Capapult: a New Stablecoin Protocol on the Terra Blockchain

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Abstract

Stablecoins have made blockchain technologies more accessible, giving many people the opportunity to exploit the advantages of a decentralized currency without having to face the risks that derive from the inherent instability of traditional cryptocurrencies. To maintain this trend, it is crucial that communities work on developing protocols that are as interoperable and decentralized as possible. This whitepaper introduces Capapult, a new protocol on the Terra blockchain with a soft-pegged overcollateralized stablecoin and a decentralized governance system managed via a dedicated token. This paper is mainly aimed at readers who do not have a specialized background and tries to be as self-sufficient as possible from the point of view of concepts and definitions.

1 Introduction

Blockchain is bringing a new perspective to security, resiliency and efficiency of systems offering a secure and decentralized way to exchange any kind of good, service, or transaction. Traditional cryptocurrencies are limited as a medium of exchange due to their high volatility. This has resulted in the introduction of new class of cryptocurrencies known as *stablecoins*. Stablecoins attempt to achieve the stability that is typical of traditional financial assets without renouncing to decentralization. The strategies adopted by stablecoin systems to minimize volatility are manifold. The most important ones include: the use of financially stable backing assets (as is the case for fiat-backed coins like USDC and USDT), collateralization (as is the case for Dai), and the recourse to fully automated protocols that modulate the total amount of stablecoin in circulation to compensate for market fluctuations (as in purely algorithmic stablecoins like UST).

With the introduction of smart contracts Ethereum demonstrated that Traditional Financial Applications can be implemented directly on-chain without relying

on intermediaries. These decentralized finance applications need stable assets, and stablecoins backed by fiat currencies are not a complete solution. Fiat-backed stablecoins are not in the owners' control, as was showcased by the Tornado Cash ban. Thus, to make blockchain technology more common there needs to be an asset with minimal volatility and that is as decentralized as possible. It is becoming more obvious each and every day that decentralized money needs a decentralized stablecoin.

Capapult's objective is to contribute in fulfilling the need for a decentralized currency with low volatility. Capapult's stablecoin, SOLID, does not rely on fiat currencies and the underlying protocol is managed according to a decentralized governance model. SOLID's market price is kept stable thanks to a market-driven mechanism based on collateralization.

This paper is organized as follows. Section 2 provides a high-level overview of the Capapult procotol. Section 3 provides detail information on SOLID. Section 4 describes Capapult's governance system. Finally, section 5 concludes the paper.

2 Overview

2.1 A high-level overview of Capapult

At the heart of the Capapult ecosystem is SOLID, an overcollateralized stablecoin soft-pegged to the US dollar. The term "overcollateralized" is indicative of two things. First, it denotes that the market value of SOLID is stabilized by means of a collateral, i.e. an asset that users have to pledge as a guarantee when they wish to generate SOLID tokens. In this sense, the process of minting Solid is understood as a loan. Second, it indicates that the stablecoin is linked to the collateral by excess: in other words, the value of the collateral needed to open a loan position is greater than the value of the SOLID tokens that are generated as a result of locking the collateral. The expression "soft-pegged" refers to the fact that, even though SOLID's exchange rate against USD is guaranteed to remain stable, it can still be subject to small, bounded variations around the 1:1 target rate.

Overall, the interactions of a generic user with the Capapult protocol are simple. A user who wishes to generate Solid tokens (referred to as a *borrower*) simply has to deposit collateral and lock it inside of the Custody smart contract. After that, the protocol mints a corresponding amount of SOLID and sends it to the borrower's address. This way the borrower opens what we call a *collateralized debt position* (CDP). The borrower can then use the generated Solid as they wish. To retrieve the collateral, the borrower needs to return the amount of SOLID that had been generated, plus a *mint fee* that is computed according to a model based on the excahnge rate of SOLID against USD at the moment the position was opened. With

the payment of the debt the CDP is closed. The fee is used to generate rewards for those who participate in the governance and, in a small proportion, pay Oracles (see subsection 3.2) and finance the development team (see subsection 4.1).

One important peculiarity of Capapult is that the protocol uses liquid staking derivatives (LSD) as collaterals. Liquid staking derivatives, also known as liquid staking tokens, are similar to bAssets in that they are tokenized representations of staked assets in a PoS blockchain. However, unlike bAssets, LSDs are auto-compounding. This means that the rewards generated by staked assets are also automatically staked, so that the value of an LSD in terms of the staked currency increases with time. Initially, the only collaterals accepted by the protocol will be liquid staking tokens on the Terra blockchain (see subsection 3.1 for a list of the accepted collaterals).

CDPs that are deemed too risky by the protocol can be liquidated. In that case, the collateral is exchanged for SOLID tokens to cover the debt. This is the purpose of the liquidation queue: users that wish to acquire collateral when a CDP is liquidated (referred to as *liquidators*) can join the liquidation queue by locking SOLID tokens in the contract and bidding for a premium (which is equivalent to a discount rate on the collateral). Whenever a CDP is liquidated, the collateral is assigned to liquidators by giving priority to those who bid for the lowest premiums. The corresponding SOLID deposits are burnt.

Capapult is provided with a decentralized governance system based on CAPA, the protocol's dedicated governance token. Users who wish to participate need to buy CAPA and stake it, thus gaining the right to cast their vote in governance polls. Governance polls allow to list new collaterals, decide on community pool expenses, and make general decisions on the future of Capapult. As already mentioned, CAPA stakers receive rewards in SOLID tokens as an incentive for participating in the governance.

2.2 Stablecoin protocol and governance protocol

Sections 3 and 4 describe Capapult in greater detail by distinguishing stablecoin protocol from governance protocol. The term "stablecoin protocol" is used here to refer to the part of the protocol that ensures proper functionality of the SOLID token. The explanation of the stablecoin protocol will cover the procedures for opening/closing CDPs, the management of CDPs and the liquidation mechanism. The term "governance protocol", on the other hand, refers to the part of the protocol that concerns the governance of the Capapult ecosystem. Governance polls and the role of the CAPA token are the main topics that will be covered in the description of the governance part.

The reader should note that the distinction between stablecoin protocol and

governance protocol has been made to provide a more schematic and understandable explanation. From a technical point of view, Capapult is implemented as a set of reciprocally interacting smart contracts, each carrying out a specific role.

3 Stablecoin protocol

3.1 Collateralized Debt Positions

As stated in section 2, the term Collateralized Debt Position refers to the loan position that users open when they lock collateral to generate SOLID tokens. From the protocol's point of view, SOLID tokens minted by depositing collateral are borrowed and must be returned at some point (unless the CDP is liquidated, see subsection 3.2 for details). The interaction between a borrower and the protocol is detailed below:

1. **Locking the collateral**: to open a new CDP, a borrower needs to send collateral to the Custody smart contract and lock it. The protocol will have a dedicated Custody for each type of accepted collateral.

2. **Generating SOLID**: once the collateral has been locked, the borrower can specify the amount of SOLID they wish to borrow: the Market smart contract will mint the requested tokens and send them to the borrower's account. The maximum amount of SOLID that can be generated depends on the value of the deposited collateral in US dollars. Since SOLID tokens are linked to the collateral by excess, the value of the generated SOLID must be always less than the value of the deposited collateral. The ratio between the value of the borrowed SOLID and the value of the collateral is called *loan-to-value* ratio (LTV):

$$LTV := \frac{\text{USD value of borrowed SOLID}}{\text{USD value of collateral}} \tag{1}$$

   Note that the borrowed SOLID also includes the mint fee that must be paid to unlock the collateral. The LTV_{max} is a protocol constant that defines the maximum acceptable LTV for a given collateral. For example, suppose that a borrower locks 1 USD worth of collateral. The borrower can choose to generate any amount of SOLID that results in a LTV less than the LTV_{max} of the collateral. If $LTV_{max} = 0.75$, then the borrower could choose to generate, say, 0.6 USD worth of SOLID, since $LTV = 0.6 < 0.75$. The reader should note that the numbers used here are just for illustrative purposes and do not reflect the actual values used in the protocol. This remark also applies to the other examples that can be found in the paper, unless otherwise specified. When the protocol is launched, LTV_{max} will be initially set to 0.5 for all

collateral assets. Then, the governance will be able to change the LTV_{max} values of each collateral independently through polls.

3. **Using SOLID**: borrowers can use the generated SOLID tokens as they prefer. For example, they may invest them to generate profits.

4. **Retrieving the collateral**: as long as the CDP is not liquidated a borrower has complete control over their locked collateral and can retrieve it at any time. In order to retrieve the collateral, the borrower has to send the amount of SOLID they originally generated plus the mint fee to the Market contract. The mint fee is computed on the basis of the exchange rate of SOLID against USD at the moment the position was opened. When the debt is paid, the CDP is closed and the collateral is unlocked so that the borrower can retrieve it. As said before, the mint fee is used by the protocol to generate rewards for CAPA stakers and, in a small proportion, pay Oracles and finance the development team.

As we already mentioned, the protocol will only accept LSDs as collateral assets (at least in the initial phase). Thanks to the decentralized governance system, members of the community will be able to propose and vote for listing of new collaterals, so that the protocol can keep evolving and expanding. The collaterals that will be initially accepted are:

- LunaX
- ampLuna
- bLuna
- Steak

The amount of LSD a borrower receives when a CDP is closed is the same he locked to mint SOLID. This means that proceeds generated by LSDs are returned to the user.

Example: suppose a borrower locks 1 LunaX when the exchange rate of LunaX against Luna is 1. Now suppose a certain amount of time passes and the borrower retrieves the collateral when said exchange rate has grown to 1.2: then, the Market contract will send 1 LunaX back to the borrower, which corresponds to 1.2 Luna.

3.2 Liquidation Queue and Oracles

The protocol can liquidate CDPs that are considered too risky. More specifically, liquidations are performed on the basis of the LTV. The protocol makes the

determination for a certain CDP by comparing its loan-to-value ratio to the LTV_{max}. In fact, the LTV_{max} may be interpreted as the threshold above which a CDP is liquidated. The liquidation threshold can be different for each collateral type, because each collateral has its own LTV_{max}

When a CDP is liquidated, its collateral is used to buy SOLID tokens that are immediately burnt. This happens through the liquidation queue. Liquidators can join the liquidation queue by locking any amount of SOLID and bidding for a premium. Whenever a CDP is liquidated, the Liquidation Queue smart contract will distribute the collateral to those who are in the liquidation queue. In doing this, the contract gives priority to those who bid for the lowest premiums. In other words, bids with lower premiums will be executed before the others, until there is no more collateral available for liquidation. The amount of collateral that a liquidator receives is computed as follows:

$$C_{liquid} = X_{liquid} + X_{premium} \tag{2}$$

where X_{liquid} is an amount that depends on the locked SOLID and $X_{premium}$ is computed as

$$X_{premium} = \text{Premium} \times X_{liquid} \tag{3}$$

where the premium must be a percentage between 0% and 30%. The protocol will also send a part of the collateral (the *liquidator fee*) to the address that triggered the liquidation. Note that the liquidation of a CDP can be partial: in other words, the protocol liquidates risky CDPs until they reach a safe LTV. When the protocol is launched the liquidator fee will be set to 1% of the collateral.

Example: suppose borrower A locks 1 USD worth of LunaX and borrows 0.7 USD worth of SOLID, and that $LTV_{max} = 0.75$ for LunaX. Now suppose that, due to market conditions, the value of the locked LunaX drops to 0.8 USD. The LTV will then rise to 0.875, which is greater than LTV_{max}. If the borrower does not lock more collateral to bring the LTV down, the CDP will be liquidated.

To determine the LTV ratio of CDPs the protocol needs to retrieve the prices of collateral assets; it does this by interrogating Oracles. Oracles are smart contracts that act as price feeds for the accepted collateral assets, thus allowing the protocol to determine the LTV ratio of each CDP. Price data from an Oracle contract is periodically updated and is only valid for a time frame of 60 second starting from the most recent update. When a time frame expires, the Liquidation Queue contract disables bid executions until new price data is fed to the Oracle.

Note that the mint fee consists in an extra amount of SOLID that borrowers need to return in order to retrieve the collateral. The costs associated to Oracles are be paid with a part of this amount.

3.3 Stability

As already mentioned, SOLID will be soft-pegged to the US dollar. SOLID's stability is ensured by a market-driven mechanism. Users are incentivized by the arbitrage opportunity to buy or sell SOLID in such a way that the market price is kept stable:

- If SOLID price is below 1 USD, then borrowers will be encouraged to buy SOLID on the market and repay their debt in order to retrieve their collateral, thus generating demand for SOLID and causing its price to rise.
- If SOLID price is above 1 USD, users will be encouraged to borrow SOLID and sell them on the market, thus increasing the supply of SOLID and causing its price to drop.

This stability mechanism is further reinforced by the use of the mint fee. As previously mentioned, this fee is computed according to a model based on the USD value of SOLID at the moment the position was opened. Such model adapts the amount of the fee to incentivize users to open CDPs so that the price is kept stable and is defined by the following law:

$$\begin{cases} M(x) = R_{base} + \frac{(1-x)}{2} * 100 & if\ x < 1 \\ M(x) = R_{base} & otherwise \end{cases} \tag{4}$$

where M is the mint fee (expressed in percentage), x is the exchange rate of SOLID against USD at the moment the CDP was opened and R_{base} is the *base mint fee*, an internal constant of the protocol. When the protocol is launched, R_{base} will be initially set to 0.5. Equations 4 show that $M(x)$ is composed by a fixed part and a variable part. The fixed part is always present whereas the variable part is added only if x is less than 1 and increases when x drops. The greater the mint fee, the more users will be discouraged to open a new CDP. This means that they will be incentivized to borrow SOLID when x is above 1, thus increasing its supply and causing its price to drop. At the same time this mechanism help avoiding an increase of the supply of SOLID when its exchange rate against USD is greater than 1. Note that the mint fee is known since the moment the CDP is opened and it does not depend on when the position is closed or how long it is kept opened.

4 Governance protocol

4.1 Governance token: distribution and use

Capapult's decentralized governance system is based on CAPA, the protocol's governance token. The functionalities that allow Capapult to be governed in a

decentralized manner are implemented in the Gov contract, which contains logic for holding polls and manages CAPA staking. After the initial bootstrapping of the protocol, the Gov contract will be assigned to be the owner of itself and of the other smart contracts.

Users who wish to partake in the governance have to buy CAPA tokens and stake them. This way, they gain the right to cast votes in governance polls. Through polls, stakers can make decision on protocol parameters, listing of new collateral assets, and general decisions about Capapult (see subsection 4.2). The decentralized governance also manages the governance pool, which contains funds that can be spent to finance new initiatives. CAPA stakers receive rewards in SOLID tokens. These rewards are funded by a percentage of the mint fees. This percentage can be tuned via governance and will be initially set to 80%. The remaining 20% will be used to maintain Oracles and to finance the development team.

When the protocol is launched, an amount of CAPA that corresponds to the total supply of governance tokens will be minted and then distributed according to the following proportions:

- **10% for Airdrop Genesis**: a snapshot will be taken in correspondence of a predefined block on the Terra chain. Users who have Luna at stake when the snapshot is taken will receive CAPA tokens from the Airdrop share in proportion to the amount of staked Luna, within a predefined cap. The extra Luna (with respect to the cap) will not count for the purposes of Airdrop Genesis.

- **20% for Lockdrop**: Lockdrop will consist of a period of seven days during which users will be given the chance to lock their Luna into the Lockdrop smart contract. The CAPA tokens from the Lockdrop share will be distributed in proportion to the amount of locked Luna. This will be done in two steps: 20% of the tokens assigned to Lockdrop will immediately become claimable after the 7 days period has expired. The remaining part, instead, will become available after a period of 6 months, together with the locked Luna and the unclaimed CAPA (which will be distributed in the form of additional rewards). Note that, during the 6 month period, the locked Luna and the 80% of CAPA will be used to generate a Liquidity Pool (LP) token, which will be sent to Astroport. After 6 months the token will be withdrawn and both Luna and CAPA will become claimable.

- **15% for the Team**: a 15% share of CAPA will be destined to the team and will become available with a vesting period of 4 years with linear unlock. This means the the team's share will initially be locked and will progressively unlock over time in a linear fashion.

- **10% for LP providers**: a 10% share of CAPA will be destined to liquidity pool providers: everyone who provides SOLID to one or more liquidity pools (chosen from a set of predefined ones) will receive CAPA in proportion to the amount of SOLID they deposited.
- **35% for Gov Pools**: 35% of the total supply of CAPA will be destined to the governance pool.
- **5% for Luna stakers**: during a period of 5 years, CAPA tokens will be periodically distributed to all Luna stakers.
- **5% for Gov Stakers**: during a period of 4 years, CAPA stakers will receive an additional reward in CAPA tokens (besides the normal reward in SOLID).

Capapult delegators will receive a 20% boost on the CAPA that is distributed for Airdrop Genesis and Luna staking.

4.2 Governance Polls

Governance polls allow community members to make changes to the protocol after its launch. Thanks to polls, the Capapult ecosystem will be able to evolve over time. Only CAPA stakers are allowed to propose polls and to cast their votes. Possible subjects for new poll proposals include:

- **Listing of new collateral assets**: governance member will be able to vote on the addition or removal of collateral assets.
- **Governance pool expenses**: proposals for investing governance funds will be approved or rejected through polls.
- **Changes to protocol parameters**: polls will allow to decide for changes of protocol parameters, such as the LTV_{max} for a certain collateral, or the percentage of SOLID that is destined to governance rewards.
- **General decisions**: through governance polls, members will be able to make determinations of various nature regarding the future of the protocol.

5 Conclusions

This paper presented Capapult, a new stablecoin protocol built on the Terra blockchain. Capapult's aim is to provide a safe, decentralized stablecoin to make cryptocurrencies more accessible for everyone. The protocol's stablecoin, SOLID,

will be soft-pegged to the US dollar, and its stability will be guaranteed by a market-driven mechanism based on overcollateralization.

Capapult will also include a decentralized governance system managed via CAPA, the protocol's governance token. CAPA stakers will be able to propose polls and cast votes on pending proposals. The protocol will finance itself with mint fees: in particular, these funds will be used to reward CAPA stakers and, in a small proportion, to pay protocol maintenance costs.

Our ultimate objective is to create a protocol that is scalable, interoperable and lasts as a valuable resource. Capapult will provide Terra with a native stablecoin, and other protocols will be able to build on Terra around SOLID. Future developments on Capapult include the following:

- Developing other protocols and decentralized financial applications that rely on Capapult in order to provide use cases for SOLID.
- Expanding Capapult on other blockchains and bring liquidity to Terra.
- Exploring Feather, Terra's upcoming project that aims at simplifying the process of launching new blockchain protocols, and explore its possible applications to the Capapult ecosystem.

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