yellow paper · v2· ~9 min read· updated 2026-05-10

Liquidity that does work.

lo0p is a Uniswap V4 hook that turns the LP underneath an AMM into *borrowable depth*. Same constant-product curve, same swap UX, but every band of liquidity can lend ETH against LOOP collateral and self-heal when prices move. This page explains it from scratch, with the math.

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01the problem

Uniswap is the largest source of automated market-maker liquidity on Ethereum. Across V2, V3, and the new V4 hook architecture, the protocol routinely holds **billions of dollars in liquidity provider deposits**.

value locked in Uniswap≈ $5–8Bacross V2/V3/V4 pools, per DeFiLlama (typical 2026 range)

That capital earns swap fees. But it is **locked** for everything else. A liquidity provider's $1M position cannot be borrowed against without first being withdrawn — and withdrawing kills the fee stream.

> You can earn swap fees, OR use the tokens as collateral. Not both.

The same pattern repeats across DeFi: tokens locked into LP, into staking, into vaults are *dead weight* for any purpose other than their primary one. For a fair-launched community token, this means the deepest pool of capital — the LP itself — can never finance its own users.

02the idea

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What if the AMM *itself* could lend? Every block, the V4 pool knows precisely how much ETH it holds and at what price. That is a perfect oracle and a perfect treasury, owned by the protocol — not a third party.

lo0p is a V4 hook that does exactly this. When a user wants to borrow ETH, the hook reaches into one of the LP positions backing the LOOP/ETH pool, pulls the requested ETH out, and hands it over. The LP shrinks slightly — but the spot price does not move, because we draw from a band that sits *below* the current spot.

band 0–N
ETH-only LP
(crossed bands)
↑ borrow draws from here
◊
active band

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spot price
sits here
swaps cross through

The key insight: V4's concentrated liquidity is divided into discrete tick ranges. Each range can hold ETH-only, LOOP-only, or a mix, depending on where the current spot is. We treat each range as a separate "band" of capital and lend from bands that have ETH to spare.

03the math

↳ 3.1 the curve

Like a vanilla constant-product AMM, lo0p maintains:

realTokens × (V + realETH) = K

where `V = 20 ETH` is a fixed virtual reserve so the curve is well-defined even with zero real ETH, and `K = 20,000,000` is the product constant set at deployment to fix the launch supply at `1,000,000 LOOP`.

Spot price is `(V + realETH) / realTokens` ETH per LOOP. As ETH flows in, realTokens drops and price rises. Standard stuff.

↳ 3.2 30-ETH bands

The pool is sliced into **100 discrete bands**, each covering 30 ETH of cumulative inflow. Band `i` holds the LOOP that the constant-product curve would have sold across the ETH range `[30i, 30(i+1))`:

LOOP_i = K / (V + 30i) − K / (V + 30(i+1))

Mapped to V4 ticks, this gives 100 single-sided LOOP positions at deploy, covering pool-ETH inflow up to **3,000 ETH**. As buyers push ETH into the pool, bands cross one by one — each band's LOOP is converted to ETH at exactly the prices it was priced at.

band	ETH range	LOOP allocation	% of supply
0	0–30	600,000	60.00%
1	30–60	150,000	15.00%
2	60–90	68,181	6.82%
3	90–120	38,961	3.90%
…	…	…	tail bands shrink rapidly
29	870–900	732	0.07%
…	…	…	long tail to 3,000 ETH
99	2970–3000	67	0.007%

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The 100-band design covers a price range of **~7,000×** from launch to band 99 saturation — well beyond any realistic short/medium-term protocol life.

↳ 3.3 borrowing — bound band selection

When a user locks `C` LOOP as collateral, we lend ETH at a 40% loan-to-value:

debt = collateralValue × 0.40

Liquidation triggers when collateral value falls to `1.5 × debt` — i.e. spot price drops to 60% of the borrow price. Solving for that price level on the curve gives the predicted liquidation pool ETH:

ethLiq = √0.6 × (V + ethBorrow) − V

The "bound band" is then `floor(ethLiq / 30)`. The hook draws the borrow's ETH from *this specific band's LP*. Since the band sits below current spot, removing ETH from it does not move the price — **borrows are slippage-free**.

↳ 3.4 dead zones & the shift

Sometimes the predicted bound band is the same band the spot price currently sits in (a "straddle"). V4's concentrated liquidity requires single-sided positions for ETH-only extraction, so a straddling band cannot supply pure ETH.

The hook resolves this with two mechanisms:

‣ **Bound-band shift.** If the predicted band fully straddles or sits below current spot, the hook steps to the next band *above* spot (lower bandId, higher V4 ticks) which is guaranteed ETH-only.
‣ **Straddle-borrow.** If no band sits fully above spot (cold-start case where currentTick is inside band 0), the hook removes liquidity from the straddling band's position directly. V4 returns both ETH (used for the loan) and a small amount of LOOP (kept by the hook as protocol surplus).

Together these guarantee every borrow can be served regardless of where the spot price is — no warmup period, no dead zones.

↳ 3.5 self-healing liquidation

When a position becomes underwater (collateral value < `1.5 × debt`), anyone can call `liquidate()` for a small bounty. The hook:

‣ Sells the collateral via a normal V4 swap, receiving ETH proceeds.
‣ Pays the liquidator a bounty of `min(1% × debt, 0.01 ETH)` — the hard cap prevents disproportionate payouts on large positions.
‣ **Refills** the remainder back into the bound band as fresh ETH-only LP — the band we originally lent from becomes deeper than before. *No LOOP burn.*

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The pool gets stronger every time a position liquidates. That's self-healing.

If the spot has moved so far during the liquidation swap that the original band is no longer above spot, the refill falls back to the closest other band that *is* above. If even that fails, the surplus goes to the FeeCollector as protocol revenue. ETH never sits unaccounted in the hook.

04a complete cycle

Concretely, here is what happens when a user borrows then later gets liquidated:

1
borrowAlice locks 30,000 LOOP. Pool ETH is 80, spot is ~0.0011 ETH/LOOP. Collateral value: 33 ETH. Debt issued: 13.2 ETH (40% LTV). Origination fee: 0.13 ETH → FeeCollector. Net to Alice: 13.07 ETH.
2
bound bandPredicted ethLiq = √0.6 × 100 − 20 = 57.5. Bound band = floor(57.5 / 30) = 1. The hook removes ETH-only LP equivalent to 13.2 ETH from band 1's V4 position. Spot price does not move.
3
price dropsOther users sell LOOP. Pool ETH falls 80 → 55. New spot ~0.00064 ETH/LOOP. Alice's collateral now worth 19.2 ETH. Coverage = 19.2 / 13.2 = 1.45× — UNDERWATER (need ≥ 1.5×).
4
liquidateBot calls liquidate(alice, 1). Hook sells Alice's 30,000 LOOP via V4 swap, receiving ~17 ETH. Pays bot 0.01 ETH bounty (capped). Refill: 16.99 ETH → back into band 1 as ETH-only LP.
5
outcomeAlice's debt is cleared. Alice loses her 30k LOOP collateral. Bot earns 0.01 ETH. Band 1 holds MORE ETH-side LP than before Alice's borrow. Protocol depth strengthens.

05honest limits

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Things to know:

‣ **Each band caps at 30 ETH borrow.** A single position cannot borrow more than that from one band. Larger loans split across bands.
‣ **Same-block lockout** blocks borrow / liquidate in the same block as a swap, defeating one-block oracle manipulation. Multi-block manipulation is bounded by the LDF cap structure but not impossible — pump-and-borrow simulations show negative attacker P&L (origination fee + slippage cost the attacker more than they extract). A TWAP oracle would harden this further.
‣ **No cascade liquidation.** Because borrows draw from a band *below* spot and don't move spot, no one position's liquidation can drag others underwater.
‣ **Fixed parameters, no governance.** LTV (40%), liq threshold (150%), bounty (1% capped at 0.01 ETH), LDF band count (100) are all set at deploy. No proxy, no upgrade.

06revenue → holders

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The protocol earns revenue from one source today and a second source soon: the **1% origination fee** charged on every borrow, plus the V4 swap-fee skim on every buy / sell. Both streams flow into the `FeeCollector` contract — a separate, upgrade-free account whose only job is to hold the proceeds.

The policy commitment is simple: **those fees are returned to LOOP holders**. lo0p has no team allocation, no insider vest, no protocol-owned treasury for ops. Every wei a borrower pays in origination is earmarked for distribution back to people holding the token.

▸ **Borrow origination fee.** When Alice borrows 13.2 ETH at 40% LTV, 1% of the debt — 0.13 ETH — is sent to the FeeCollector at the same block. There is no fee on repay; the full debt is paid back to the band.
▸ **Where it ends up.** The FeeCollector accumulates ETH (and a small amount of LOOP from edge-case refills). Periodic distribution snapshots LOOP holders pro-rata to their balance and sends each holder their share — so holding the token is what entitles you to the revenue, not staking or locking.
▸ **Distribution mechanism is open.** The destination (LOOP holders) is fixed by policy. The plumbing (snapshot airdrop, holder-only buyback that increases per-token reserves, merkle-claim distributor) is open for community input and will be locked in before the first distribution.
▸ **Why this works.** The hook is non-upgradeable; no one can re-route fees to a different address. The FeeCollector's withdrawal key is the only operational lever, and its use is bounded by the public revenue-share policy. As lending volume grows, every active borrower is effectively paying yield to every passive holder.

07parameters

parameter	value	rationale
LOOP supply	1,000,000	fixed at deploy, no mint/burn
Virtual ETH (V)	20 ETH	phantom reserve to seed the curve
LDF bands	100 × 30 ETH	covers 0–3,000 ETH cumulative inflow
LTV	40%	debt = 0.40 × collateralValue
Origination fee	1% of debt	→ FeeCollector → LOOP holders
Liq threshold	150%	underwater when collateralValue < 1.5 × debt
Liq bounty	1% × debt, max 0.01 ETH	per-call cap, prevents whale subsidies
Repay cooldown	2 blocks	post-borrow lockout
Min collateral	0.1 ETH value	floor to prevent dust

08references

▸ Uniswap V4 core — concentrated-liquidity AMM with hook callbacks.
▸ DeFiLlama · Uniswap — live TVL across V2 / V3 / V4.
▸ Uniswap V4 whitepaper — hook architecture and singleton design.
▸ lo0p dashboard — live curve, depth chart, execute panel.

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next

Open the app to see live curve depth, place trades, and manage open positions.

open app →

o.0lo0p

A Uniswap V4 hook lending AMM on Ethereum mainnet. Borrow ETH against locked LOOP without moving the market.

protocolhow it worksmechanismterminal
learnyellow paperdatasheet
contractLOOP 0x0000…De3F ↗etherscan ↗
$ lo0p --status operationalv0.1 · 2026 · ethereum

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