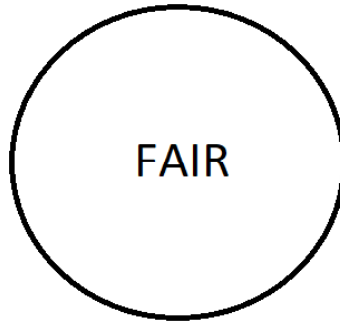


Mktplace: A CD - CDP Protocol

Turn any vault of assets into a collateralized debt position using an auction of certificate of deposits.



by FAIR Labs – fairlabs.eth

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Blockchain History & Context

When the internet was first being formed, there was no native money. This was because it was considered impossible at the time to create a digital object that was truly scarce. Any packet of information could simply be copy/pasted ad infimum by any computer. Connecting computers via protocols like HTTP, while brilliant and creating the dot-com revolution, did not solve the scarcity problem. This resulted in the ad-based internet (and attention economy) we live in today.

But computer scientists in the early days of the modern internet *did* theorize about mechanisms for ensuring a specific packet of information could be considered unique. Decades later, Bitcoin, the first production peer to peer digital currency, was born. It leveraged cryptography to ensure that any N number of computers running the Bitcoin software (“nodes”) could programmatically agree on how to track packets of information (Bitcoins) perfectly and immutably through a distributed ledger (a blockchain). While any computer could copy/paste the software and print an infinite number of bitcoins, the *consensus* of most (nearly all) the nodes running the software will be to ignore those bitcoins because they do not have the chain of transactions going all the way back to the genesis of bitcoin itself.

Social consensus + software for perfect record-keeping of packet transfers led to a programmable money supply and peer to peer digital currency without any centralized issuer / manager.

The most significant advancement in blockchain since Bitcoin is Ethereum. Ethereum, is an actively community managed blockchain with, unlike Bitcoin, a flexible money supply policy and introduces a key innovation from the theorists of the 1990s: smart contracts. Code that lives on the blockchain and serves as “algorithmic law” – when its conditions are met, it **always** performs its pre-specified routine either in totality or not at all (i.e., it can revert to its initial state if any actions fail). The combination of a Turing-complete programming language to write smart contracts (Solidity) on top of a perfect record-keeping ledger is revolutionizing finance, digital media, entertainment, supply chains, and much more.

The most relevant items for this paper are ERC-20 Tokens and ERC-721 Non-Fungible Tokens. Technically, there is also ERC-1155 Semi-Fungible tokens that bridge the best of both worlds. You don’t need to fully understand these to understand the goal of Mktplace, but here are some examples.

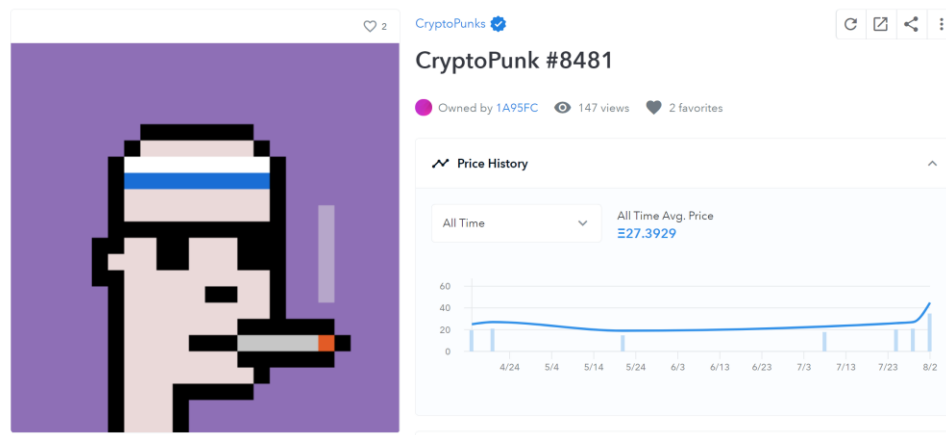
Asset Type	Example
ERC-20	MATIC, the token used to pay for transactions on the MATIC/Polygon network. Total supply: 10,000,000,000.
ERC-721	CryptoPunk #8481, a historically significant piece of digital art, part of the CryptoPunk collection of NFTs on Ethereum. Recently sold for 44 ETH (> \$100,000 at time of writing).

Problem

The value of an asset is generally considered to be the price it can be sold for. This is trivial for ERC-20 assets as they are fungible. There is no serial number for Ether – the token used to pay for transactions on the Ethereum network. They are all the same, so its value can be readily determined through checking its price across a variety of exchanges both centralized and decentralized. At time of writing, Ether is priced around \$2,500 each. Note: transactions are typically priced in “gwei”, where 1 gwei is equal to 0.000000001 Ether.

But what about that art I mentioned?

For a fungible token the value is easy to identify because there are large liquid markets with ready buyers and sellers doing thousands of transactions a day. But for non-fungible assets, like CryptoPunk #8481, sales are significantly rarer. This punk has only been sold (i.e., priced) 7 times since April 2021.



The value at any point in time is estimated based on past sales of the asset (e.g., the recent 44 ETH sale) and recent sales of related assets (i.e., other sales of the CryptoPunk collection).

There are 2 main problems with this:

1. Markets thrive on information, and ad-hoc pricing of illiquid assets is a messy heuristic and subject to large swings.
2. It makes it difficult for the asset holders to access critical financial services such as *collateralized debt positions (CDP)*.

Now, you may think CDPs are some esoteric fancy thing, but I'm confident you've heard of these common examples: A home equity line of credit uses your home as collateral to borrow money (without committing to sell your home unless you don't pay your loan). Similarly, people take loans against their cars (a title loan). For people without those high value assets, pawn shops allow people to take loans against assets like watches or jewelry.

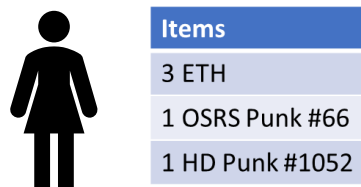
This paper proposes Mktplace as a **decentralized pawn shop** to solve these 2 problems and unlock significant value for illiquid asset holders who want cash but don't want to commit to selling.

Solution

Example: Amy's Vault

Consider Amy, holder of both fungible and non-fungible assets. She wants USD dollars to make a large personal purchase but does **not** want to commit to selling any of her assets. There are both tax advantages and strategic investing benefits to doing this:

1. Selling property (which is what the US IRS considers crypto assets to be) is a “taxable event” where she’d pay tax on the appreciation of her assets.
2. If she sells one of her assets and it rises in price, she will have to pay more in the future to be at the same position she is in now.



Mktplace would allow her to deposit her assets into a smart contract- a vault that stores and releases assets automatically with no human intervention given pre-defined conditions, i.e., a **trustless** pawn shop safe. For simplicity let’s assume she has a desired rate (3.5%) for any loan she takes and that she specifies she wants the loans in Coinbase/Circle dollars: USDC, which is exchangeable 1:1 for dollars.



Note: Including ETH is not required but it fluffs up the bids, which will make more sense soon.

Bidders

Individuals will use Mktplace to find these vaults of assets and submit structured bids for the vault:

Bidder	Rate	Time	Bid
Oxfd4f3	3.5%	15 weeks	10,000 USDC
Ox49d3	3.5%	10 weeks	8,000 USDC
Oxgg34	3.5%	13 weeks	12,000 USDC
Oxpq9k	3.5%	25 weeks	1,000 USDC

This is the key innovation of Mktplace. A **bidder** locks their **bid** for a specified period of **time**. This creates a certificate of deposit (CD). This CD is stored in a lending protocol to generate yield which will be given to bidders at the end of their term or the end of Amy’s loan (via close out or liquidation).

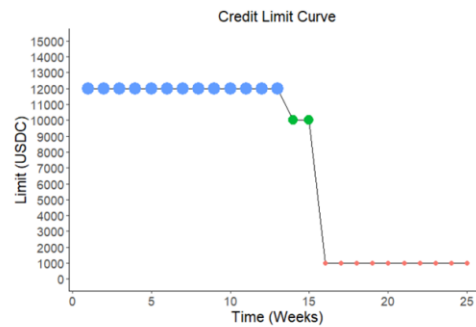
Credit Limit Curve

Sorting the bids from largest to smallest (and ignoring bids that expire prior to a higher bid) creates a **credit limit curve**.

	Bidder	Rate	Time	Bid
	0xgg34	3.5%	13 weeks	12,000 USDC
	0xfd4f3	3.5%	15 weeks	10,000 USDC
	0x49d3	3.5%	10 weeks	8,000 USDC
	0xpq9k	3.5%	25 weeks	1,000 USDC

0x49d3 is both a smaller bid AND shorter time than 0xfd4f3's bid. So it is ignored when sorted.

0xgg34 is the Highest Live Bid.

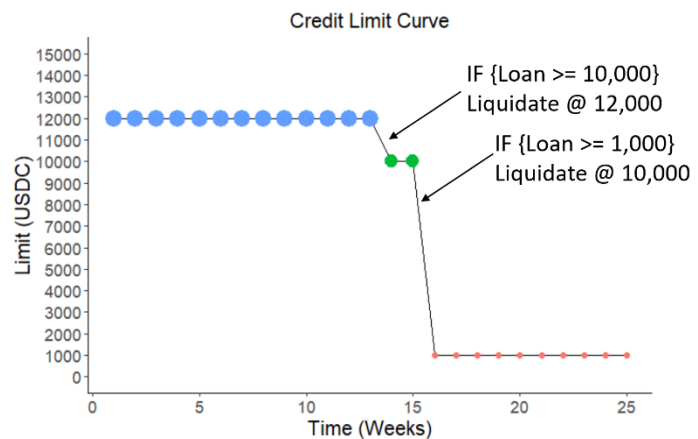


Amy can use the **highest live bid** (HLB) as collateral for a loan. Where the loan must either be **closed** at the end of its term OR continued at the next highest bid (which then becomes the highest live bid).

If at any point, Amy has borrowed more than her credit limit her assets are liquidated- her debt disappears but the highest live bid is given her assets.

Rate	Week	Credit Limit
3.5%	1 – 13	12,000 USDC
3.5%	14 – 15	10,000 USDC
3.5%	16 – 25	1,000 USDC

- Liquidations automatically triggered at end of highest live bid IF outstanding debt > next available bid.
- Yield from protocol goes to bidder(s) upon liquidation of a vault.



Formal Definition

1. Given a Holder {H} and a Vault of assets {V}
2. Bidders {B} can submit certificates of deposit bid {C} for time {T}.
3. The Holder can use highest live bid { HLB = MAX(C) } as collateral for a loan {L}.

Consider:

Holder {H} has Vault {V} and takes a Loan {L}

Where { $L < C_1$ } AND { $C_1 > C_2 > C_3$ } AND { $T_1 < T_2 < T_3$ }

Bidder {B}	CD / Bid {C}	Time {T}	Status
B ₁	C ₁	T ₁	Open HLB
B ₂	C ₂	T ₂	Open Pending HLB
B ₃	C ₃	T ₃	Open

One of 3 events can occur:

1. If the loan ever exceeds the highest live bid, the vault is liquidated and given to the current HLB Bidder. All bids are then closed early with no penalty.
 - a. IF ($L > C_1$) THEN { $V \rightarrow B_1, L \rightarrow 0, B_2$ CLOSED, B_3 CLOSED }
2. If the highest live bid expires AND the loan is above the **next** highest live bid, the vault is liquidated and given to the bidder with the **current** highest live bid.
 - a. IF (Current Time $\geq T_1$ AND $L > C_2$) THEN { $V \rightarrow B_1, L \rightarrow 0, B_2$ CLOSED, B_3 CLOSED }
3. If the highest live bid expires AND the loan is NOT above the **next** highest live bid, the loan continues with a new highest live bid resulting in a shift of the credit limit curve.
 - a. IF (Current Time $\geq T_1$ AND $L < C_2$) THEN { B_1 CLOSED, $B_2 \rightarrow$ HLB }

Result

Mktplace revolutionizes price discovery

Want to know the value of CryptoPunk #8481?

Currently, to estimate the value of illiquid assets involves heuristics based on recent sales of similar assets. Even protocols that attempt to allow collateralization (or fractionalization) of NFTs typically use a heuristic like floor price (lowest Buy Now price of a different asset within the collection) or a simple multiplier of the most recent sale.

There is **no** existing protocol that allows for passive pricing of arbitrarily complex collections of liquid or illiquid assets. Regression methods may tell us the direction of price movement (“CryptoPunks are going up” is only partially useful) but they can’t tell us what people *would* pay for an asset.

For liquid assets, we have plentiful information of what people *would* pay for an asset, they’re called order books. This information is critical for both traders and the overall market to engage in price discovery.



Figure 1 Screenshot of Ether order book on Coinbase Pro. There are over 3,000 ETH worth of buy orders ready for if the price falls to \$2430. While there is a little under 2,000 ETH sell orders ready to sell if the price rises to \$2,510.

Mktplace brings network effects to illiquid assets & Certificate of Deposits

Mktplace’s certificate of deposit system creates an on-chain record of what prices people *would* pay for an illiquid asset- this information critical for price discovery. This will enable more NFTs to be listed by holders (even if the holders don’t intend to take out loans, they could still list their assets to gain information on potential buyers) AND enable the large market of asset depositors to remain in a yield bearing position (i.e., their money was already in a lending protocol earning yield) to automatically buy assets they’re interested in when the price is favorable.

Clarifying example: I already put some of my ETH in AAVE to generate returns from lending. Mktplace would do the *exact same thing* – put my ETH in a lending protocol to generate yield – but in exchange for locking it in for a set period of time, I get the benefit of having those assets *possibly* buy me a vault of interesting assets (not necessarily only NFTs) that I would not be able to buy directly- either because those assets were not listed for sale OR because their price was inappropriately high (and there was no price discovery available prior to Mktplace).

I wouldn’t pay 44 ETH for CryptoPunk #8481. But if I already have 10 ETH deposited for yield anyway, I wouldn’t mind having a smart contract automatically buy it for me for 10 ETH (77% discount) if the current holder needed a loan and didn’t pay. Whoever has CryptoPunk #8481 may not want to sell, but they can list it on Mktplace and get the benefits of price discovery with no risk until they take a loan!

Mktplace allows for arbitrarily complex options

Earlier I mentioned Amy could fluff up bids by adding 3 ETH to the vault. Imagine for one second if she *only* put 3 ETH in the vault. There are 2 interesting interactions here:

1. Game theory implies bidders will bid (3 ETH – transaction costs – lock up time cost) for this vault.

Some interesting things happen if she requests the funds be in USDC. It creates an ETH-USDC option as a yield bearing collateralized debt position. If Carlos puts a \$6000 USDC bid for her 3 ETH and he locks it in for 10 weeks, then Amy would be smart to purposefully liquidate herself whenever ETH falls below \$2000 each and then take the money and buy more ETH from another market. Carlos would technically be a small loser on this bid, but he'll have generated yield during the time that offsets the loss while having effectively done a limit-buy of ETH at \$2000. If Amy ends up needing more money than expected, she can self-liquidate to Carlos's profit at a fixed price anytime up to 10 weeks, reducing her short term price exposure to ETH.

2. Anytime there are >1 bidder, a market determined collateral ratio is created

If AMY has 3 ETH and wants to borrow USDC. She doesn't need Mktplace. She can go to AAVE (or another lending protocol), deposit her ETH, and take out a USDC loan directly. But she does so at (1) the market interest rate and (2) at AAVE's collateral ratio (i.e., she can't borrow \$6000 with only \$6000 worth of ETH, that doesn't leave enough wiggle room for interest to grow and ETH's value to fluctuate prior to her AAVE liquidation).

With Mktplace when she has 2+ bids her vault is supported by an **excess of collateral**.

If Carlos does a \$6000 USDC bid for 10 weeks and Andrew does a \$5500 USDC bid for 20 weeks; then for 10 weeks there is \$11,500 in collateral behind her 3 ETH vault. With AAVE directly, she'd be capped at 80% of her ETH's dollar value (**\$4,800**) – the limit of AAVE's collateral ratio. But with Mktplace, she'd be able to borrow up to 80% of the total collateral backing her vault (capped at the highest live bid):

Week	Total Collateral	Max Loan	Description
1 – 10	\$11,500	\$6000	capped at highest live bid; dangerously close to liquidation.
11 – 20	\$5,500	\$4,400	With only 1 bidder, she is now technically worse off than simply doing the loan by herself.
21+	0	0	Liquidation OR close out.

This effect is most powerful with more bids and with complex vaults that are fluffed with a fungible token because it both improves price discovery (implied value of NFT is bid minus the market value of fungible fluff) and enables market determined collateral ratios that are capped only by the highest live bid!

Some other interesting options include bidding on your own vault to serve as a price floor or making an extremely long bid and then making a vault of *that bid*!

Important Caveats

1. In practice, Mktplace will rely heavily on the interest rates available on the lending protocol used to pool together bids. While a desired interest rate is possible, it is bounded by a complex interaction of number of bids, total collateral backing a single vault, the collateral ratio of the chosen lending protocol, and the loan amount.
2. To prevent attack vectors such as coordinated bidding & withdrawal of bids it's important to lock the certificates of deposit entirely. A few options to handle bid withdrawal include:
 - a. The safest way: placing the bid in a vault and having people bid to win that bid (creating a derivative market for bids that the bidder regrets placing for so long).
 - b. The withdrawal could be penalized heavily and the protocol float the leftover time of the bid in exchange for the penalty.
 - c. A complex calculation of outstanding debt versus marginal impact of removing a bid (does removing the bid affect the credit limit curve? How much is tolerable?).
 - d. Allowing any Nth bids to be withdrawn as long as $N < \text{some constant}$ (e.g., Highest live bid and next highest live bid cannot be withdrawn but 3rd+ can).

The minimum viable product is planned to not allow early withdrawals, but to include it on the roadmap.

3. Anytime the bid & the denomination of debt differ (e.g., If Amy accepts ETH bids but wants her debt in USDC) it is possible for an external liquidation to occur (where the total collateral backing the bid falls below Amy's debt resulting in the lending protocol behind Mktplace liquidating the vault's backing- which would drain multiple bids and possibly lock Amy's vault permanently). The minimum viable product is planned to require bids and debts to be denominated in the same unit to prevent external liquidation and any risk of vault lockouts.

Revenue

Primary revenue options include taking a cut on liquidations (industry standard), taking a cut on the yield, or engaging actively in the derivative market where the protocol is agnostic to being the Nth bidder and careful about being a HLB or next HLB (as to not fill the treasury with illiquid assets that need to be managed, but to earn profits from penalties of early withdrawal of safe bids).

Competitor Space

AAVE & OpenSea could team up

AAVE is one of the most prominent lending protocols in the decentralized finance space. OpenSea is one of the most prominent NFT marketplaces. AAVE is considering NFT collateralization for their protocol, but it will likely have a noticeably high collateralization ratio (i.e., lending a 44 ETH punk and only getting to borrow < 20 ETH). It will likely also be constrained to extremely well known and centrally vetted NFT assets. OpenSea allows for minting and auctioning of NFTs, including arbitrarily priced and virtually unknown NFTs. The bids are held by OpenSea with 0% interest and can be withdrawn at any time. The vast majority of NFTs do not get any bid or price discovery benefits on the platform.

Mktplace will allow for *any* arbitrarily complex set of assets in any number and decentralizes the choice of collateral ratio by relying on users to set bids, including what we suspect will be a plethora of low-ball bids, since it generates yield anyway and plenty of people use AAVE without any built-in option for

buying a vault on discount. For bidders, Mktplace leverages the benefits of AAVE (yield) with only a minor constraint (time lock up) in exchange for potential discounted liquidation of a vault. For holders, Mktplace leverages AAVE to draw in bids, including low-balls, to pool together a large amount of collateral to allow holders access to a collateralized debt position at possibly extremely low collateralization ratios (getting to borrow 43+ ETH for a 44 ETH Punk if the bids are sufficiently high) while also enabling significant on-chain price discovery that generates network effects for the entire illiquid asset ecosystem.

NFT Fractionalization

NFT protocols, including NFTX, enable liquidity for NFT holders through fractionalization. Essentially, you bring a 44 ETH Punk and they hold that punk in a vault. In exchange they mint a fixed supply of tokens that represent a piece of that Punk. The implied value of the Punk would be the market capitalization of its fractions.

Converting illiquid assets into synthetic fungible assets is a valuable protocol, but they are also biased extremely well known NFTs and the ability to redeem the synthetic fungible assets back for the illiquid NFT is not simple. We do not consider fractionalization protocols to be direct competitors, as it has a totally different goal- they want to democratize the ownership of historically significant NFTs, we want to make any illiquid assets usable for accessing debt and improving their price discovery.

Alternative Auction NFT Structures

After sharing this paper and discussing the idea with others more into the NFT space, we learned there are a few protocols in development seeking to solve this problem, e.g., PawnFT and GenieXYZ. So far, they seem to have significant overlap in the idea of using bids as collateral but all that I've seen so far skip the 2 key innovations of Mktplace: Fully abstract to any arbitrarily complex vault of mixed NFTs/ERC-20s and using time locks to convert bids into yield bearing certificate of deposits to create a credit limit curve. These two innovations are critical for recording the marginal demand curve of any specific asset (e.g., the marginal demand of Amy's OSRS Punk when its in a vault with 3 ETH to fluff up bids) and for creating arbitrarily complex options, e.g., derivative market of time locked bids.

Token

It is classic to say we'll have a governance token (i.e., a stock) that will be used to dump onto everyday retail investors and make the early investors rich. This gets into securities law and realistically, it's difficult to create a community that is active enough to consider "government by the people". We've seen the misuse of governance tokens at scales ranging from tiny scams to multi-billion dollar protocols. Fair Labs has no interest in this. If we launch a token, it will be to users, for their benefit, and our benefit will be limited to revenue from the protocol + any coincidental benefit we get from being users too.

Investing

Fair Labs is in the friends & family seed round. For those interested in supporting this vision's execution, you can make donations to our Ethereum address at fairlabs.eth or join the auction of our GenerativePalettes Founder NFTs at opensea.io/collection/fairlabsfounder – we hope to see these NFTs on the protocol soon!