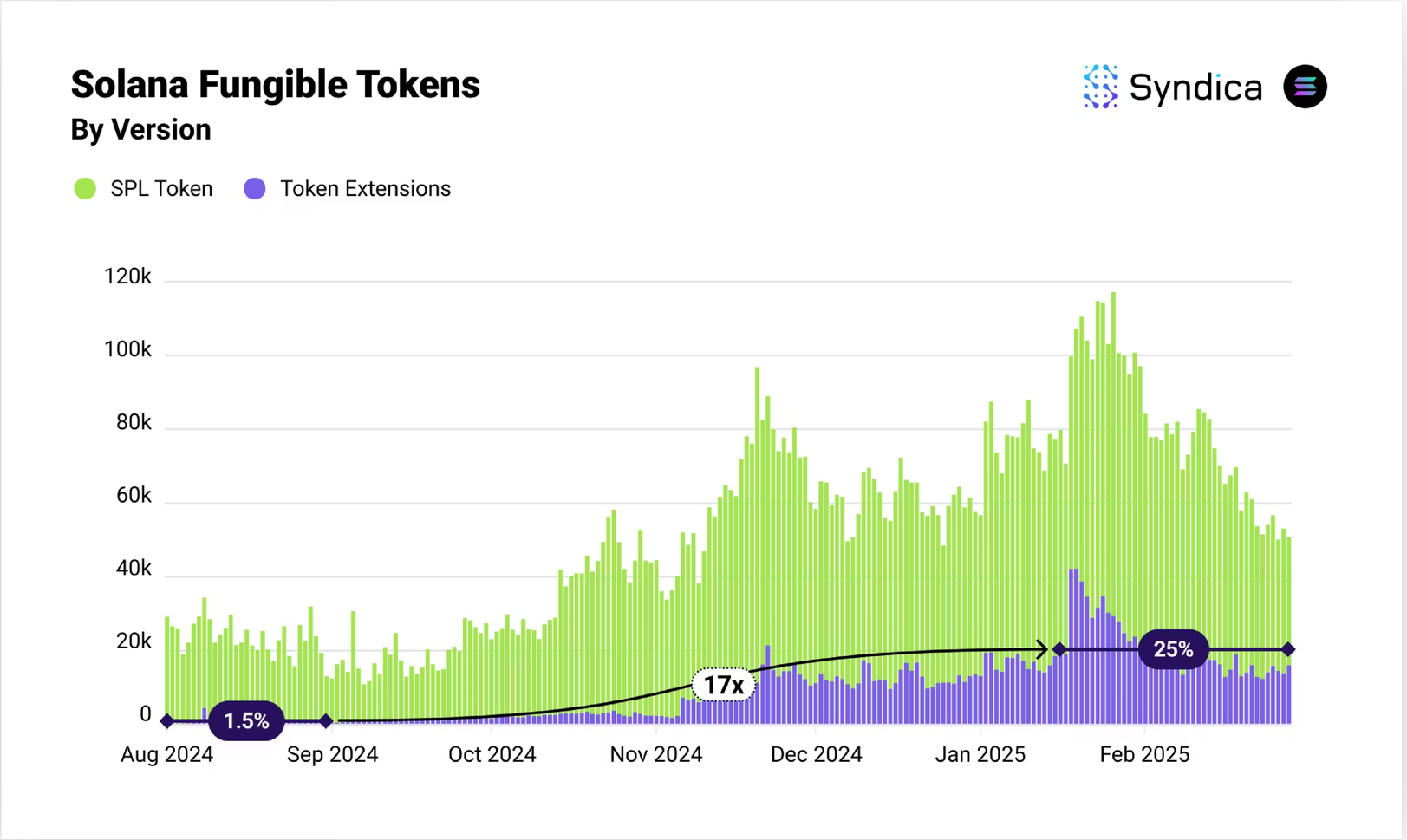
One in four new Solana tokens now use Token-2022.

Token-2022 added new functionalities to Solana tokens, like being able to add transfer fees or set programmable interest rates. This enables developers to create more sophisticated financial applications.

The new token standard saw modest initial adoption, at just 1.5% in August 2024, before gaining significant traction in Q4. By early 2025, around 25% of tokens used the new standard—a 17x increase.



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