Lending Protocols

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Why?

* has ETH, but not USDC
* wants USDC to pay the rent
* doesn't want to sell ETH because she believe it will grow

Alice

* has USDC
* wants to earn interest

Bob

Long position

You believe ETH will rise:

- Hold ETH.
- Or put your ETH to the lending protocol and earn interest.

Short position

You believe ETH will drop:

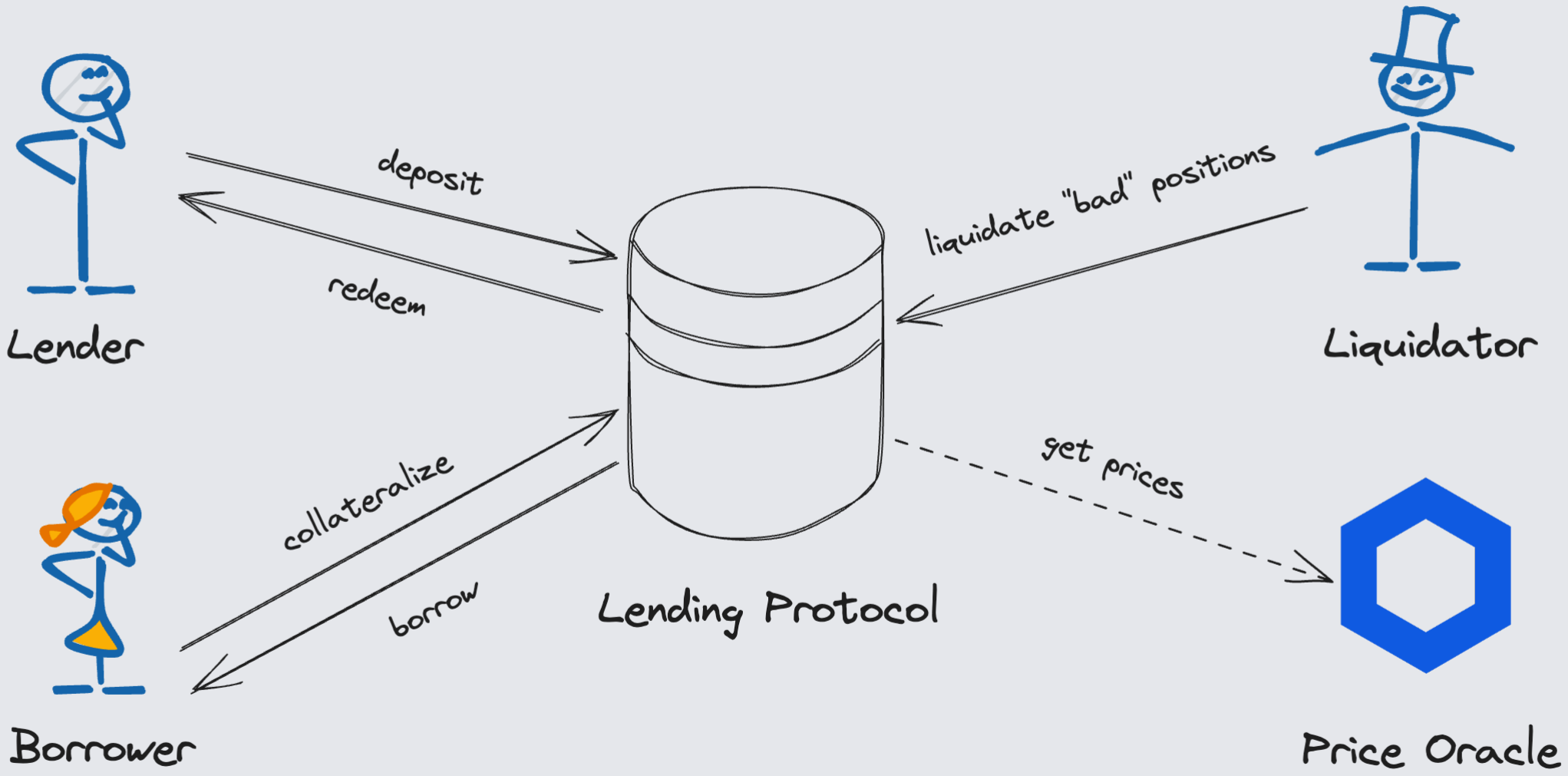
- Borrow ETH.
- Immediately sell it.
- Repay it after with a lower price.

Leveraged short position

You believe ETH will drop:

- Borrow ETH.
- Immediately sell it.
- Provide more collateral with sold ETH.
- Borrow more ETH.
- ...
- Repay it after with a lower price.

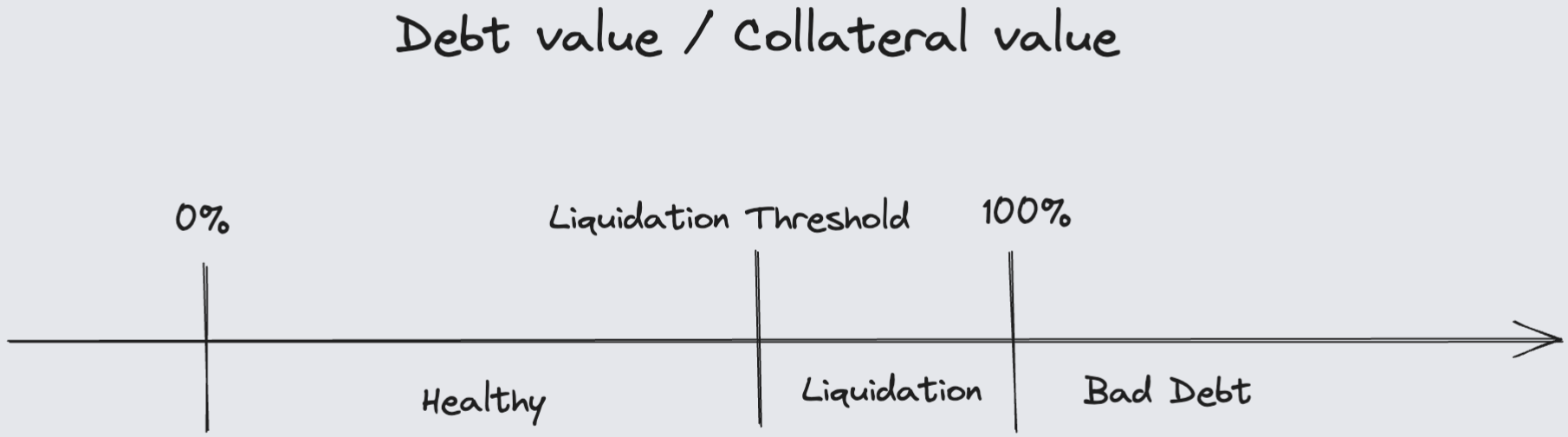
Lending actors



Main terms

- **Collateral**: Assets deposited by a borrower to secure a loan.
- **Liquidity Pools**: Collections of funds locked in a smart contract used for lending and borrowing.
- **Interest Rate**: The cost of borrowing or the return on lending, usually expressed as a percentage.
- **LTV (Loan-to-Value) Ratio**: The ratio of the loan amount to the value of the collateral.
- **Liquidation**: The process of selling collateral to cover a loan if its value falls below a certain threshold.

Bad debt

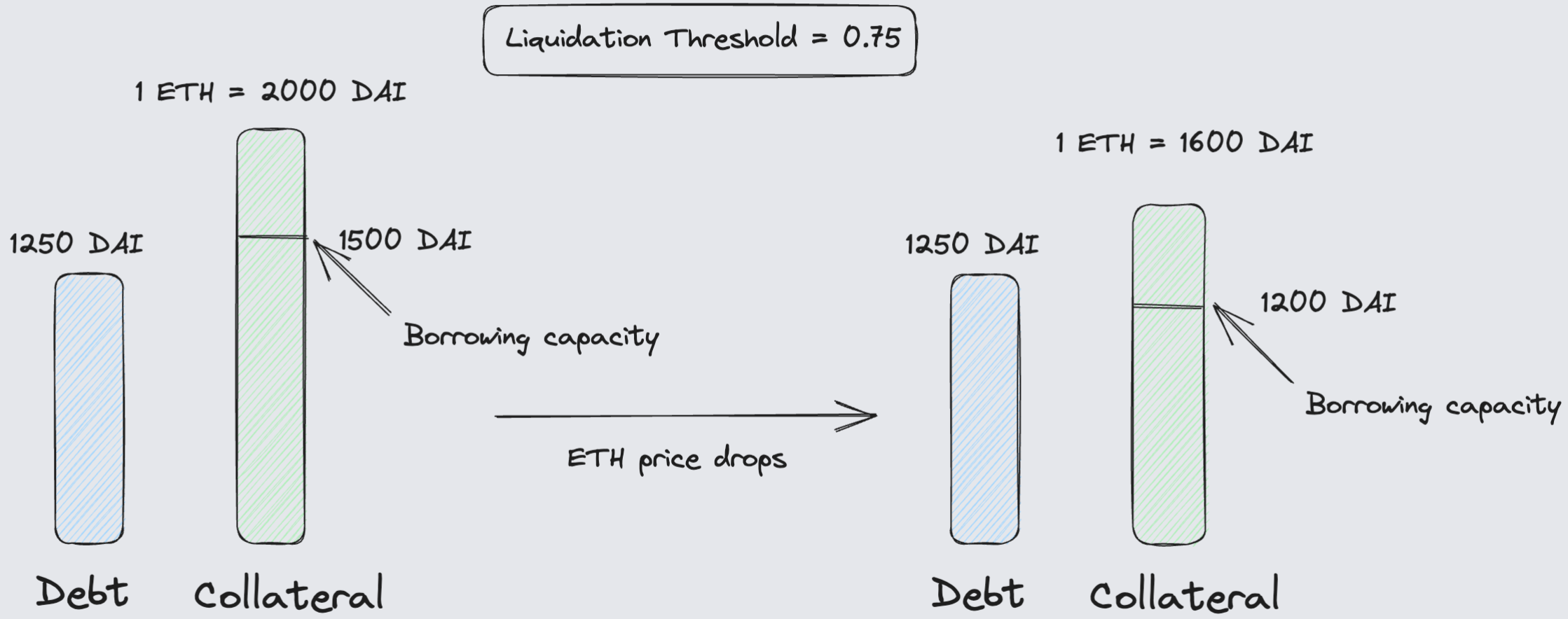

Debt value / Collateral value
0%
Liquidation Threshold
100%
Healthy
Liquidation
Bad Debt

Health factor

$$Health\ factor = \frac{\sum Value\ of\ collateral_i \cdot Liquidation\ threshold_i}{Total\ value\ of\ debts}$$

- $0 < Liquidation\ threshold < 1$
- When the health factor declines below 1, a borrowing position becomes liquidatable.

Health factor



Liquidation

- Happens when health factor < 1.
- Liquidator is repaying the user's debt and getting user's collateral.
- Liquidator needs some incentive to make it.

Liquidation terms

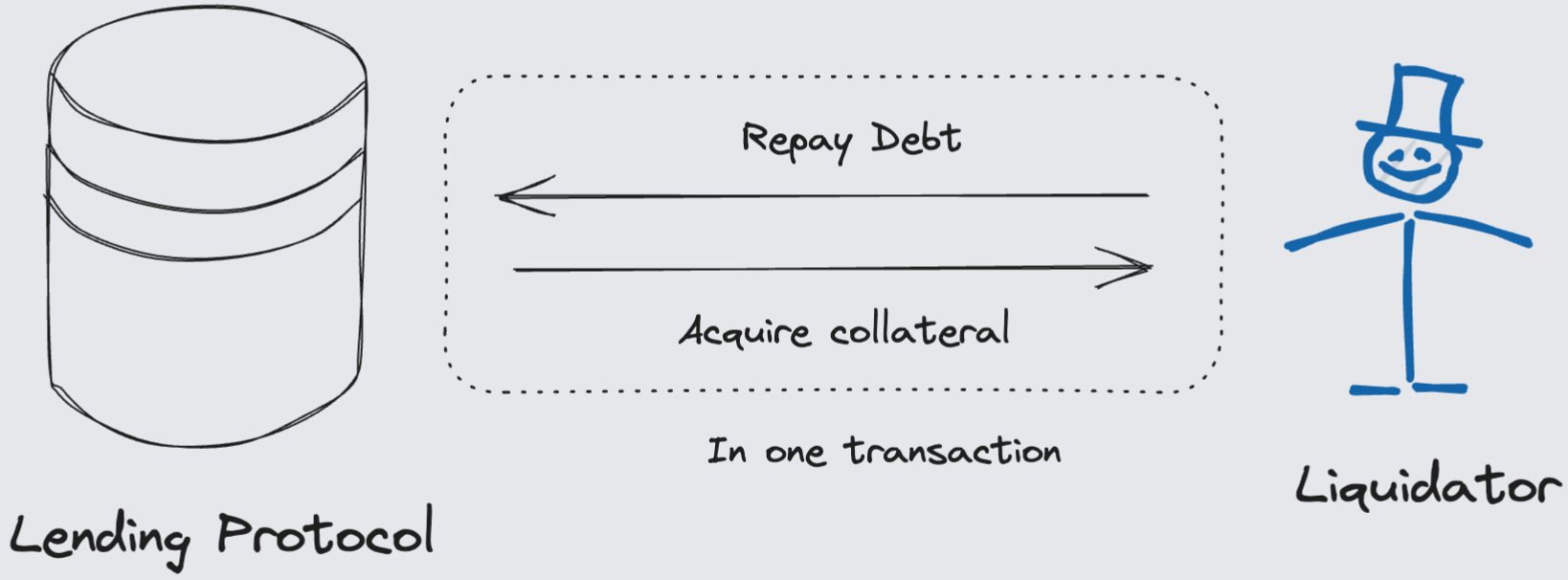
- **Liquidation Spread (LS)**: Discount that liquidator gets when liquidating.

$$Value\ of\ Collateral\ to\ Claim = Value\ of\ Debt\ to\ Repay \cdot (1 + LS)$$

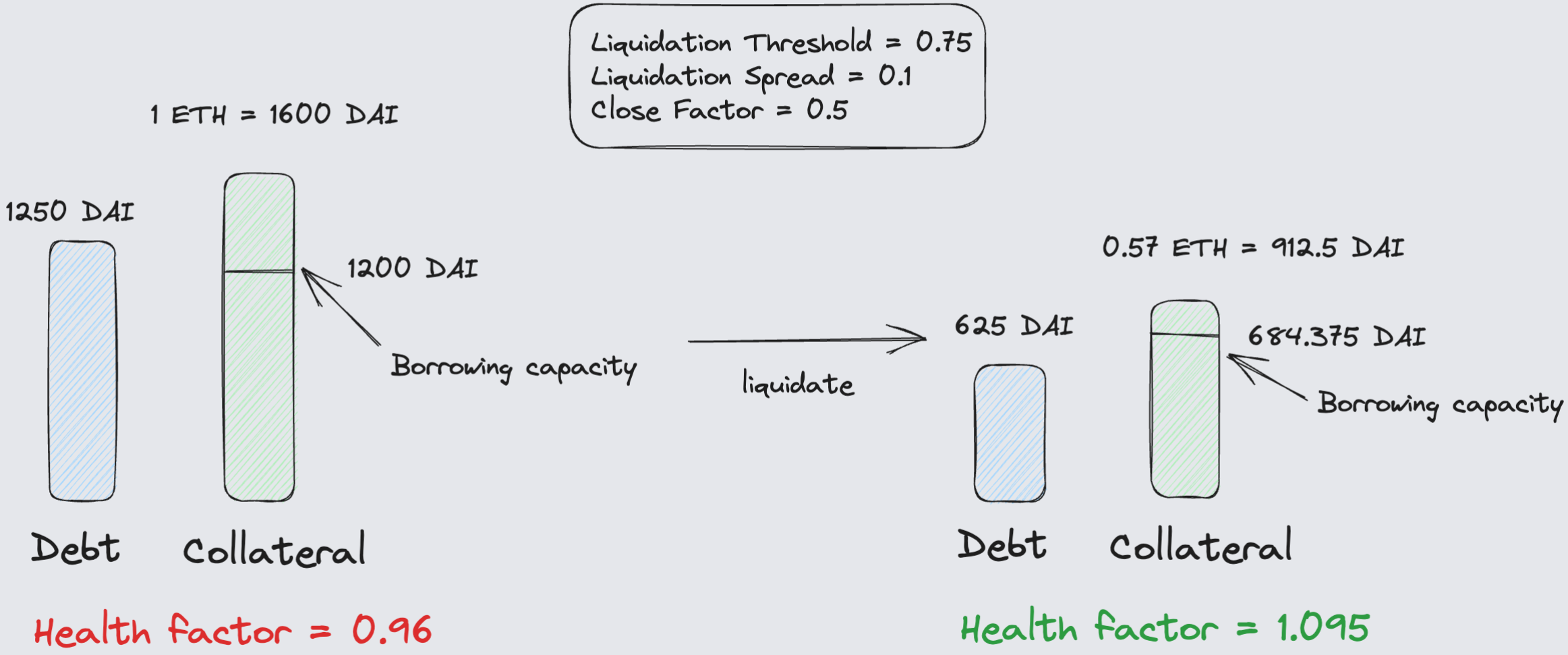
- **Close Factor (CF)**: Maximum proportion of the debt that is allowed to be repaid.

$$Value\ of\ Debt\ to\ Repay < Total\ Value\ of\ Debt \cdot CF$$

Fixed spread liquidation



Fixed spread liquidation

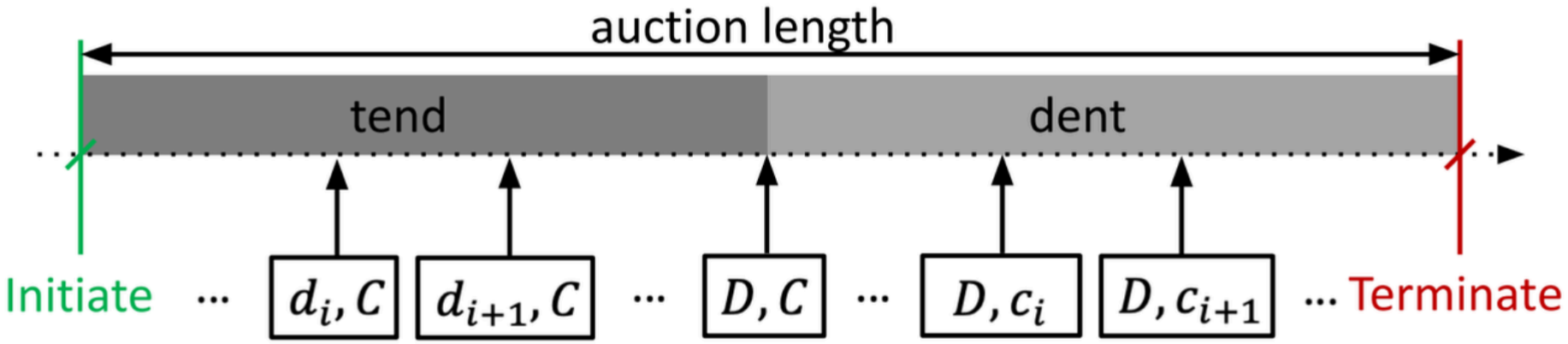


Auction liquidation

- English Auction.
  - Bidders outbid each other increasingly.
- Dutch Auction.
  - Auction begins with a high asking price and the price lowers until the auction terminates.

MakerDAO example (til April 2021)

- A position with D debt and C collateral



$d_{i+1} > d_i$

$c_{i+1} < c_i$

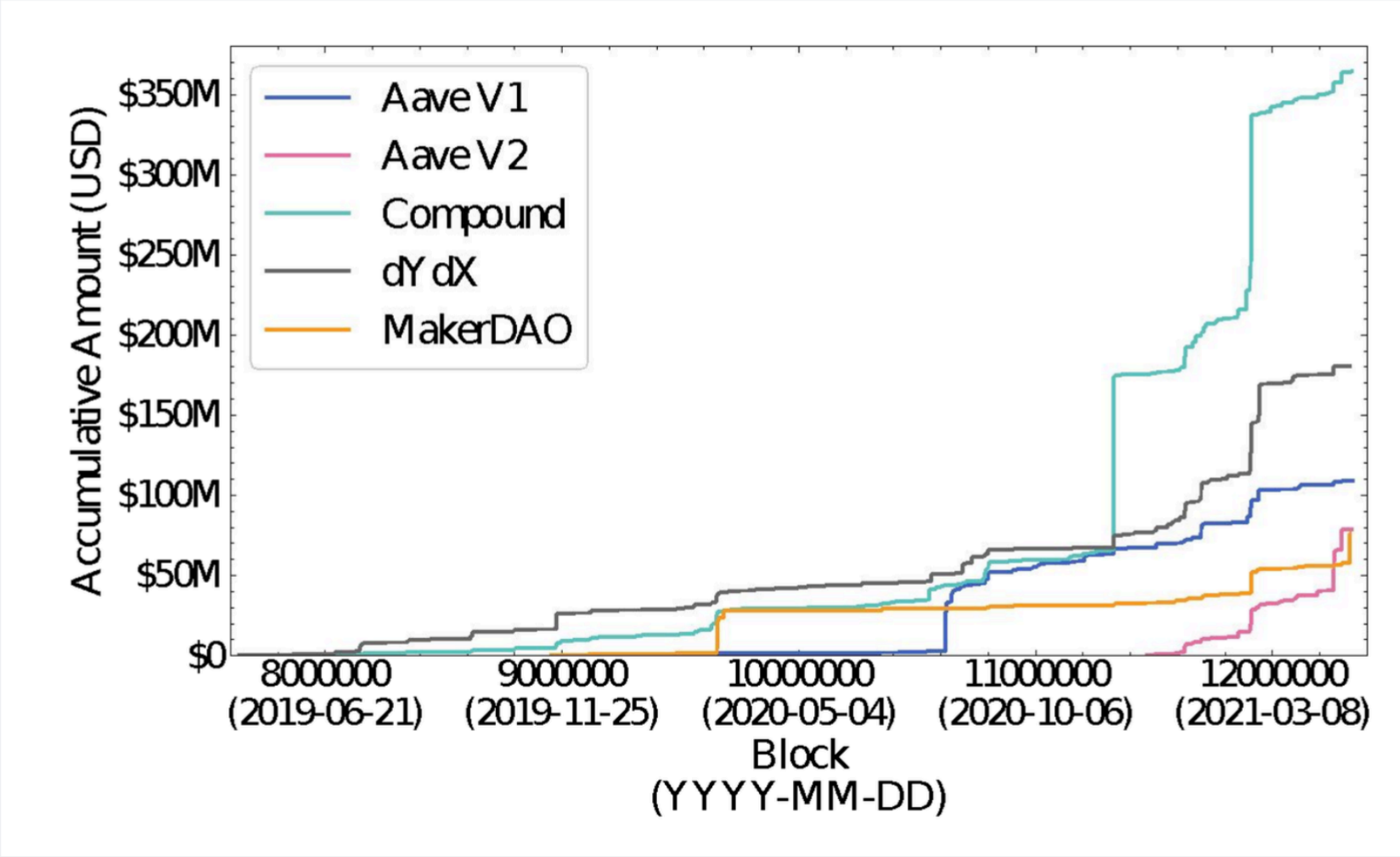
Bid — debt to repay, collateral to claim

MakerDAO example (from April 2021)

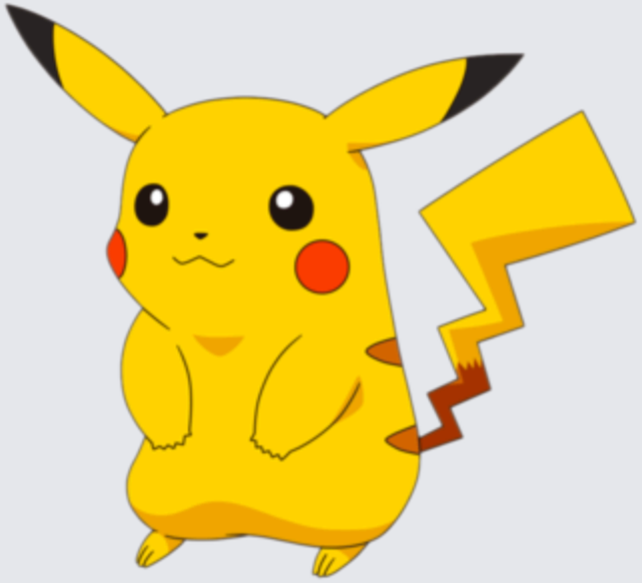
MakerDAO Dutch auction (April 2021 — Present)

- Unlike English auction which are operated in multiple transactions, the Dutch auction is settled instantly in one atomic transaction.
- No upfront debt is required => flashloan can be used.
- Collateral price decreases over time => nobody can get the collateral for free by accident.

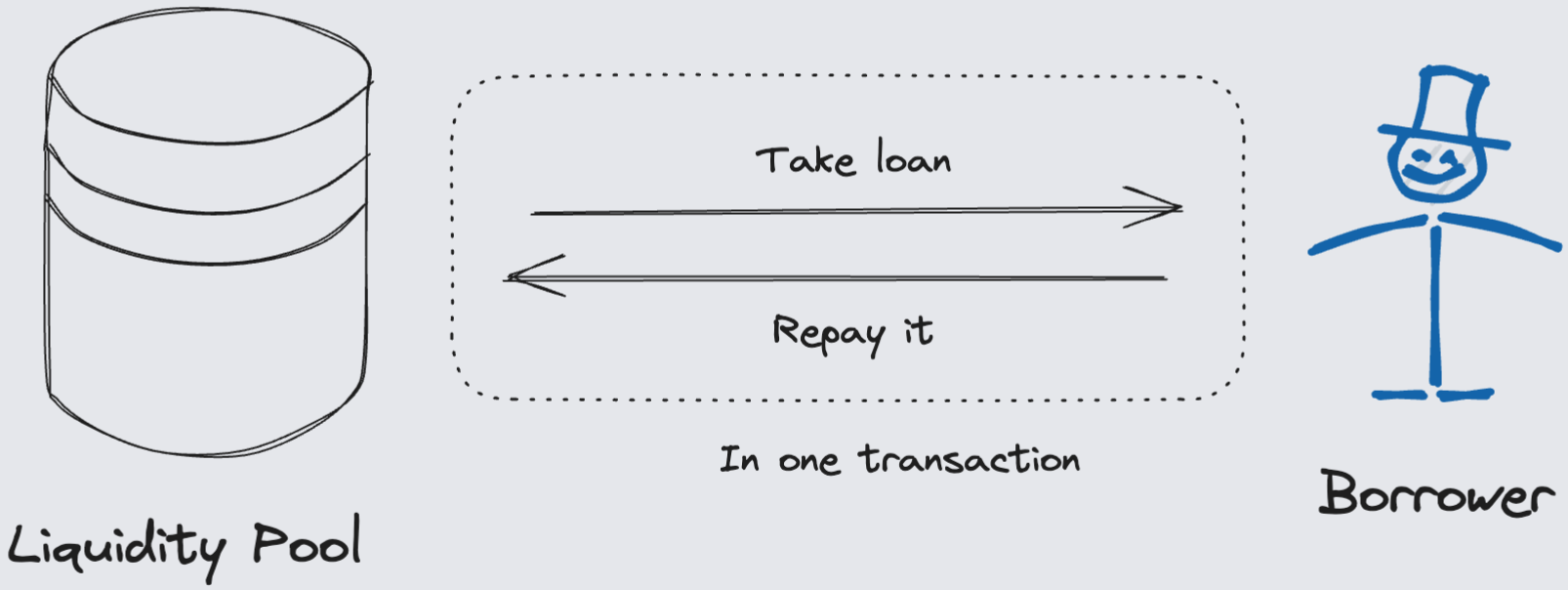
Liquidation statistics



Flashloan



Flashloan


Take loan
Repay it
In one transaction
Liquidity Pool
Borrower

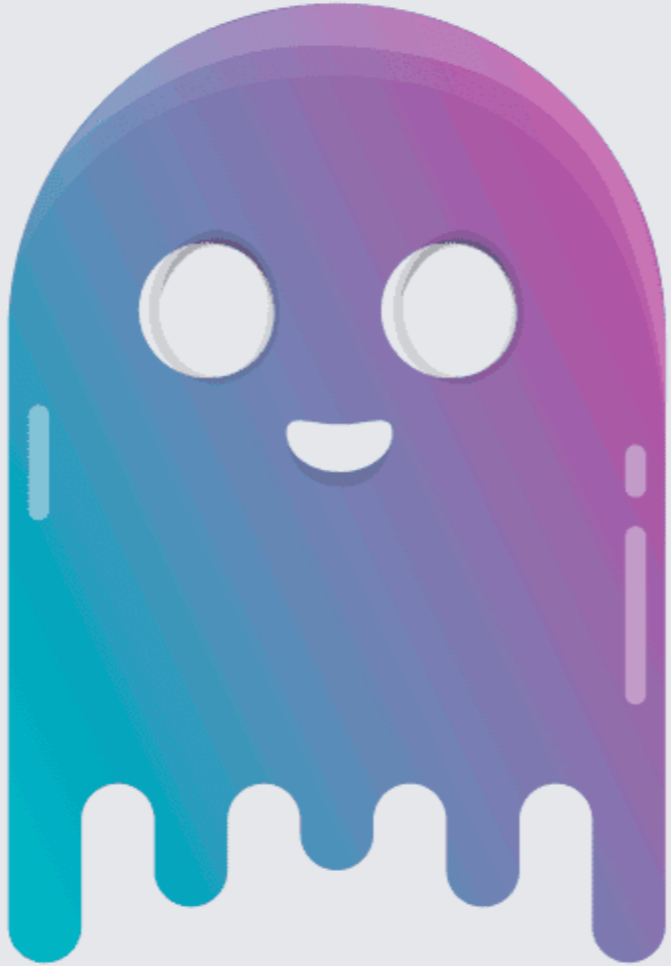
Flashloan use cases

- DeFi attacks (e.g. Price Oracle manipulation).
- Arbitrage.
- Liquidations.
- etc.

Projects

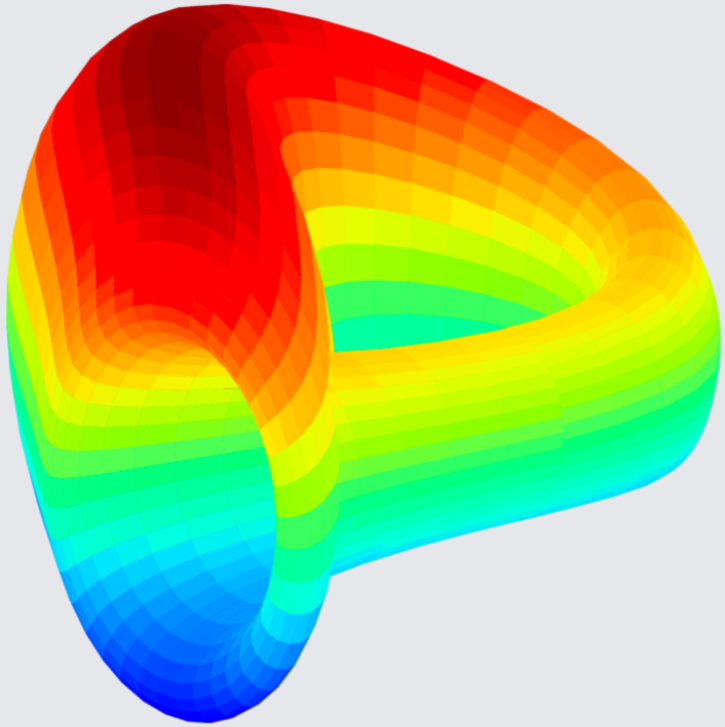
Compound

Aave



MakerDAO

Curve Stablecoin



Task

Assume you are a user interested in investing in the DeFi lending protocol, Compound V3. Your task is to calculate the potential profit you could earn over a period of 3 months (92 days).
You have decided to invest 5 ETH. The current base interest rate per Ethereum block is 0.00003% (consider a block every 12 seconds), the slope low multiplier applied by Compound is 0.001%, total borrows in the protocol are 100,000 ETH and total supply is 200,000 ETH. Consider all parameters remain constant throughout the period.