Overview

The Dex (decentralized exchange) module contains the central business logic of Neutron DEX. Users may interact with this module to provide liquidity and execute trades according to commonly-accepted exchange semantics.

Neutron DEX, at its core, is a novel AMM design. We are also building a set of features around the AMM in order to enable powerful and sustainable financial markets. At the core of the AMM lays an incredibly simple swap mechanic: liquidity pools that allow traders to buy or sell tokens at a constant price.

Constant-price pools enable a new level of simplicity, flexibility, and capital efficiency which benefits liquidity providers and traders alike. Reasoning about external use cases and core features becomes much easier, leading to an enhanced, simplified user experience.

Dictionary

Concentrated Liquidity : AMMs which allow LPs to choose targeted ranges to provide liquidity to and typically more capital efficient as a result.

Capital Efficiency : The ability of an AMM to give traders better prices on the same amount liquidity.

Liquidity Pools : Holds liquidity, price and fee data that tells users how they can interact with it (i.e., how much they'll get in output on some input). Allows liquidity providers to pool their liquidity together instead of fragmenting it.

Liquidity Fragmentation : When liquidity of the same pairs is spread across numerous exchanges or AMMs. This increases the costs of trying to get the best price on a trade.

Ticks : Integers that map to data about the liquidity that can be traded at. The price for ticki i isp (i) = 1.000 1 i p(i) = 1.0001^{i} p (i)

= 1.000 1 i .

Fees : The way LPs charge traders in order to make returns. It is similar to a bid-ask spread on orderbooks.

Bid-ask Spread : The difference between the highest buy price (bid) and lowest sell price (ask).

Market Order : An order to buy/sell some amount of token at the best available price.

Limit Order : An order to buy/sell some amount token at a set price determined by the placer of the order.

Flexible

Neutron DEX is the one-stop shop for any payoff or trading style.

Traders can choose between market orders and limit orders.

Liquidity providers can replicateany feasible AMM curve (liquidity distribution) by strategically choosing prices and the distribution of liquidity across them.

While two liquidity providers on Neutron DEX may prefer completely different liquidity distributions, they will still use the same underlying pools. The only difference is the amount deposited in each pool. We call this featureshared liquidity because it has numerous advantages, such as reducing liquidity fragmentation and increasing the cost of price manipulation for traders and liquidity providers.

Better Prices

Neutron DEX’s mechanism design is extremelycapital efficient since liquidity providers can arbitrarily concentrate their liquidity on a single price. If there is enough liquidity at the peg price, traders can benefit from true zero-slippage swaps on stablecoins and highly correlated assets (e.g., stakednon-staked pools).

Neutron DEX has also implementeddynamic routing to further give traders better prices. Most routers calculate and broadcast the path(s) that a trade should take before the trade is executed. This reveals dangerous information to searchers who can sandwich or front-run the broadcasted route. As a matter of fact, because the prices of pools are volatile, the run-time route is likely no longer the optimal route.

WithDynamic Routing, Neutron DEX only reveals the in-token and out-token in the mempool, and finds the best path(s)

when the trade is executed. Thus if the price moves because of volatility or because someone is trying to front-run your trade, your route will respond in real time to find the next best route.

App-Specific Infrastructure

Computer scientist Alan Kay famously said that those who are serious about software build their own hardware. We believe that people who are serious about exchanges own their whole stack.

App-chains (and soon app-rollups) open up a rich design space of unexplored possibilities that can solve some of DeFi's most urgent problems.

1. MEV protections can be implemented at the consensus level and/or expressed through more complex application logic, which is not reasonable on generalized smart contracting chains.
2. Expensive transactions fees and network congestion become less of an issue with app-specific infrastructure.
3. New incentive schemes based on order flow and fee markets can put an end to DeFi's unsustainable token emissions models.

Neutron DEX strives to be a hub of innovation for pushing the boundaries of what is possible with app-specific infrastructure.

AMMs and Orderbooks

AMMs

AMMs were the first time that capital markets were created on-chain, in a computationally efficient manner. This was a transformative innovation. However, these AMMs were extremely capital inefficient, meaning that a significant amount of the liquidity deposited in them was not used. This led to extremely high price impact (aka slippage) for traders.

Recently, AMMs have introduced concentrated liquidity to increase their capital efficiency. This enabled liquidity providers to decide at what prices they wanted their liquidity to be used as, and gave liquidity providers better prices. These concentrated liquidity paradigms are often implemented in complicated manners, and still don't reach the full capital efficiency of orderbooks.

Orderbooks

Orderbooks are the dominant trading mechanism of traditional finance, and involve a set of limit orders that market makers fill. They are extremely capital efficient: limit orders, by definition, have zero price impact for traders. While they offer a familiar UX and capital efficient trading experience, they are extremely computationally inefficient to implement on-chain, and don't offer the same liveness and composability properties that make AMMs a core DeFi primitive.

Neutron DEX

Neutron DEX's mechanism combines the best of AMMs and orderbooks. It is a series of constant-priced pools where LPs can deposit their capital. For example, an LP can deposit capital at the 1.000:1.000 price on a DAI/USDC pair.

This simple design has significant consequences. Neutron DEX can reach order-book levels of capital efficiency (zero price impact on trades, swaps, and limit orders) while still maintaining the computational efficiency and liveness properties of AMMs.

A Quick Note on Fees and Value Accrual

Concentrated liquidity and orderbooks differ slightly in how liquidity providers accrue value. On concentrated liquidity AMMs, liquidity providers accrue value through a[fee](#) that they choose when placing the liquidity. The fee is a predetermined premium that traders pay when using the liquidity to swap between two assets.

Orderbook liquidity providers accrue value through maintaining a bid-ask spread, which entails them offering to sell assets slightly above the current current price and buy them slightly below the current price. It turns out that these two mechanism are actually very similar in that they describe the difference in prices between the best sell and buy prices.

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