3F Mutual

Protocol White Paper

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Abstract

3F Mutual is a decentralized insurance protocol on Ethereum, aiming to hedge against the MakerDAO emergency shutdown. This white paper introduces the decentralized mechanism and implementation of how 3F Mutual helps cover the potential risk of assets for DeFi investors in extensive collapse events via a design similar to rainy day fund and mutual insurance.

1. Introduction

1.1. Background

1.1.1. DeFi Insurance

With the rapid development of DeFi (Decentralized Finance), the total value of assets locked in DeFi and liquidity volume is constantly increasing. Several security attacks occurred, exposing the vulnerability of DeFi to the world, underscoring to DeFi investors the importance of hedging.

Nexus Mutual[1] and Opyn[2] are currently the primary DeFi insurance products on the market. Nexus Mutual **provides insurance coverage against loss due to smart contract failures**. If insurance buyers lose their assets from security issues and bugs in smart contract code, they can submit a request to the Nexus Mutual smart contract, and wait for NXM holders to vote on the validity of the claim and reimbursement. On the other hand, Opyn is a hedging tool adopting the default swap model. Users can hedge the price risk of their underlying DeFi assets by using oTokens to effectively buy a Put Option at a specific price.

Nexus Mutual is useful but lacking in scope as it only covers losses incurred from bugs in smart contracts. The problem with Opyn is that it lacks reasonable market making strategies, which can result in the user facing low coverage of their positions with extremely high insurance fees. With the products currently available on the market, it's difficult for DeFi investors to appropriately hedge risks and guarantee against their assets in case of a flash crash or "Black Swan" event occurred on March 12, 2020.

1.1.2. MakerDAO and Emergency Shutdown

MakerDAO is the most crucial protocol in the realm of decentralized finance. The assets locked in DeFi are worth more than 9.6 Billion[3] dollars as of Sep 2nd, 2020. Almost 1.6 Billion dollars of assets are locked in MakerDAO, accounting for 17% overall.

DAI, the stablecoin operated by the MakerDAO system, requires users to mortgage their ETH or other specific assets to issue DAI. Because of the price volatility of mortgaged assets, the MakerDAO protocol requires users to maintain a ~150%+ collateral ratio. Once the collateral ratio is lower than 150%, the system would liquidate and auction some of the mortgaged assets to maintain system stability.

The DSS (Dai Stablecoin System) of MakerDAO is operated by the governance token: MKR. While facing great systemic risks like hacking attacks, system malfunctions, or huge market fluctuation, MKR holders can vote to activate Emergency Shutdown [4] as a final means to protect DAI and CDP (Collateral Debt Position) holders from further losses. Emergency Shutdown would terminate all the regular functions of MakerDAO, liquidate the residual values of all collateral assets and refund the remaining to all DAI holders, which proclaims the bankruptcy of MakerDAO.

Although Emergency Shutdown can safeguard MakerDAO from further breakdown, there will be no assurance for DAI holders to claim back sufficient value of assets, which puts them at considerable risk as long as MakerDAO Emergency Shutdowns.

### 1.1.3. Systemic Risks of DeFi

DeFi protocols can be composed with one another like Legos, due to the interoperability of Ethereum smart contracts. MakerDAO is the infrastructure of the DeFi ecosystem which has been adopted by several protocols in the application layer.

For DeFi projects that have adopted MakerDAO and DAI into their protocols such as Compound [5] and Curve [6], a MakerDAO breakdown would be enhanced combinatorially producing a knock-on effect to other protocols. Quantified hedging methods like shorting ETH/MKR/DAI cannot avoid the risk of fundamental protocol failure. Thus, a thoroughly different insurance mechanism is required in hedging such risk.

1.2. Basic Concept

3F Mutual is an insurance system with a mechanism like mutual association or deposit insurance, which addresses the event of MakerDAO Emergency Shutdown. Empowered by a risk model designed by experts, 3F Mutual encourages depositors, traders, or developers to pay small amounts of insurance fees during regular times to accumulate security funds to compensate losses during massive industrial crises.

In a decentralized world, there is no need for a transaction to meet a certain order, but the possibility to acquire a quoted price based on supply and demand status in smart contracts, which is known as the P2Contract mechanism. Underwriting insurance via the pool of capital in the smart contract is called AMM (Automatic Market Making), allowing anyone to buy any number of insurance units at any given time. The insurance fees flow into the pool of capital, and when MakerDAO Emergency Shutdown happens, compensation will be paid out via the pool of capital. Insurance fees and the multiple of compensation will be influenced only by market forces.
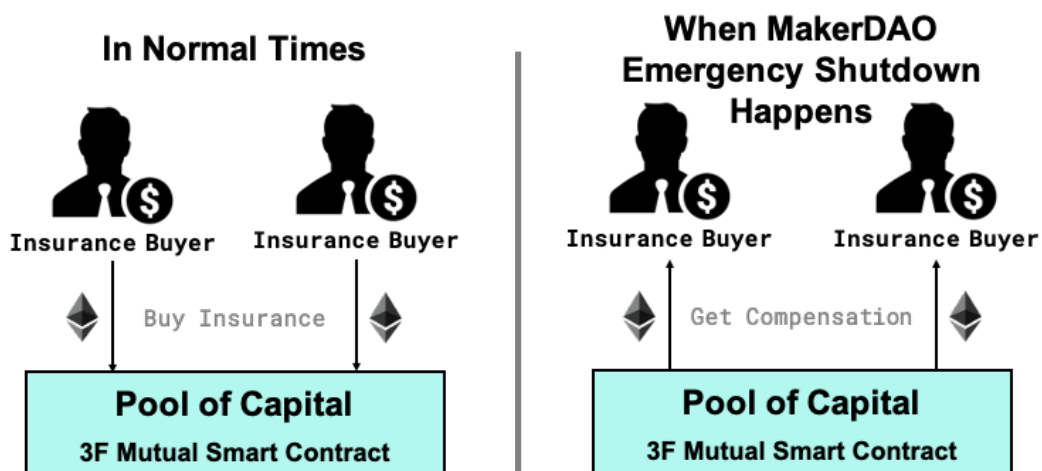
2. The 3F Mutual Protocol
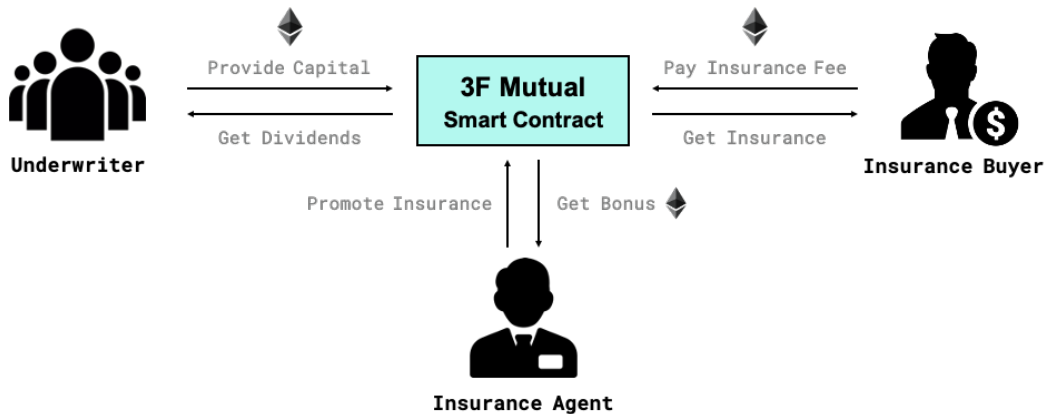
There are three roles in 3F Mutual insurance: **Underwriter, Insurance Buyer,** and **Insurance Agent**. Underwriter provides capital to pool in return for earning dividends; Insurance Buyer pays insurance fees to acquire the guarantee in a certain period; Insurance Agent simply gets the bonus by promoting insurance.

2.1. Underwriter and Insurance Buyer

The insurance fee of each purchase in 3F Mutual would be calculated based on two parameters: "X: Insurance Units" and "Y: Covered Days." If MakerDAO shutdowns during the period of Y days after purchase, the insurance buyer can get compensation in which amounts are determined by the pool of capital and (unexpired) total insurance units.

3F Mutual is a decentralized insurance system that collects the insurance fees into the pool of capital in the smart contract; provides compensation for insurance buyers while MakerDAO shutdowns. The insurance fees paid by insurance buyers would become the pool of capital to compensate insurance buyers. As a result, for everyone who buys the insurance, they are both insurance buyers and underwriters.

2.2. Dividend Mechanism of Shareholders

The expected value of purchasing insurance is quite low for early insurance buyers in 3F Mutual because of few amounts of ETH in the pool of capital. To balance the disequilibrium of economic incentive, 3F Mutual introduces a long-term profit mechanism: Insurance buyers would receive the same amount of "Shares" along with insurance units, enabling all the insurance buyers to be "Shareholders" of the pool of capital.
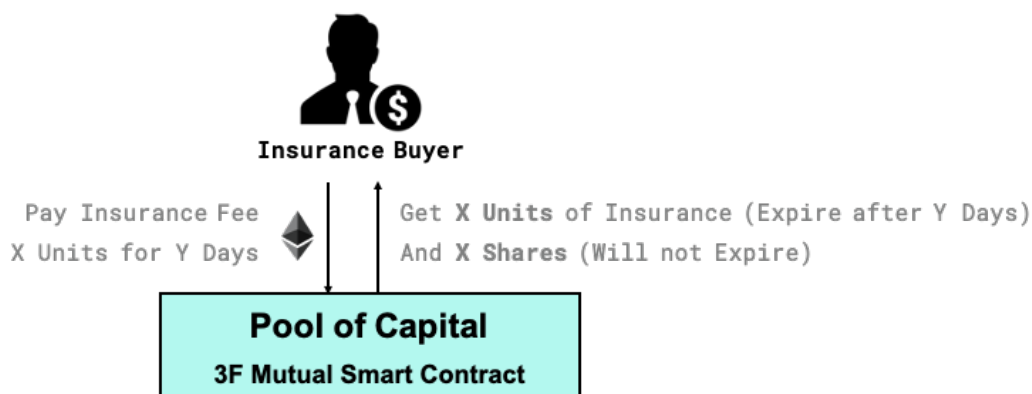
Shares will not expire, unlike insurance units, and can receive dividends of 15% insurance fees in proportion to all the following insurance purchases. The dividend for a shareholder in each new purchase is calculated by the formula below:

$$Dividend\ of\ a\ New\ Purchase = Insurance\ Fee\ \times\ 0.15\ \times\ \frac{Shares\ of\ the\ Shareholder}{Total\ Shares}$$

2.3. Insurance Fee

The price of each unit in 3F Mutual would rise as more purchases, try to buy 1 unit of insurance and find out current bp (basic price). The insurance fee in each day would decrease at the rate of 1% a day while more days were purchased at one time, which means there will be more discounts if more days are included in a purchase, however, with an upper limit of 100 days.

The following formula displays how insurance fees are calculated (bp=basic price; d=covering days of insurance):

$$price\ of\ a\ unit = bp \sum_{d=1}^{100} 0.99^{d-1}$$

The time standard of 3F Mutual is based on UTC (Coordinated Universal Time). The timeframe for one-day insurance begins at the moment of purchase confirmed and ends at 24:00 of that very day.

For example, if Alice bought 3-day insurance at 01:00 9/3 UTC, insurance would expire at 0:00 9/6 UTC (the border between 9/5 and 9/6), covering 71 hours total. For insurance buyers, the first day of insurance would be incomplete (less than 24 hours).

FYI, 3F Mutual also allows people to buy 0-day insurance, which includes **only shares** not insurance units.

2.4. Compensation

Only those who have an active insurance unit(s) at the moment of MakerDAO Emergency Shutdown can claim for compensation. The amount of compensation for an insurance owner would be "Total ETH Amount in Pool" times the proportion of "One's Active Insurance Unit(s)" in "All Active Insurance Units," displayed as the following formula: (IU represents "Insurance Units")

$$Someone's\ Compensation = Pool\ of\ Capital \times \frac{Someone's\ Active\ IU}{All\ Active\ IU}$$

After MakerDAO shutdowns, the compensation would not be directly delivered to the ETH address, but temporarily kept in 3F Mutual smart contract waiting for insurance owner to claim it.

The shutdown of MakerDAO represents the end of a round of 3F Mutual. The status of ETH in Pool, Insurance Units, and Shares would stop changing at the moment of MakerDAO shutting down, waiting for insurance owners and shareholders to claim their compensation and dividends. 3F Mutual core team would announce the activation time of the next round of 3F Mutual insurance in the community.

2.5. Insurance Agent

The insurance agent system is one of the major features in 3F Mutual. Anyone can spend 0.01 ETH to register a unique name in 3F Mutual to become the insurance agent. After registration, several referral links would be unlocked. For those who visit 3F Mutual via referral links, the link owner will be considered as their agent, receiving a bonus in each of their insurance purchases.

There are three forms of referral links: registered name, ETH address, and serial number, which share the same effectiveness for agents to promote on different occasions. Please note that recommended people are not linked to an agent before purchase, but temporarily kept in the browser's local storage, which **would be overwritten if visiting with the other referral link.** Insurance agents are also allowed to purchase insurance with their referral links and get bonuses from each of their purchases.

Insurance agents of 3F Mutual are capable of building personal images: profile picture and opening remark through connecting to 3BOX distributed database protocol built with IPFS technology.
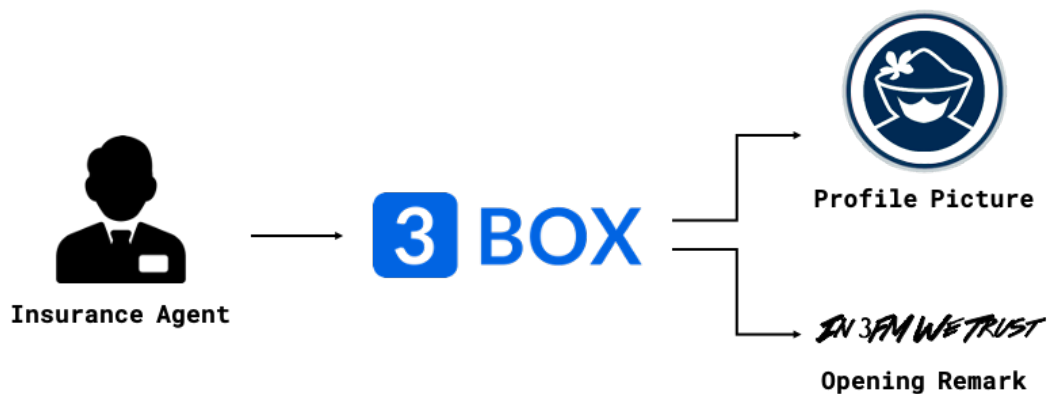
2.6. Long-term motivation mechanism

Insurance agents can receive a fixed percentage as commission, which would be raised as level upgraded, of the bonus from each promoted insurance purchase. The level of insurance agent would begin from Bronze after registration and allow for an update after reaching a certain accumulated bonus amount.

Required bonus for updates in each level will not be affected by bonus withdrawals, but consecutive in each level. The highest level of the insurance agent is "Blue Diamond" (Level 10), sharing a 16% bonus of each insurance purchase.

Bonus percentage and requirements for each level are shown in the table below:

LEVEL	REQUIRED BONUS (ETH)	SHARING PERCENTAGE
N/A	N/A	0%
Bronze	0	7%
Silver	0.073891	8%
Gold	0.200855	9%
Platinum	0.545981	10%
Beryl	1.484132	11%
Sapphire	4.034288	12%
Ruby	10.966332	13%
Emerald	29.807980	14%
Diamond	81.030839	15%
Blue Diamond	220.264658	16%

2.7. Distribution Model of Insurance Fees
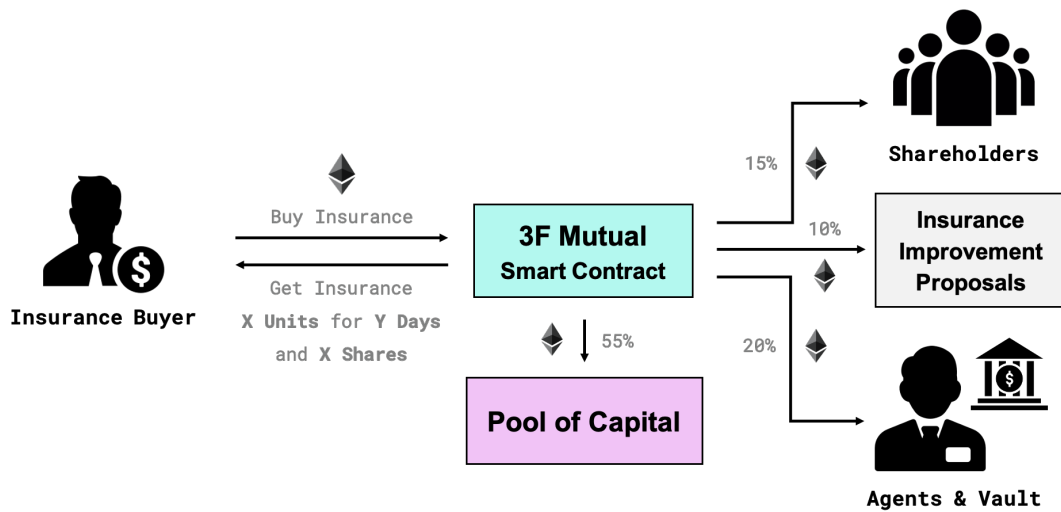
The insurance fees of each purchase would be distributed in the following proportions:

DESTINATION	PROPORTION	NOTE
Dividends	15%	Equally distribute to all shareholders
IIP	10%	Reserve for Insurance Improvement Proposals
External	20%	Allocate to insurance agent (0~16%) and vault
Pool of Capital	55%	Compensations for MakerDAO Emergency Shutdown

2.8. Insurance Improvement Proposal (IIP)

10% of the insurance fees will be deposited to an operable vault of 3F Mutual as the reserve for Insurance Improvement Proposal. The purpose of the reserve can be decided by all the HAKKA token holders through the governance system of Hakka Finance, including the development, maintenance, or upgrade of the protocol.

3. Interface Walkthrough

3.1. Dashboard
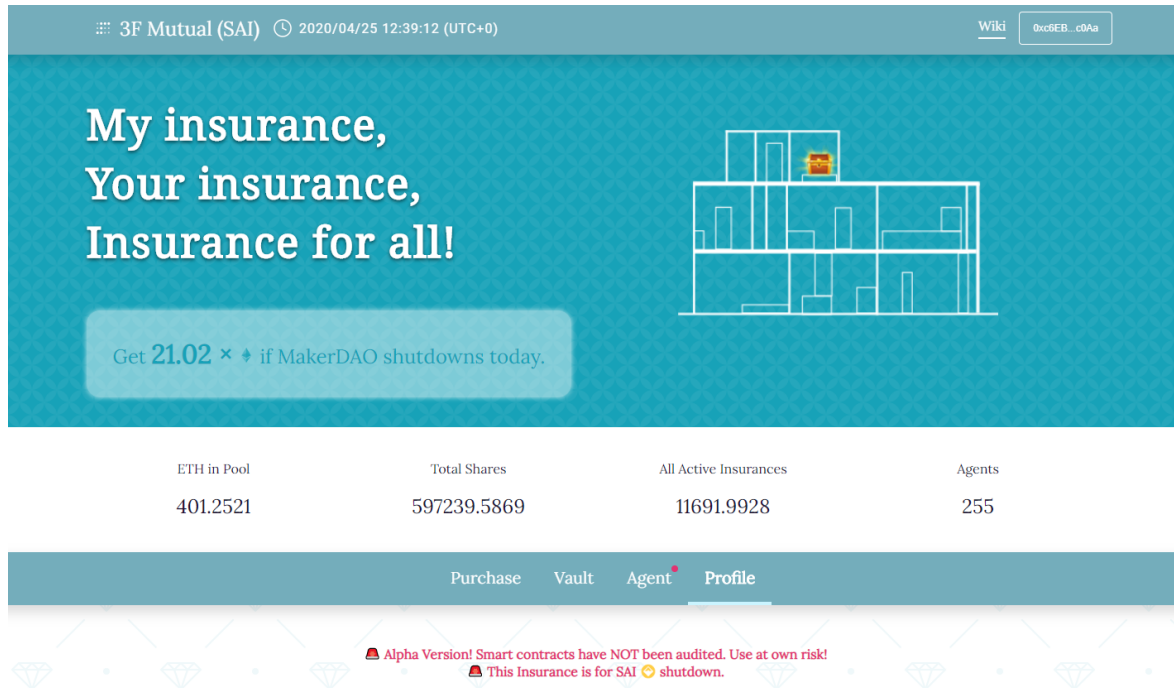
ETH in Pool
The total amount of ETH in the pool of capital, which would only increase before MakerDAO shutdowns.

Total Shares
All the shares issued to divide 15% dividends of insurance fees paid afterwards.

All Active Insurance
Active insurance means the insurance units at that very UTC day qualified for claiming compensation if MakerDAO shutdowns.
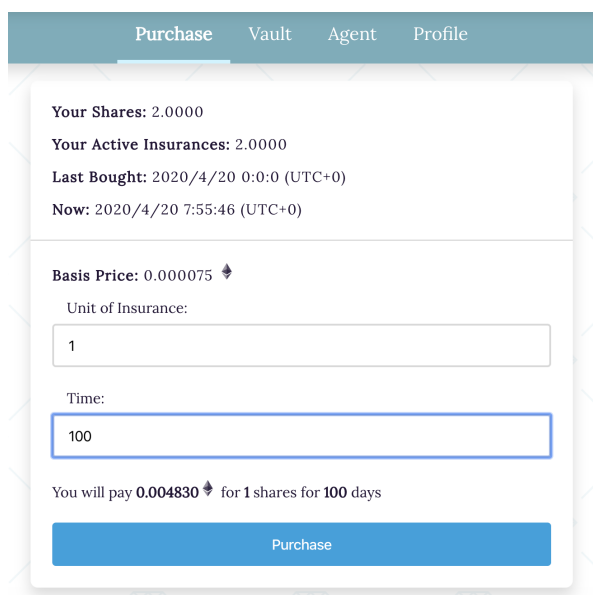
Agents
The total number of registered insurance agents.

Get **21.02** × ⧫ if MakerDAO shutdowns today.

This column shows how many times of compensation each insurance unit would receive if MakerDAO shutdowns on that day. 21.02x means if spending 1 ETH to buy insurance of today expects to get 21.02 ETH in return regardless of slipperiness.

This rate is calculated from all ETH in pool divided by active insurance units as of today.
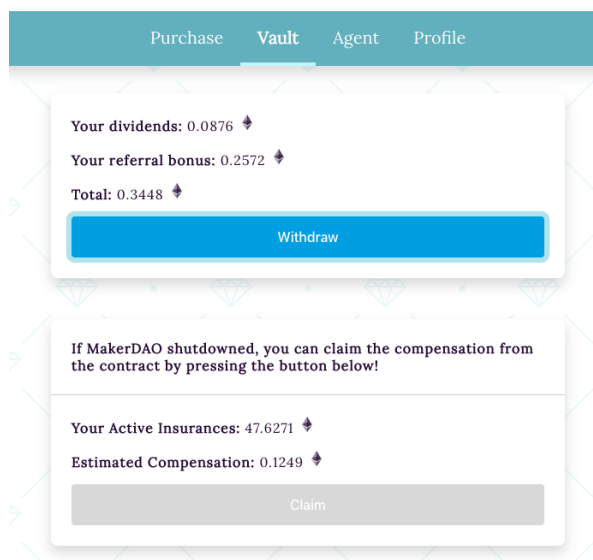
3.2.
Purchase Insurance

There are two parameters: "Units of Insurance" and "Time (insurance covered days, with upper bound of 100 days)" on the page of "Purchase."

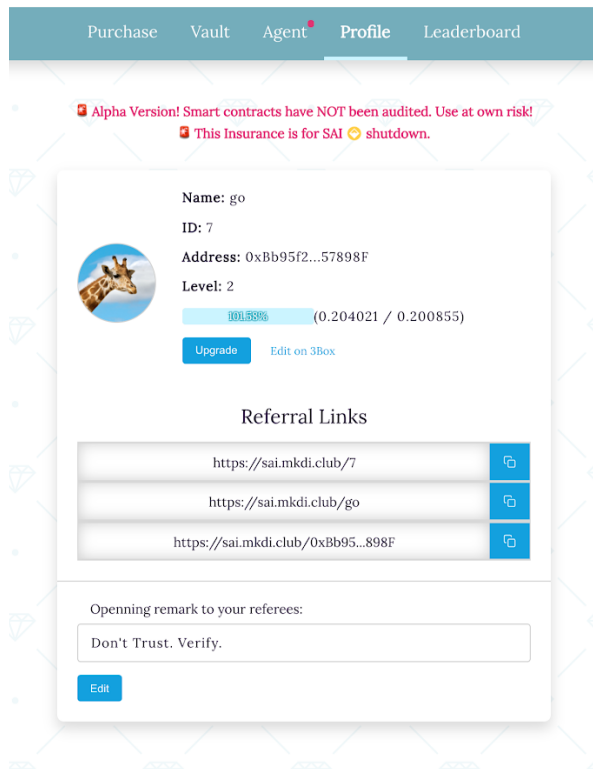Insurance fees would be automatically calculated after parameters inputted.

3.3.
Claim Compensation

Dividends as the shareholder and bonuses from promoting insurance as the agent would be allowed to withdraw on the page of "Vault."

While MakerDAO shutdowns, here is the place to claim compensation if you are holding active insurance units.

3.4.
Insurance Agent

Agent registration is available at the "Profile" tab. There will be a bar showing the accumulated bonuses of the agent. Once specific requirements are reached, click the "Upgrade" button to go up to the next level and unlock a higher commission percentage.

Connect to the 3BOX protocol and edit your profile picture and opening remark.

Three referral links with the same effectiveness are made for different occasions.
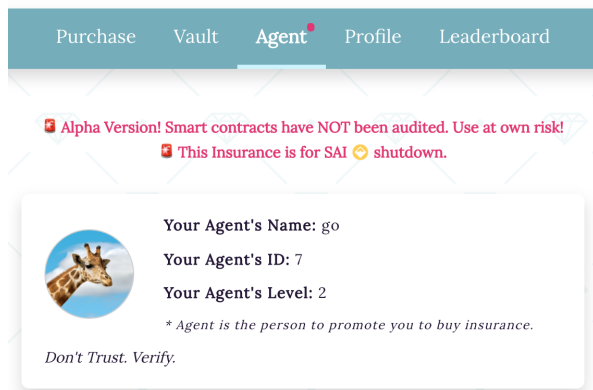
While visiting 3F Mutual via referral links, information about your agent will be shown on the "Agent" tab. Whenever you purchase some insurance, some bonuses will be delivered to your agent.

4. Summary

In general, 3F Mutual is the insurance that would compensate insurance buyers with the pool of capital while MakerDAO Emergency Shutdown occurs. Features are concluded as below:

- 3F Mutual is a rainy day fund underwriting insurance with capital collected from sunny days.

- Insurance fees are calculated by a formula that provides a greater discount if more days are covered in a single purchase.

- If MakerDAO shutdowns during the time covered by insurance, insurance buyers can claim for compensation with their insurance units by proportion.

- Insurance buyers will receive the same amount of insurance units and shares; shares will NOT expire.

- While later insurance buyers purchase, early insurance buyers will receive dividends, and their shares are diluted contingently.

- Referring to the insurance mechanism in the real world, anyone can become an insurance agent of 3F Mutual to earn bonuses through the promotion system.

5. Glossary of Terms

- **Applicant:** You. The player of the game. Precisely, an Ethereum address interacting with our contracts.

- **Agent:** A applicant who registers one or more names. When one becomes an agent, they can use the referral links to invite other applicants.

- **Share:** The tickets of the game. An applicant with share receives dividends from other applicants when they also buy a share. Unlike insurance, they don't expire upon purchase.

- **Pool:** Asset stored in the contract for compensation. Will only be used to pay the applicant.

- **Emergency Shutdown:** DAI Stablecoin System totally shutdowns. A one-time event that only takes place when Maker governance crashes.

6. References

[1] Nexus Mutual: https://nexusmutual.io/

[2] Opyn Insurance: https://opyn.co/

[3] DeFi Pulse: https://defipulse.com/

[4] MakerDAO blog: https://blog.makerdao.com/introduction-to-emergency-shutdown-in-multi-collateral-dai/

[5] Compound Finance: https://compound.finance/

[6] Curve Finance: https://www.curve.fi/