

# Hashstack Finance

## Open protocol

An autonomous lending framework enabling under-collateralized loans for upto 1:3 collateral-to-debt ratio.

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## Abstract

The recent resurgence of decentralised finance[hereafter defi] has enabled millions around the world with better access to capital, & a means for alternative income streams. This surge however paved the way for its own unique set of challenges. Challenges that can be narrowed down to one word, inefficiency. While there has been no dearth in innovation in decentralised finance, the majority of the existing solutions are far from comparable to their centralised counterparts. One such niche, the present day defi struggles with is, Lending. Defi lending in its current state is broken. It serves a niche use-case, and is sub-par in comparison with the centralised services. While the technology to build a much more efficient product is available, unfortunately, it is not implemented yet. We propose Open protocol. An autonomous lending framework with multi-chain interoperability, providing under-collateralized loans upto 1:3 collateral-to-debt ratio[hereafter cdr], at predictive interest & yield rates.

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# Hashstack Finance

## Mission

Hashstack is on a mission to build an ecosystem of trustless, borderless decentralised financial products that serve the needs of millions of underserved around the world.

## Open protocol

### Concept note

Hashstack's Open protocol encourages productive lending. Productive lending is when the money is borrowed to boost personal finances. When Hashstack lends, it assumes that the borrowers use the funds productively to earn a profit so that they can pay the lender back while keeping some extra earnings to themselves. When the loan is outstanding it is an asset for the Hashstack and its creditors aka depositors, while a liability (debt) for the borrower. When a loan is repaid, the assets and liabilities disappear, and the exchange is good for both the borrower and creditor.

Hashstack permits a collateral-to-debt ratio[hereafter CDR] of upto 1:3, i.e. a borrower can seek a loan upto \$300 usd against \$100 usd collateral. CDR is a simple formula to calculate.

$$CDR = C_{usd} \div L_{usd}$$

- $CDR$  = *Collateral to debt ratio*
- $C_{usd}$  = *Collateral value in US dollars.*
- $L_{usd}$  = *Loan value in US dollars.*

During its initial operational days, Open protocol will support AVAX, ETH, BNB, USDC as base currencies, This means, a user can deposit tokens or borrow in these denominations only. As the protocol progresses, we plan to expand support for additional tokens to appeal to a wider audience. Hashstack's open protocol plans to support only the assets with adequate liquid and serious development.

## How it works

As with any financial system, a user must establish a relationship with Hashstack inorder to use any of our services. This can be done by connecting a compatible wallet with Hashstack's web application. A compatible wallet can store either ERC20, or BEP20, or tokens of both standards. We recommend Metamask as a wallet as it supports both the token standards. When the wallet is connected with Hashstack's web application, the decentralized application[hereafter dapp] can detect any outstanding deposits or loans against the wallet address, and display it to the user. The web application serves as a home to all the products in the Hashstack ecosystem. In this section, we will limit our discussion to our lending

product, Open protocol. In Open protocol, the user will be able to deposit the supported assets, earn annualized percentage yield in return, or borrow funds.

## Depositor flow

To make a deposit, the user must transfer the base tokens<sup>1</sup> supported by Hashstack to the treasury contract. The treasury contract is the reserve contract storing 60% of the total liquidity at any given time. A deposit can be of two types

1. Fixed deposit.
2. Flexible deposit.

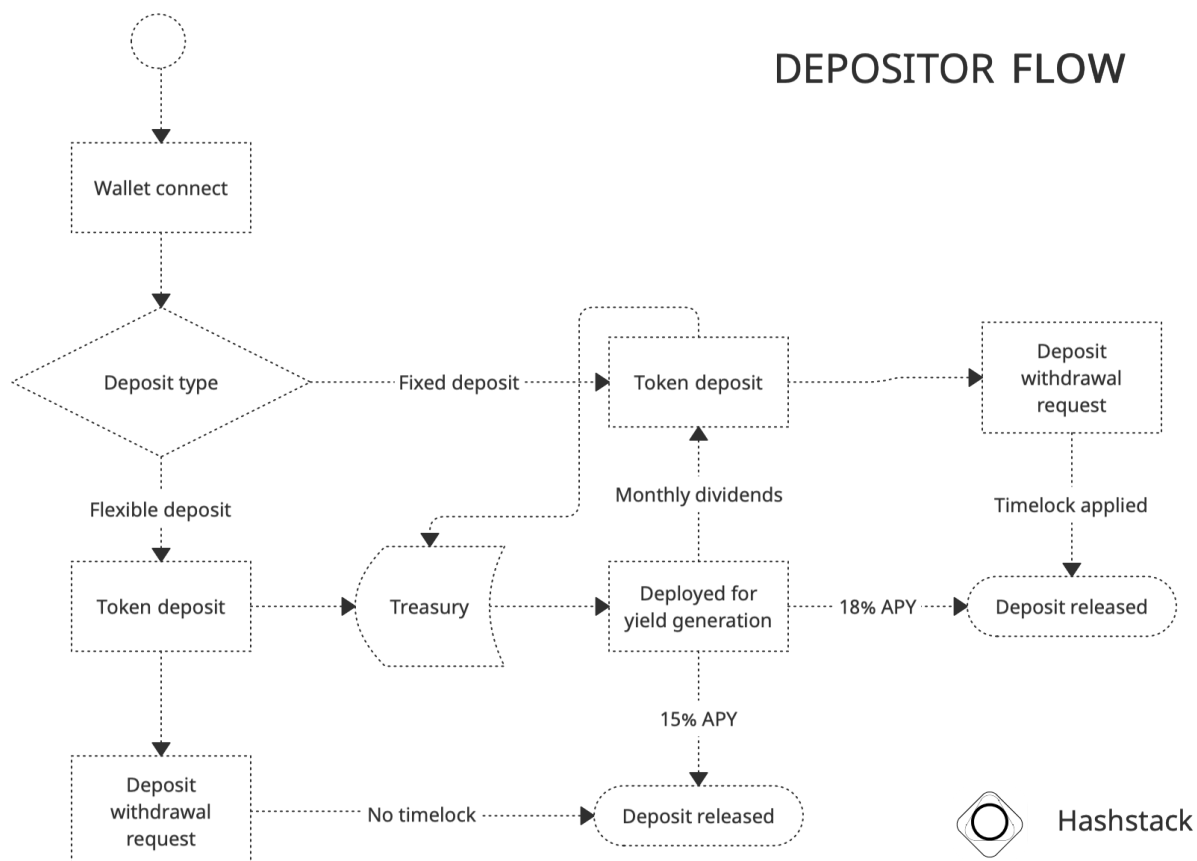
In the fixed type of deposit, a withdrawal time-lock of 172,800 BSC blocks(approximately 6 days) is applied. This means, a depositor can withdraw their deposits 172,800 blocks after a withdrawal request is placed. Fixed deposits help Hashstack maintain a predictive state of liquidity inflow & outflows. As an incentive, the fixed depositors are rewarded with a secondary yield source, in the form of Dividends. A dividend is an excess yield an asset[token] might generate over a period of a month. This is in addition to an annualized percentage yield of 18% on their deposits. A fixed deposit in addition to the 18% APY, earns monthly dividends the asset might generate.

There is no withdrawal time-lock applied for the flexible deposits. A user can withdraw the underlying funds any time. Unlike fixed deposits, a flexible deposit does not earn dividends. A depositor with a flexible deposit earns an annualized percentage yield of 15% on the deposited funds. In effect, the predictive apy for fixed deposits is 18%, while the predictive apy for flexible deposits is 15%. The accrued yield for both the deposit types is in the same denomination as of the underlying(deposited) asset. Eg: A user with 100ETH as a fixed deposit, will earn 18ETH as interest at the end of 12 months. This means, the depositor if kept the funds untouched over a period of 12 months, will see their asset value increase to 118ETH.

To withdraw the deposit, the depositor places a withdrawal request on the web application. Based on the deposit type, a time-lock may be applied. During the withdrawal, the accrued interest is calculated, and notified to the user. A fixed deposit does not accrue any interest between the period of withdrawal request till the withdrawal is processed. This is mainly because, when a withdrawal request is placed, Open recovers the deployed liquidity to make available for withdrawal. Any interest accrued in this timeframe will be utilised to meet the apy commitments. Any excess yield will be distributed to other fixed deposits as dividends.

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<sup>1</sup> AVAX, ETH, BNB, USDC



## Dividends

A second yield layer designed to reward the depositors opting for fixed deposits. Dividends offer a dynamic yield, dependent on how in demand the underlying token is. Hashstack estimates to earn a yield of 1.5% - 2% from the AUM<sup>2</sup> in a given month. Open protocol only needs 1.5% monthly returns on an asset to ensure it fulfills its APY commitment of 15-18%. 15% apy for flexible deposits, 18% apy for fixed deposits. It is impractical to assume Open can deploy 100% of the available assets into loans. To address this, the borrowers are charged a fixed 24% APR against the loan amount. The 6% yield difference between APY & APR provides a relief ceiling to the Hashstack.

## Borrower flow

Similar to a depositor, a borrower must establish a relationship with the Hashstack before a loan is sought. To achieve this, the loan seeker(hereafter borrower) connects a compatible wallet with Hashstack's web application. A borrower can place a loan request, by selecting the intended token(s) to borrow, and the amount. A collateral check<sup>3</sup> is performed off-chain. The borrower is notified of the collateral inadequacy, in

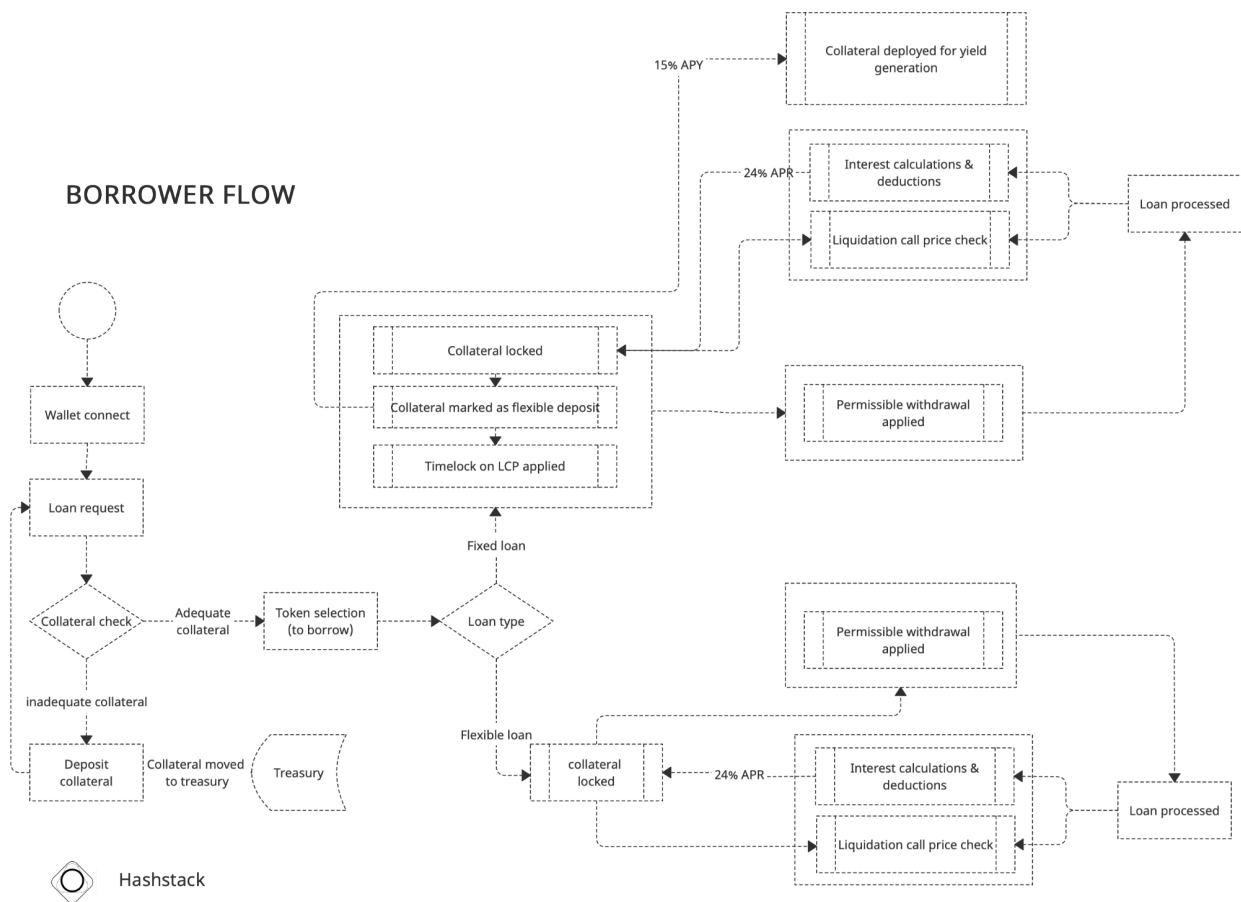
<sup>2</sup> Assets under management

<sup>3</sup>An off-chain check to determine if the loan request is within the bounds of permitted CDR. If exceeded, the borrower is required to provide additional collateral, in order to secure the loan amount.

the event of one. The borrower in order to secure the loan, must ensure there is adequate collateral with respect to the CDR(collateral-to-debt ratio). The collateral similar to that of the depositor flow is stored in the treasury contract. The borrower can choose the desired loan type from the below two options

1. Fixed loans
2. Flexible loans.

In the fixed loan type, a loan closure period[LCP] of 172,800 BSC blocks(approximately 6 days) is applied. The borrower after the loan repayment can withdraw the collateral after 172,800 blocks. As an incentive, the collateral of the borrower with a fixed loan is regarded as a flexible deposit. This collateral enjoys the benefit of 15% annualized yield. Loan closure period is not applicable on flexible loans. A flexible loan can be closed anytime. A flexible loan does not earn any yield as compared to a fixed loan.



Additionally Hashstack's Open protocol enables a borrower to swap the borrowed token(s) into another base token(s), or non-base token(s), or partially withdraw the loan funds through our AMM<sup>4</sup> partners.

The permissible withdrawal amount on a loan, is a determinant of the lesser USD value between that of 70% collateral value, & 100% loan value. For example: A user provided 1,000 BNB(token price, \$100) as collateral, to borrow 10,000 LINK(token price, \$10), and 50 ETH(coin price, \$2,000). CDR in this case is 1:2.

<sup>4</sup> Automated market makers. Eg: Uniswap, Pancakeswap.

$$(1000 \times 100) \div ((10000 \times 10) + (50 \times 2000)) = 100000 \div 200000 = 1/2$$

Here,

USD value of 70% collateral = \$70,000

USD value of 100% loan = \$200,000

In this example, the borrower can withdraw loan funds amounting to \$70,000 in USD value.

To repay a debt, the borrower must have the deposit(s) the asset(s) in the same denomination as that of the borrowed token(s). The borrower can repay the debt partially, or at-once. If the loan is of fixed type, the loan closure period is applied even on the partial repayment.

## Interest calculation

Open protocol maintains a flat & predictive APR & APY. This provides stabler yield & interest expectations for both depositors & borrowers. A predictive apy, apr structure is a deliberate departure from the method of determining interest rates solely based on liquidity deployment as loans. This in its current context has not only created unpredictability, but also restricted the other defi lending products for yield generation, as they rely only on loan distribution. Hashstack aims to effectively utilise the aum<sup>5</sup> available through open protocol for consistent yield generation. On Open, a borrower pays interest at an annualized percentage rate[APR] of 24%, while a depositor earns interest at an annualized percentage yield[APY] of 18% + dividends(for fixed deposits). The interest rates are revisited each quarter by the economist contract.

When a loan is in active state, the interest is deducted from the borrower's collateral every block. So, in essence 1 block time = 1 epoch on Open protocol. Similarly, the yield is credited to the deposits every block. This update however, is recorded off-chain. During the withdrawal, the yield accrued is added to the depositors' funds, before the funds release..

The payable interest is calculated in US dollar denomination against the borrowed assets. The borrowed tokens serve as the anchor for calculating interest rate deductions.

Below example explains the implementation methodology for calculating the Interest.

A borrower provided a collateral of 100ETH(coin price, \$1,000) to borrow 10,000 LINK(token price \$10). The 24% apr when determined to a block, amounts to  $2.28 \times 10^{-6}\%$ . This percentage when applied to the borrowed funds, equate to \$0.002283105 US dollars per bsc block. This is the deductible amount from the collateral provided by the borrower.

Continuing the above example on the apr calculation; we determine the interest rate per block in the event of variability change. i.e. change in the usd price of either or both of the collateral, and the borrowed token(s). Let us say, the price of LINK appreciates by 10% to \$11 US dollars, while the price of ETH remains at \$1,000 US dollars. The deductible interest per block in USD value now amounts to \$0.002511415525114, or  $2.511415525114 \times 10^{-10}\%$  of the deposited ETH collateral, against the

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<sup>5</sup> Assets under management

same  $2.28 \times 10^{-6}\%$  percentage interest per block. The deductible interest(in usd) per block is calculated by the formula -

$$I_b = (2.28 \times 10^{-8}) \times \sum_{i=1}^n (T_{num} \times T_{usd})$$

- $I_b$  = Deductible interest per block.
- $T_{num}$  = Number of T – tokens borrowed
- $T_{usd}$  = USD price per T – token.

## Liquidation

A debt on Open, can be classified into one of the 3 categories

Debt category 1(DC1)	$CDR^6 \geq 1$	Collateral > Debt
Debt category 2(DC2)	$0.5 \leq CDR < 1$	Loan is higher than the collateral, but less than 200% of the collateral value(in usd).
Debt category 3(DC3)	$0.333 \leq CDR < 0.5$	Loan exceeds collateral by 200% in usd value, but is less than 300% of the collateral value(in usd).

## Liquidation call

When a collateral nears its liquidation price, an alert is sent to the borrower through in-app notification. Additionally, the borrower can enable email notifications for better accessibility. A Liquidation call is triggered at a price determined by the method

$$Lc = Lp + 0.03(Cusd)$$

- $Lc$  = Liquidation call price(in usd)
- $Lp$  = Liquidation price(in usd)
- $Cusd$  = Collateral value(in usd)

The 0.03, or 3% multiplier to the  $C_{usd}$  is the slippage offset intended to address any slippages that may arise from the liquidation process. This offset is subject to change based on the market factors. In such instances, the borrower is duly notified through appropriate means.

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<sup>6</sup> Collateral-to-debt ratio



## Liquidation price

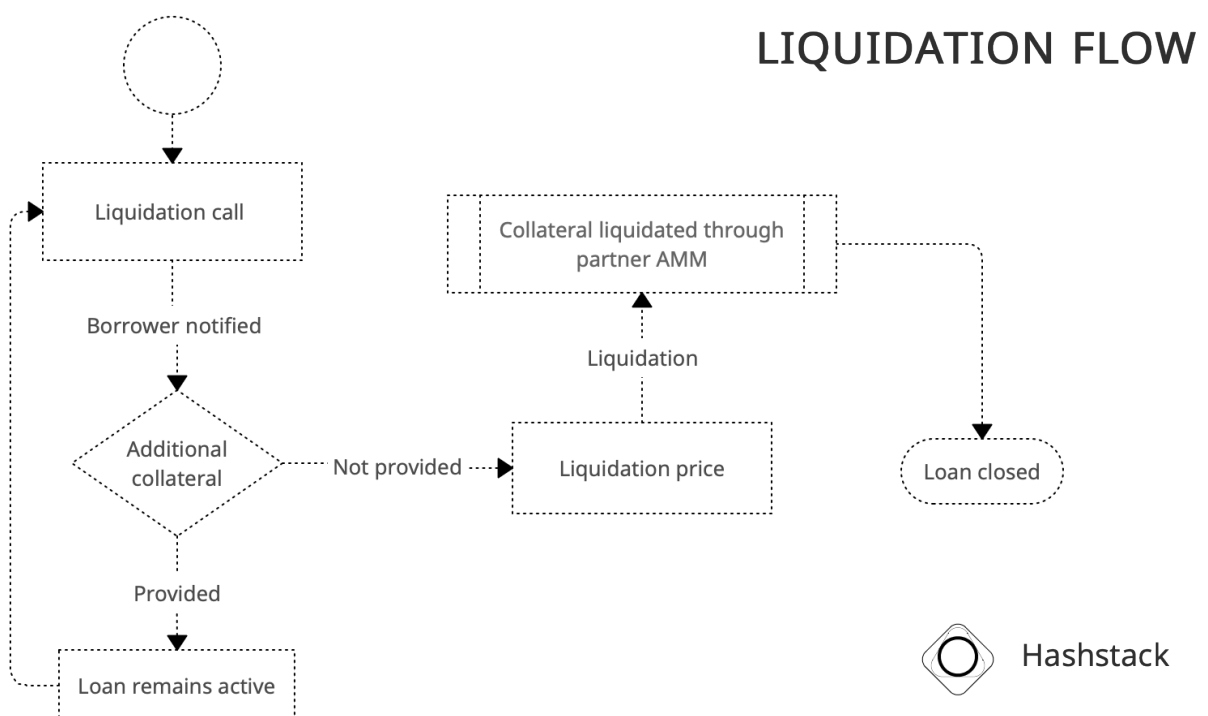
The price at which the collateral is liquidated. The category specific liquidation price is determined by the calculations mentioned in the below table. Any outstanding loan is automatically liquidated by Open protocol, when they reach the liquidation price.

Loan category	CDR Range	Liquidation price formula
DC1	$CDR \geq 1$	$Lp = LUSD + 0.06(CUSD)$
DC2	$0.5 \leq CDR < 1$	$Lp = LUSD + 0.084(CUSD)$
DC3	$0.333 \leq CDR < 0.5$	$Lp = LUSD + 0.108(CUSD)$

$Lp = \text{Liquidation price(in usd)}$ ;  
 $CUSD = \text{Collateral value(in usd)}$ .

$LUSD = \text{Loan value(in usd)}$ ;

The liquidation price appreciates by 2.4% of the collateral value as the debt category moves from DC1 to DC3. This is done to ensure a smoother liquidation process.



## Benefits of Hashstack's Open protocol?

In this section, we try to highlight some of the key benefits a depositor and borrower can enjoy by using Hashstack's lending product - Open.

A fixed loan is best suited for long-term investors & position traders, who prefer to hold an asset that is expected to perform good, over a period of a month to a year. A position trader can avoid sitting on the sidelines, by leveraging Hashstack's fixed loans; to earn yield on otherwise dormant funds. The trader can invest the borrowed funds into another asset most likely to yield better returns in a shorter span. With fixed loans, the borrower enjoys the below benefits.

1. Free-up the liquidity locked in an asset[for example: Bitcoin, Ethereum] to invest in other assets.
2. Earn an annualized yield of 15% on the dormant assets[deposited as collateral].
3. Secure any profits earned through the investment of the borrowed funds, to themselves.

Here is an example: David owns 100 BNB[market price: \$500]. David plans to invest in Bitcoin, but not at the expense of BNB. As a solution to this problem, David deposits 100 BNB on Hashstack's Open protocol as collateral, and borrows \$100,000 USDC<sup>7</sup> as fixed loan at a 1:2 cdr. David withdraws the permissible \$35,000 USDC<sup>8</sup>. He swaps the remaining loan value of \$65,000 USDC to Bitcoin. A month later, Bitcoin appreciates 30% in value, effectively converting David's \$65,000 into \$84,500; while his alt coin positions return a 20% return. David swaps bitcoin into USDC to repay 84.5% of his loan. His \$35,000 turned into \$42,000. Of which he repays \$15,500 back effectively closing the loan. All the while, his BNB collateral earned him 15% APY. So, in effect, David ended up earning \$26,500 in addition to 1.5% interest on his BNB coins. This is a possibility not seen in any of the existing decentralised financial solutions.

A flexible loan is tailored for the day traders, swing traders & smaller investors. A flexible loan can be deemed as a source of the trading capital. This loan provides an opportunity to the borrower to continue holding a token, while freeing up trading capital to invest in other tokens, yield compound returns.

Deposits are designed to help a user convert the long-term investment hodl tokens into actively yield compounding secondary income streams, as compared to an alternative of storing on the centralised exchanges, or a wallet. A key caveat to note that, the interest accrued on a deposit is reinvested to compound returns for the depositor. This is enabled for only the fixed deposits.

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<sup>7</sup> Coinbase's USD stable coin

<sup>8</sup> \$35,000 USDC is the lesser USD value of 70% collateral value, and 100% loan value.

## Summary

1. Open protocol is the lending framework developed by Hashstack.
2. Open protocol facilitates loans upto 300% against the collateral.
3. Similar to traditional financial institutions, Open maintains a predictive interest rate. On Hashstack, a depositor earns 15-18% APY. The interest rates are revised each quarter. Any basis point adjustments are propagated to the apy & apr accrued in the succeeding quarter.

## Glossary

1. Collateral: A token(s) deposited by a borrower as a security deposit in-order to secure a loan.
2. Base token: Primary tokens supported by Hashstack's lending protocol, Open. These are AVAX, ETH, BNB, USDC.
3. CDR: Collateral to debt ratio, is the proportion of collateral provided by a borrower against the loan amount. CDR relies on US dollars as a base currency to determine the ratio. For example: A user with the collateral of 100ETH, at a current ETH price of \$1,000 can borrow funds of utmost \$300,000 in USD value.
4. Depositor aka maker aka creditor: A user who provides liquidity to the Hashstack's lending ecosystem through deposits.
5. Borrower aka taker: A user who borrows assets from the Hashstack lending product by providing a collateral in the range of 1:1 to 1:3 collateral to debt proportion.
6. APR: An annual percentage rate (APR) is the annual rate charged on the collateral against the borrowed amount.
7. APY: An annual percentage yield (APY) is the annualized rate of interest earned against the deposits. APY compounds gains on the interests earned by automatically considering the interests as additional deposits.
8. Collateral-check: An off-chain verification performed to determine if the borrower has adequate collateral to maintain loan security.
9. LCP: Loan closure period. The time period measured in block time, between the loan repayment and the collateral release.

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