DUO Network Ecosystem Whitepaper

DUO Network Limited

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Abstract

The rapid growth of crypto market is fueled by a combination of speculation and innovation; however, persistently elevated price volatility has become a major obstacle for the real-world adoption of blockchain technology. To help market participants navigate such volatile market conditions, we present a decentralized platform named DUO Network, which enables issuance, trading, and settlement of tokenized crypto derivatives. It mainly consists of Collateralized Autonomous Tokens (CAT), Price Oracle, CAT Exchange, and DUO Network Token. The platform aims to reduce risks and barriers in traditional derivative transactions, through collateralized smart contracts and distributed price feeds, thereby creating a transparent and autonomous derivative marketplace.

Keywords: Volatility, Trustless, Collateralized, Autonomous, Tokenized, Derivatives, Exchanges

Contents

1. Introduction

The majority of blockchain economies in their nascent years can be characterized by a deterministic market supply, unrestricted growth in users and transactions, and a lack of consistent fundamentals to help anchor their intrinsic value. The result is elevated price volatility. This lack of price stability in cryptocurrencies inevitably detracts value from their real-world applications and may ultimately raise the hurdle for their mass adoption as a medium of transaction or store of value.

Intrigued by this conundrum and inspired by a similar topic in international economics, we hereby propose the impossible trinity of cryptocurrencies: a blockchain economy cannot achieve all three goals below at the same time. In pursuing any two of these goals, the community must forgo the third.

- A deterministic currency supply
- Free growth in ecosystem activities
- Price-stability of the underlying currency

We have seen various attempts to achieve price stability through mechanisms either backed by fiat or involving altering the supply and liquidity of the currency. However, the fundamental spirits of blockchain economy in terms of autonomy and decentralism are often compromised in the process. There has to be a viable solution for managing price volatilities without severely sacrificing the core design principles of the blockchain economy.

Volatility Puzzle

Crypto market has displayed persistently elevated levels of volatility unseen in any other asset classes. The disturbing aspect of such volatility is its rather spurious nature, where market could gap up or down with almost no significant change in the tangible economic value. The advent of blockchain technology is celebrated because of the power it holds to disintermediate and democratize finance. But an extremely right-skewed distribution in the wealth creation of cryptocurrencies has become an inconvenient paradox that we can no longer ignore. Such inequalities can be attributed to the excess volatility, compounded by information asymmetry and lack of market instruments to manage such volatilities. As the market matures, we will likely see greater demand for instruments to hedge against price risks.

Lack of Trust

Despite the trustless and democratizing nature of cryptocurrencies, the majority of the trading volumes are paradoxically concentrated on centralized exchanges known to be vulnerable to attacks and frauds. By trading over centralized platforms, the public is placing confidence on institutions with a short and unregulated track record. Trading decentralized assets on centralized exchanges has set the stage for repeated security breaches and mishandling of funds, private keys, and user data. As decentralized exchanges continue to overcome their design and implementation bottlenecks, it is natural to expect community preference for security and autonomy outweigh performance concerns, thereby driving a redistribution of liquidity.

Decentralized Volatility Solutions - Trustless and Autonomous

As witnessed in traditional markets, successful development of a derivative market is often a testament to the depth and maturity of the underlying asset class. To address the problems of high volatility, inadequate liquidity, and lack of risk management tools, we propose a new framework for crypto derivative contracts - Collateralized Autonomous Token (CAT). Our tokenized smart contract design means that each derivative contract trades as an immutable token with payoff terms fully captured in the smart contract and enforced through the Price Oracle.

A Price Oracle is developed in-house to administer distributed price feeds to ensure relevant, timely, and unfettered market inputs. To facilitate quoting and trading of derivatives, we also need a marketplace where traders, investors, and other users can access the CAT contracts. A decentralized platform, subject to certain performance limitations being addressed, is the most natural platform due to its advantages of being trustless, private, and secure compared to their centralized counterparts. Given the innovative features of CATs, we have not found any existing DEX exchange which can accommodate CATs with desired performance and functionality. Therefore, as part of the supporting infrastructure, we plan on developing a new decentralized exchange based on 0x protocol, in order to provide a complete trading experience for CATs.

2. Collateralized Autonomous Token

Collateralized Autonomous Token defines a set of standards for the issuance, redemption and settlement of crypto derivatives. More specifically, CATs possess below key features:

- **Collateralized** - CAT's value is backed by digital assets held in its custodian smart contract.
- **Splittable** - A custodian may create two or more payoff classes of CATs, each representing a partial claim of the underlying collateral. The split can be based on seniority, levels of risk or other option payoff structures.
- **Fungible** - CATs are two-way convertible with corresponding collaterals. They can be created from depositing collaterals into the custodian smart contract, or redeemed back into collaterals anytime during its lifecycle. The mechanism enforces the net asset value (NAV) parity between CATs and their underlying collaterals, and allows market to self-correct any price dislocations.
- **Autonomous** - Streamlined issuance and settlement procedures mean reduced adminstrative costs and lower entry barriers. Distributed price oracles help to create a fair and objective reflection of the underlying asset value and safeguard against price manipulations. The result is high degrees of transparency and market autonomy.
- **Tokenized** - All CATs are ERC-20 compatible. By allowing storage and trading across most existing wallets and exchanges, we make it possible for derivative positions to be freely transferred and not bound to any centralized venue. We believe cross-platform trading of tokenized derivatives holds the key to an efficient market by improving decentralized liquidity and price discovery.

All derivative products offered by DUO Network are CAT compliant.

2.1 Mechanism and Lifecycle

All of our CAT products have the following mechanism and lifecyle:

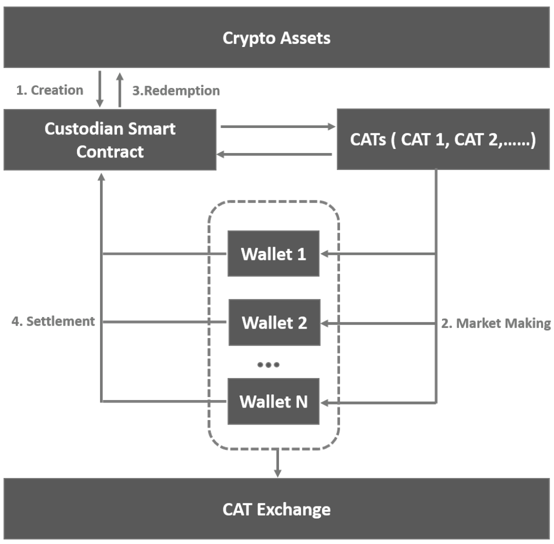


Figure 1: CAT Mechanism & Lifecycle

1. **Creation** - The process of underwriting that a market maker collateralizes crypto assets to the custodian smart contract and receives CATs issued by the contarct.
2. **Market making** - Market makers can sell all or part of the issued CATs in open market to respective investors.
3. **Redemption** - At anytime before settlement,the CATs can be merged to redeem the collateralized assets through the custodian smart contract.
4. **Settlement** - Under predetermined settlement conditions (maturity, upward/downward reset etc.), the custodian smart contract will calculate and distribute the payoff to CAT holders.

3. Products

DUO Network offers numerous types of CAT products. Leveraging on our innovative Split and Collateral Recycling framework, we hereby present our dual-class tokens, options, and structured products, tailored to investors with various objectives and risk appetites. More details on implementation will be outlined in the upcoming technical yellowpapers.

3.1 Dual-Class Tokens

The consumption and transaction utilities of many crypto assets, for instance as network fuel and medium of exchange, can clearly benefit from short term price stability. However, the issue of extreme volatility for many crypto assets is ultimately a market property driven by a myriad of technological as well as speculative factors, and can only be addressed by introducing market instruments that create an effective mechasim for transfering risk among market participants.

We took inspiration from the dual-class fund structures that gained popularity in the stock market, and engineered a mechanism where we could convert a basic crypto asset (e.g. ether) into a dual-class structure, i.e. two classes of CATs, with each class representing a different risk-return profile on the underlying.

Beethoven

In our pioneer product, Beethoven smart contract, we split the underlying crypto asset into A) an Income CAT which provides a stable stream of fixed income, and B) an Leverage CAT which provides leveraged capital gains linked to the underlying asset, with funds borrowed from A. The entire creation and redemption lifecycle of Beethoven as well as its associated price reset mechanisms have been throughly tested in our public testnet event in 2018Q3, with the production release projected for 2018Q4.

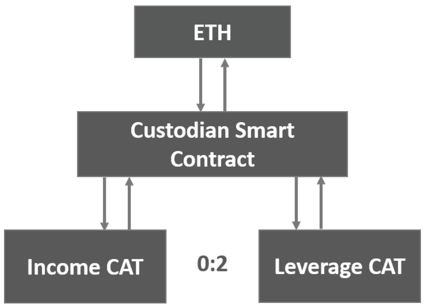


Figure 2: Beethoven Mechanism

Income CAT accumulates and pays interests based on its original net value in fiat currency (e.g. USD) as of previous settlement. It is possible to split Income CAT into another tier of Income CAT and Leverage CAT to further reduce volatility, based on extensions in the Academic Whitepaper.

Leverage CAT gains leveraged return of the underlying digital assets. Think as Leverage CAT holders borrow capital from Income CAT holders to invest in the underlying crypto.

Mozart

To provide more diversified payoffs under dual-class structure, we also have plans to implement an additional smart contract named Mozart as a way for market to short the underlying.

While Income CAT and Leverage CAT only allow the holder to be either flat or long, Short CAT enables investor to express a bearish view on the underlying crypto asset. Utilizing the two-way fungible property and dual-class structure, the Mozart Smart Contract is designed to effectly bind speculators with opposing market views under the Dual Class Token structure.

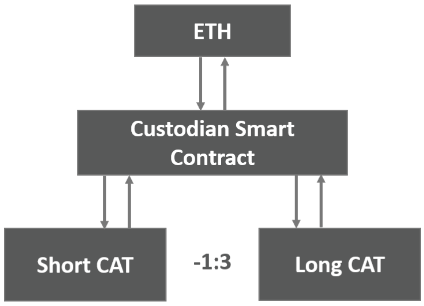


Figure 3: Mozart Mechanism

Short CAT short-sells the crypto asset (-1x) and stands to benefits from downward price movement of the underlying.

Long CAT has a 3x leverage where the additional 2x leverage obtained from the short CAT class.

3.2 Options

An option gives contract holder the right to buy (call option) or sell (put option) the underlying asset at a specific price (strike price) on a future date. An European option can only be exercised on maturity date, while an American option is exercisable at any time during the life of the option. The third type, named Bermudan option, could be early exercised within a predetermined period of time before maturity.

Options introduce an element of asymmetry to any linear risk exposure. Combining calls and puts across different strikes and expiries gives an investor a strategic payoff he wishes to customize - risk reversals, strangles, digitals, calendar spreads, and so on. Options and stable coins are both trying to address the same problem in the crypto market - excess volatility. However, options provide greater payoff customizability and possibility of trading volatility as an asset class.

Currently, investors are only able to trade options on limited centralized exchanges and have to deal with counterparty risk and potential single source of failure. Moreover, as the option chains are predefined, an investor might still struggle to find his or her desired trading pair and level. To tackle this problem, we propose to implement tokenized options through smart contracts, allowing autonomous, customization, and trustless position transfers.

Convention and Scope

Let us take the crypto pair DAI/ETH as an example, a call on DAI/ETH is equivalent to a put on ETH/DAI, with exchange rate inverted. Note that in both cases, DAI is the call currency, and ETH is the put currency. DUO Network platform will support trading any ERC-20 token pairs as long as there are reliable and tradable quotes. Future extensions are also achievable with cross-ledger solutions.

3.2.1 Mechanism

Vanilla call option gives investor unlimited upside if price of the underlying asset increases, whereas vanilla put options protected investors from the downside up to the strike level. By simultaneously longing a European Call and shorting a European Put, an investor creates a synthetic long forward position, expressing a bullish view without explicitly holding the underlying asset. The parity is famously known as Put Call Parity, and the strategy of combining long call short put is called Risk Reversal.

Parity : $C - P = S - Ke^{-rt}$

A call writer faces unlimited potential loss. In addition, investors of the call option faces counterparty risk as option writer might not be able to honor the obliged settlement. To limit the risk, covered call is an frequently used strategy where one writes a call while holding the underlying asset. As observed from the Put Call Parity, a covered call position will derive a similar payoff as shorting a put.

Tokening options makes it much easy for even an ordinary investor to exploit opportunities across the volatility surfaces through long/short combinations of calls and puts. Below we propose our split mechanism that we can create a call option CAT and a covered call option CAT by depositing call currency to custodian smart contract.

Two way fungible : Depositing the call currency as collateral into the governing smart contract, a market maker can create a call CAT (C) and a covered call CAT ($S - C$) . To redeem the collateral simply requires combining a call and covered call position, as the combined CATs always equals to the collateral. Note that market makers who consider put option on a pair could still use the covered call structure by inverting the base/quote token and strike price.

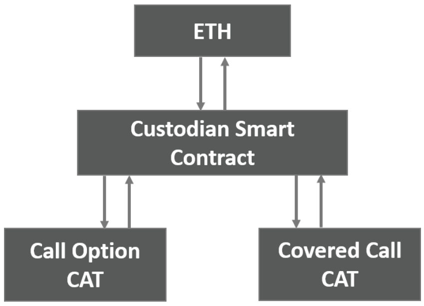


Figure 4: Split Mechanism

3.2.2 Collateral Recycling

As demonstrated in the vanilla call/covered call splitting mechanism, fully collateralizing the underlying digital asset effectively minimizes counterparty and settlement risk in derivative transactions. In most derivative markets, however, margins are calculated as a function of mark-to-market valuation. Therefore, even under a decentralized approach, the idea of posting 100% collateral regardless of an option's payoff and moneyness not shows a lack of economic sensitivity but also incurs unneccesary costs. One solution is recycling: corporates receiving collaterals in a reverse repo transaction could use the same collateral to fulfill a derivative transaction requirement.

The concept of "Recycling Repo" inspires us to effectively address the issue of overcollateralization on our platform through a key mechanism, named collateral recycling. What this means is that the vanilla call CAT created under first split can also be used as a collateral for further splitting based on Net Asset Value (NAV in short) parity. In the most basic case, a buyer of a call option token with strike K_1, can recollateralize his long call position to underwrite another call with strike K_2 ($K_2 > K_1$), a further Out of the Money Call. The advantage of collateral recycling is that it substantially reduces the funding requirement. A high cost of acquiring and maintaining the collateral could disincentivize option sellers from selling low delta options, thereby stifling price discovery across strikes.

From a practitioner's standpoint, the introduction of collateral recycling not only optimizes costs of underwriting but also provides a range of essential catalysts in option supply dynamics. It is worth highlighting that collaterals can be recycled recursively where the buyer of K_2 strike call above can in turn choose to underwrite a new call CAT with $K_3 > K_2$. The intuition behind this is consistent with market practice in many other asset classes, where further out-of-the-money strike supply typically comes from option buyers of near-the-money strikes. Except for a niche group of traders who trade volatility as an asset class, most are expressing a view on the underlying via options in which case the long option holders may need to fund his position by selling out-of-the-money calls subject to the right risk-reward. For instance, knock-out features in FX options are often included in payoffs only when the seller has an existing long vol exposure. Therefore, we see it as a natural extension of the vanilla call/covered call split mechanism because collateral is instrument agnostic whether it is an underlying asset or an option thereon. In other words, the platform universally allows selling any optionality that is a subset of the option seller's existing claim to the underlying asset. More details of the applications will be discussed in the next section.

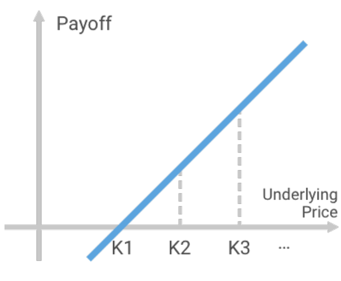


Figure 5: CAT Collateral Recycling Mechanism

3.2.3 Use Cases

We have below uses cases to elaborate our split and collateral recycling framework. All the options hereby are European style, which means that they can only be exercised on maturity date.

Case 1: Call Spread

A call spread strategy involves buying and selling two call options at different strike levels. Bull / Bear call spread are often used to express views on the asset price movement with little premium cost. To construct a call spread, an investor might attempt to purchase a call and a covered call CAT at the same time; however, a more economical solution is for an market maker to split a call option struke at K_1 into a call spread trade and another long call struck at K_2.

Parity : $C(K_1) = (C(K_1) - C(K_2)) + C(K_2)$

Other strategies such as strangle, collar, etc. could be split in similar fashions.

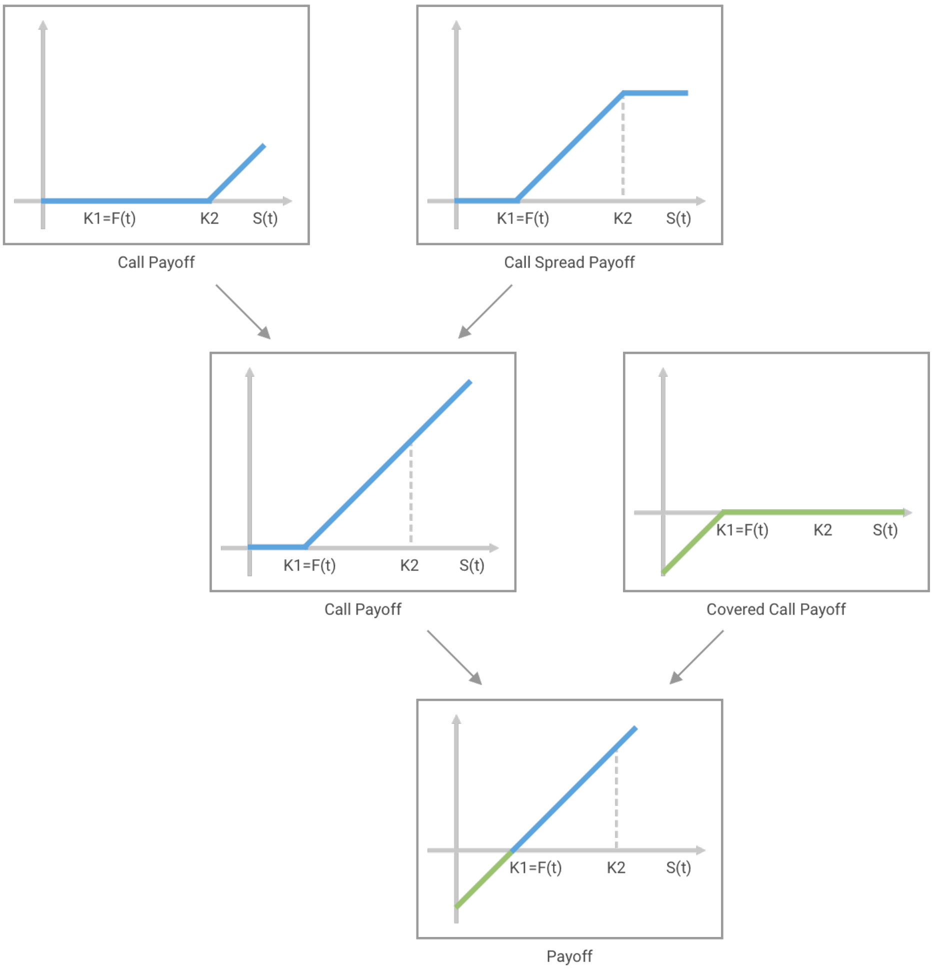


Figure 6: CAT Collateral Recycling : Call & Call Spread

Case 2: Barrier Options

Knock in option only becomes valid when hitting the barrier level, whereas a knock out option becomes invalid upon hitting. Given the additional constraints, barrier options should be intuitively cheaper than an otherwise equivalent vanilla option. In fact, the combination of knock-in and Knock-out options equals to a vanilla option at the same strike level and maturity.

Parity : $\textit{Knock In} + \textit{Knock Out} = \textit{Vanilla}$

Collateral recycling enables a market maker to reuse the created vanilla call position as collateral and create variations of barrier options, vice versa.

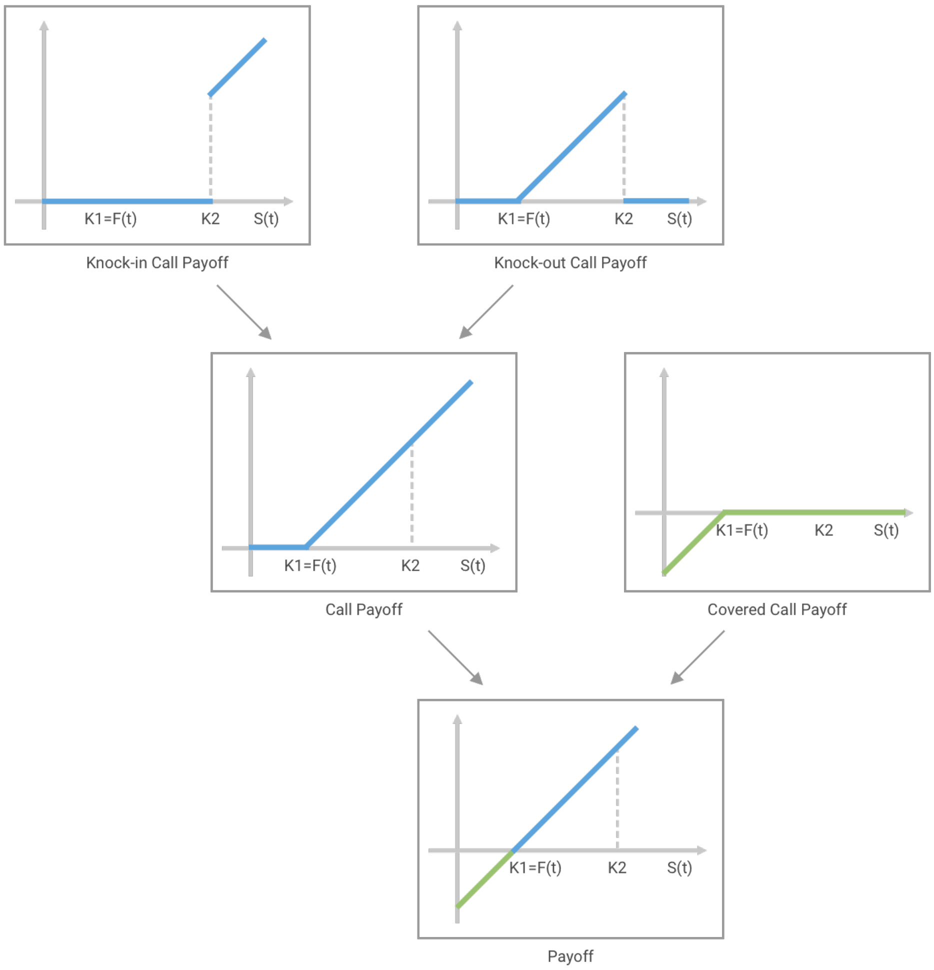


Figure 7: CAT Collateral Recycling : Knock In & Knock Out

Case 3: Tail Call

As most of liquidity and demand is more concentrated near the At-The-Money (ATM) strikes with implied vol that is easy to model, market making a deep Out-of-The-Money call (OTM) by pledging the full collateral is often not economically viable due to the complication of funding cost, even if the option premium by itself is justifiable. However, collateral recycling provides a simple solution. One way is to leverage on a bear call spread, where a market maker can deposit one ATM call that creates a call spread with a deeper OTM call at higher strike. Another interesting example is as follows:

Consider longing an European up-and-in call option that pays $(S - K)$ at maturity if $S > B$, and shorting a digital call option that pays a $(B - K)$ if $S > B$, then the terminal payoff will be either $S - B$ or zero. In other words, a vanilla call struck at B.

Parity : *Knock In Option* $(K, B) =$ *Vanilla Call* $(B)+$*Digital Call* (B)

Through depositing an up-and-in ATM call at selected barrier levels, a market maker can easily making market for OTM vanilla and digital calls. The mechanism not only greatly reduces the barrier to enter the trade but also provides a much cheaper funding solution.

Case 4: Structured Products

In order to sustain a deep and liquid market for options and other derivatives, healthy demand for structured products is often needed. Such products suit passive investors who wish to express a certain medium to long term view, which if realized would provide a higher payout, hence the term yield enhancement products. These structured payoffs provide the option supply vital to the developement of the option market and subsequent need for delta trading of the underlyings. However, many such products in traditional markets feature high entry barriers and fees due to illiquidity and institutional stronghold. With the development of a decentralized derivative market, disruptions in structured payoffs may soon ensue. For instance, a client looking to overlay certain conditionality on his payoff simply needs to post the maximum downside payout he's expected to pay - a seamless extension from our vanilla examples.

Take Accumulators for example, an accumulator could be viewed as series of future positions. As discussed earlier on, a synthetic future postion could be created from longing a call and shorting a put at the same strike. A market maker could therefore, leverage series of risk reversal trade to construct an accumulator contract.

Take Basket Options as another example, investors with exposure to a few currency pairs can consider trading them together in a basket with a strike on the basket value. The merit of tokenization is that underlying asset could be fractioned into any amount. By applying CAT to a basket of underlyings, investors can benefit from diversification effect and cheaper cost of hedging.

3.2.4 Dynamic Margin

The two way fungible property, splitting, and collateral recycling mechanism has provided an effective solution to manage the collateral of a token derivatives transaction at any point of time. To tie-up the margin requirement with traditional OTC instruments, it would be beneficial and more cost effective to calculate dynamic margin based on current mark to market value and future expected exposure. However, the performance and scalability on Ethereum blockchain bottlenecked dynamic margin implementation. A forceful implementation is possible but both observation frequency and calculation speed would be limited. With the mainstream blockchain technology tackling scalability issue through sharding, plasma and etc, we put dynamic margin trading in our future pipeline to perform on plasma or other high performance side chain.

3.2.5 Underlying Replication

It should be noted that a liquid and well-functioning futures market is an important precondition for the development of options market on a given crypto underlying. This is because hedging of options requires delta-trading the forward or futures contract in order to achieve exact replication, and forward rates are key inputs for accurate mark-to-market valuation and margin calculation. In traditional exchange traded options markets, the underlyings are typically futures traded within the same exchange, for instance treasury or e-mini futures. Crypto market delta-one derivatives are very much in their infancy where liquidity in futures is congregated in front end tenors and OTC forwards negotiated further out on the curve are impractical for dynamic hedging. In addition, current futures liquidity is found primarily in centralized exchanges and it will take time for decentralized solutions to materially disrupt this space. Therefore, a complete derivatives marketplace under DUO Network for the trading and hedging of options at this moment will need to be supported by a liquid but centralization-agnostic futures market, by seeking potential collaboration with existing exchanges.

3.2.6 Collateral Compression

For market participants holding portfolios of call/covered call positions, the implicit collaterals pledged for holding the covered call position could be quite costly. Notice that any combination of a call/covered call position could be viewed as a call spread, which has limited upside and downside, plus the underlying asset. It then follows that by compressing two legs of options together, the underlying used as collateral could be released from the combined structure. Hence, we can imagine a super dealer who is willing to collect separate legs from individual traders, and return to them a compressed structure token plus collateral rebate less a fee. The Collateral Compression mechanism will enable traders to claw back some of the collateral posted, while the super dealer is essentially provide funding for traders to earn a fee.

4. Supporting Systems

4.1 Price Oracle

Deriviatives are priced based on no-arbitrage principle against the replicating portfolio. Thus, the core of derivative pricing and trading is the ability to hedge derivative with the underlying. In current crypto markets, centralized exchanges provide the best liquidity for our underlying assets and consequently to execute hedges for derivatives.

The price fix of the underlying should possess a set of desirable characteristics - relevance, timeliness and manipulation resistance. To ensure those properties, recent exchange trades over a short period are aggregated into a price fix weighted by trading volume across exchanges. Order books are not taken into consideration as it is not resistant to manipulation.

We aim to evetually decentralize the oracle price fixing scheme. As we require tradable or traded price for pricing fix, predictions based on perceived values are irrelevant. Therefore, Schelling scheme is not an option. Connecting external price sources to smart contracts is also not acceptable as the data source is vulnerable to manipulation and third-party risk. We plan to move the oracle system on to Proof of Stake scheme as part of the DUO Token Ecosystem.

4.2 CAT Exchange

Building a new decentralized exchange (DEX) is not an isolated objective but a way of creating a marketplace for CATs. Having reviewed all current DEX platforms, we identified the need to build our own exchange in order to provide a desired combination of performance, functionality, and user experience. A full comparison of exchanges can be found in the table below.

Exchange	No Deposit	Price Discovery	Order Book	Trustless	Maker Free Entry	Compatibility
Centralized Exchanges	✗	Market	✓ off-chain	✗	✓	✓
Dex.top	✗	Market	✓ off-chain	✓	✓	✓
Etherdelta	✗	Market	✓ off-chain	✓✓	✓	✓
IDEX	✗	Market	✓ off-chain	✓	✓	✓
Bancor	✓	Magic equation	✗	✓✓	✗	✗
Airswap	✓	Dealer	✗	✓✓	✗	✓✓
Kyber	✓	Dealer	✗	✓✓	✗	✓✓
0x Protocol	✓	Market	✓ off-chain	✓	✓	✓✓✓

Table 1: CAT Exchange Candidates

As inherently required in the design of CAT, the custodian must be able to access user's wallet address and adjust balance directly based on the payoff or trigger condition of the contract. Therefore, if an exchange requires asset deposit from users, it must mirror the contractual adjustments made by the custodian for CATs to work properly in that exchange. Currently, all centralized exchanges and some decentralized exchanges such as EtherDelta, IDEX, and Dex.top come under this asset deposit category. CATs can potentially trade on these exchanges though not all desired features of CAT are currently supported.

Another option is Bancor on which prices are dictated by a predefined equation resembling a planned economy rather than market forces. This is rather undesirable because under a decentralized approach, we expect price discovery for all derivatives to be market-driven whereas models should only serve as price guidance.

Other exchanges such as Airswap and Kyber are technically compatible with CATs in most aspects. However, the lack of order book depth beyond authorized dealer's bid/offer risks causes inefficient price discovery in the market without enabling all participants to make and take prices with equal market access. An order-book-based liquidity platform is therefore much more appealing for CAT than the dealer quoted model.

All factors considered, we conclude that at the moment, 0x protocol is the only viable choice that meets most of our requirement for the listing and trading of CATs and we are free to build our own relayer. The reason we cannot use an existing relayer such as RadaRelay or DDEX is the need for certain logical implementation in addition to a standard 0x relayer. For example, the order book for Dual Class Tokens must be purged after every reset event. Option tokens require a user interface optimized for volatility trading. Furthermore, third party relayers cannot guarantee timely listing and delisting of CATs especially as the issuance volume of CATs picks up. Therefore, building our own relayer ensures the undisrupted user access to the marketplace.

We are closely monitoring viable blockchain technology to improve trading speed and support cross-chain asset swaps. Plasma, similar to the idea of bitcoin lightening network, is a blockchain-of-blockchain design with Ethereum as the main chain for securing assets. When plasma advances to a more mature stage, a high performance DEX with a fully trustless, on-chain order book can then be implemented. Cross-chain trading can make DEXes more powerful and easier to use. Currently, there are several blockchain solutions attempting to achieve cross-chain trading, such as notary schemes, sidechains/relays, and hash locking. We aim to make our CAT exchange support cross-chain trading in the near future.

5. DUO Network Token

The DUO Network Token is an ERC-20 token with limited supply. The design of DUO Network requires a token which value is implicitly linked to the growth and adoption of the Network. DUO Network Token functions as a medium of exchange among network participants, smart contracts, and the DUO community as a whole.

5.1 Utilities

The precise scope of the DUO Network will be developed further and will be announced once finalised. The following features are planned for DUO Network Token.

Price Oracle Node

Network participants can stake their DUO Tokens to become a node in our Price Oracle. Penalties and rewards are distributed in DUO Tokens based on difference between each node's price feed and the accepted price.

DUO Protocol Node

Network participants can also stake their DUO Tokens to become a super node and be able to propose new custodian specifications.

Governance

We aim to create a community-based governance model. Any DUO Token holders can vote proportionally on protocol decisions and development based on DUO Token balance.

Conversion Fee

All custodian contracts in DUO Network charge a small percent of fees on CAT conversions. Users can choose to pay fees in ETH or DUO. Early stage payments in DUO will be discounted to encourage token adoption.

Price Service Fee

External users can use our Price Oracle as a pricing service, charged in form of DUO Token.

Community Rewards

The Network provides its participants with an incentive scheme similar to mining on blockchains. Instead of recording transactions on blockchain, the Network recognizes conversion arbitraging, which helps stabilizing the token prices, as the mining operation. In addition to arbitrage profits, the Network rewards participating users with DUO Tokens. The detailed reward scheme will be released at a later stage.

5.2 Token Allocation

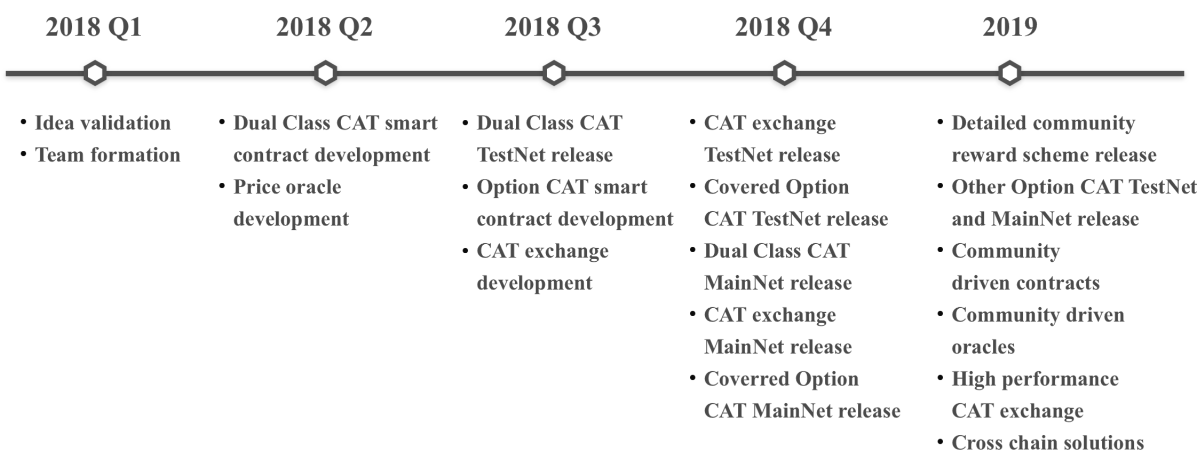
Total supply of DUO Network Tokens = **100,000,000** DUO

For Sale	22,000,000	22%
Community & Ecosystem Incentive	28,000,000	28%
Long-term Operation Reserve	25,000,000	25%
Team Incentive	20,000,000	20%
Advisors & Compliance	5,000,000	5%

Table 2: DUO Network Token Allocation

6. Road Map

The DUO development team works on a collaborative and agile pace. We are looking to launch products on main net by Q2 2019. We will publish more detailed road map through community channels.



7. Team

Crypto Products & Markets Team

Crypto Markets team is headed by Jerry Li. Jerry graduated from National University of Singapore (NUS) with Highest Distinction in Quantitative Finance. He worked at Citigroup and SS&C on hedge fund valuation, where he built the regional quantitative team, and advised multiple billion-dollar hedge funds in valuation policy and derivatives strategies. Before joining Citigroup, Jerry was a sales & trading analyst at UBS Investment Bank. The team has over 10 years of cumulative trading and financial engineering experiences in global financial institutions, including Citigroup, IHS Markit and HSBC.

Tech Engineering Team

Tech Engineering team is directly led by CTO, Yizhou Cao. Yizhou worked at Nomura Securities for forex proprietary trading and at Credit Suisse for fixed income t echnology. He is experienced in trading and large-scale system development. Yizhou graduated from NUS with Highest Distinction in Quantitative Finance and Statistics. His thesis formulated a comprehensive model in stochastic control framework for strategic transmission of costly information problem in a continuous time setting. The team is comprised of experienced developers proficient in cloud solution architect, information security, machine learning, smart contract developments, and website design. Their backgrounds include Accenture, Deloitte, Fuji Xerox, Huawei and PIMCO.

Advisors

Steven KOU - Questrom Professor in Management at Boston University

Professor Kou is the Director of Risk Management Institute and the Class of 62 Chair Professor at the National University of Singapore (NUS). Before joining NUS, Professor Kou worked at Columbia University, University of Michigan, and Rutgers University. He is a world-renowned expert in Financial Engineering and Applied Probability. He has published in numerous journals including Management Science, Operations Research, Mathematical Finance, and received the Erlang Prize by the Applied Probability Society of INFORMS. In terms of financial engineering, Professor Kou is well-known for his research on the double exponential jump diffusion model and models for growth stocks, which have been widely used on Wall Street. He is currently the Co-Area Editor in Financial Engineering Area of Operations Research and Associate Editor of MatBUhematical Finance, Mathematics of Operations Research, Journal of Business and Economic Statistics, Statistica Sinica, etc.

Min DAI - Professor at National University of Singapore & Director of Center of Quantitative Finance

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