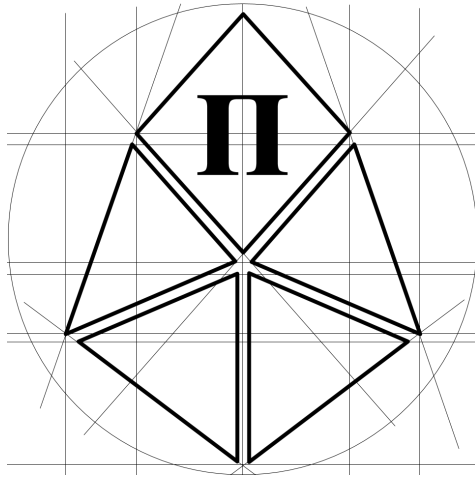


PIEOS

PIE, crypto-backed stablecoin providing interest-bearing savings accounts and optional privacy-protecting transaction features on EOSIO blockchain



Whitepaper

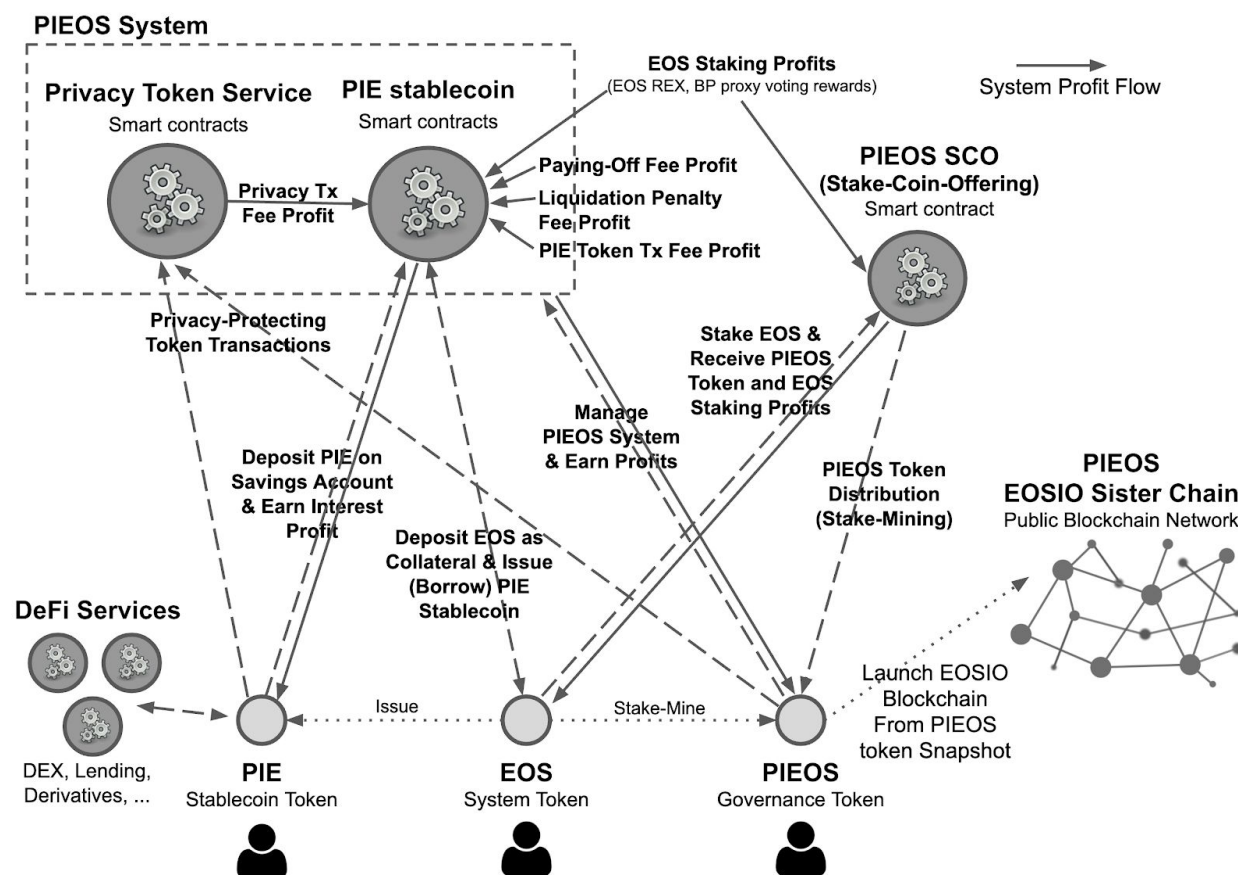
Apr. 29, 2020 - (DRAFT) v0.9.1

June 15, 2020 - v1.0

<https://pieos.io>

PIEOS Builders

PIEOS Overview



[Figure 1] PIEOS System Overview

The PIEOS smart contracts system implements crypto-backed stablecoin and optional privacy token transaction service on the EOS Public Blockchain. EOS (native system token) holders can issue (borrow) USD-pegged PIE stablecoins by locking EOS as collateral. The total supply of PIE stablecoin should be fully backed by the on-chain crypto collateral funds (EOS) without the counterparty risks of IOU-type stablecoins (e.g. USDT), through the automatic liquidation of loan positions having insufficient collateral value according to the collateral price feed from price-oracles. Privacy-protecting token transfer service for the PIE and PIEOS governance tokens implements the Monero-style privacy technology (ring-signature, one-time stealth address, bulletproofs) as the smart contracts in EOS blockchain. Privacy token functions are optional features designed to comply with crypto-currency travel rules as much as possible (e.g. limiting privacy-protecting token transfer amount for accounts without KYC). PIE stablecoin can be deposited to the on-chain PIE savings account service to gain stable and profitable interest earnings. PIEOS system is designed to maximize the interest-earning rate of PIE savings account service by distributing the large portion of PIEOS on-chain system profits from various

sources of system revenue such as EOS staking profits from the locked EOS collaterals, PIE stablecoin paying-off fee (loan interest), liquidation penalty fee from liquidated PIE loan positions, privacy-protecting token transaction fee and transaction fee for large-amount PIE token transfer. The crypto-backed PIE stablecoin yielding high savings interest rate is expected to be a core underlying asset for other EOS DeFi services like DEX, lending services and derivatives. PIEOS governance token holders can manage the PIEOS system in a decentralized manner by participating in the governance votings, and can make the profits from a portion of PIEOS system revenues and increasing value of PIEOS ecosystem. PIEOS community will launch a DeFi-centric EOSIO-based public blockchain from the snapshot of PIEOS token distribution after establishing a good PIEOS ecosystem on EOS mainnet. The PIEOS governance tokens will be distributed through the PIEOS SCO (Stake-Coin-Offering) token distribution process, where EOS holders who stake their EOS tokens (or proxy-vote to PIEOS BP-voting proxy account) can receive PIEOS tokens without spending their crypto asset.

SCO (Stake Coin Offering) of PIEOS Governance Token

PIEOS is a utility token representing the right to participate in governance of the PIEOS ecosystem by voting on the decentralized managerial control for the PIEOS smart contracts system on EOS mainnet. PIEOS owners can benefit from the increasing value of the PIEOS ecosystem and the on-chain profits generated by PIEOS smart contracts operations. It is planned to snapshot the PIEOS token distribution at some future point to launch a DeFi-centric EOSIO sister chain in which PIEOS tokens are used as the native system utility token.

PIEOS tokens will be distributed on the EOS mainnet to as many PIEOS-supporting community members as possible in a fair and transparent manner without selling the token, i.e. no ICO fundraising. The PIEOS token will be issued and distributed to the EOS token holders staking their EOS tokens to the PIEOS Stake-Coin-Offering (SCO) smart contract (or proxy-voting to the PIEOS BP-voting proxy account, receiving less PIEOS tokens compared to EOS staking) guaranteeing the underlying EOS staking profits (EOS REX lending profits + BP proxy-voting rewards, excluding PIEOS system operation costs) to be returned to the staking participants. EOS token holders can get the newly-issued PIEOS tokens proportional to their SCO-staked EOS token amount and the staking time span, inversely proportional to the total amount of EOS tokens being staked by all SCO participants. Anytime, PIEOS SCO participants can unstake and withdraw their staked EOS tokens (after EOS rex maturity time). PIEOS SCO is scheduled to proceed for one year period, every day the same amount of new tokens will be issued and distributed. Once the EOS-backed stablecoin (PIE) implementation is released on EOS mainnet, the collateralized EOS tokens on the PIE stablecoin smart contract will be also

regarded as SCO staking participation and equally eligible for the PIEOS token offering until the end of PIEOS SCO.

PIE, Crypto-backed USD-pegged Stablecoin on EOS Mainnet

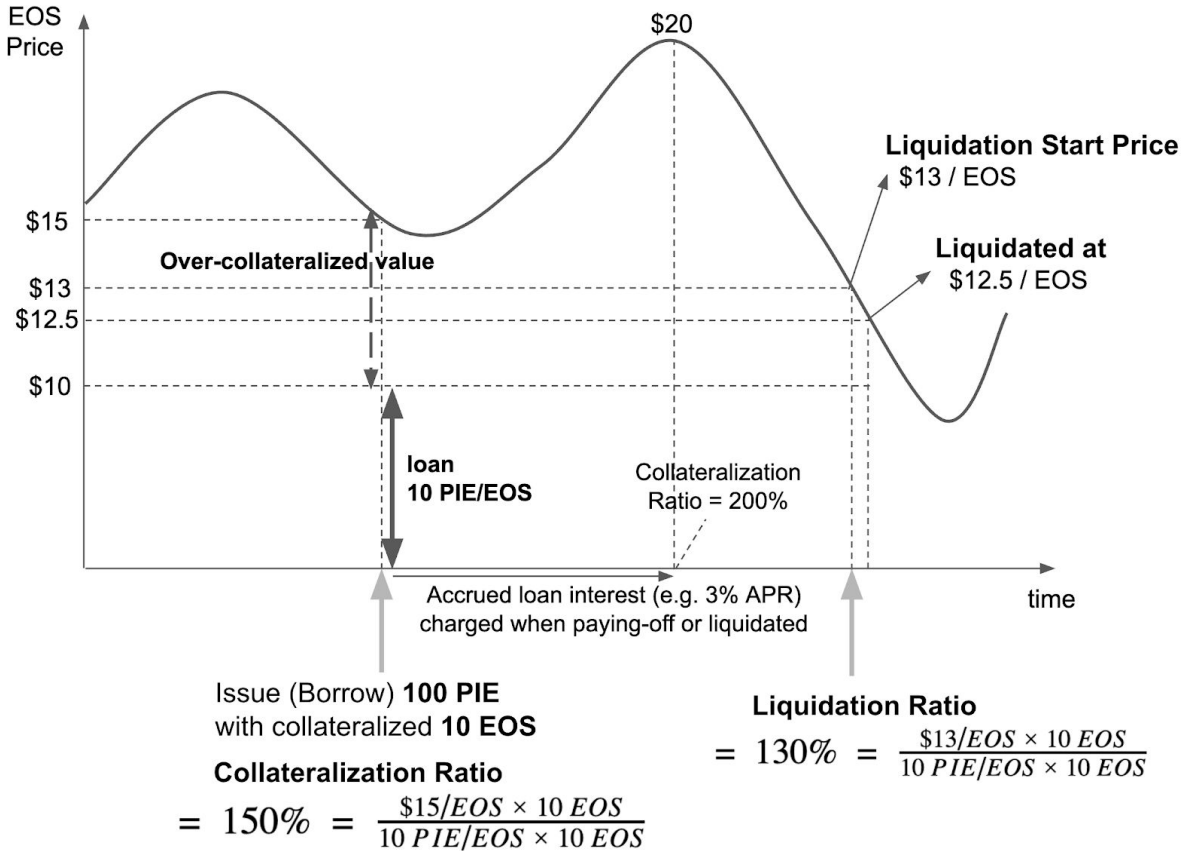
A simple way to create USD-pegged stable cryptocurrency is issuing IOU tokens backed by the same amount of off-chain USD funds held by a trustable entity guaranteeing the 100% redemption of the total circulating IOU tokens to real USD funds. USDT issued by Tether company is currently the most popular stablecoin in crypto markets. But, IOU-style stablecoins have inherent counterparty risk of centralized IOU token issuers.

Blockchain and smart contract technology (EOS public blockchain is the most advanced and scalable smart contract platform) enabled decentralized programmable money and opened a new horizon of DeFi (Decentralized Finance). The safe and sound USD-pegged stablecoin can be issued through smart contract code on blockchain with no dependency on any external centralized issuer and backing fiat funds. The issued crypto-backed stablecoins are fully backed by the blockchain-native cryptocurrencies as collateral, and operated only through the transparent and reliable smart contract code. PIEOS smart contracts issue and circulate the EOS(native system token)-backed USD-pegged PIE stablecoin. 1 PIE token is pegged to 1 USD value. A EOS native token holder can issue (borrow) as much PIE USD token as the holder wants within his/her over-collateralized EOS token value denominated in USD. The issued USD-pegged PIE tokens have many utilities.

- Used to buy other cryptocurrencies (leveraged investment) in on-chain DEX services or external crypto currency exchanges where PIE is listed
- Used as a financial asset in other DeFi services, e.g. lending PIE to earn interest, participating in derivatives market
- Deposited to an on-chain PIEOS Savings Account to earn PIE(USD)-denominated interest
- Used as a means of USD-denominated payment to merchants accepting PIE stablecoin

Anytime the PIE issuer (borrower) can pay off his/her EOS-backed PIE loan position by returning the issued (borrowed) amount of PIE and redeeming the collateralized EOS funds. Then the returned PIE tokens are burned. When the PIE loan pay-back happens, the loan interest should be paid by the borrower to the stablecoin contract, collected as PIEOS system profits which are distributed to PIEOS token holders and the interest-giving source pool for PIE savings accounts. The loan interest (1%~3% APR) (pay-off fee proportional to the loan time span) can be paid from the EOS staking profits of EOS collateral or the EOS collateral itself

(liquidation case) or by the explicit fee payment summed in the paying-off PIE token amount according to the governance decision from PIEOS holders.



[Figure 2] Issuing, paying-off and liquidation of EOS-collateral backed USD-pegged PIE stablecoin

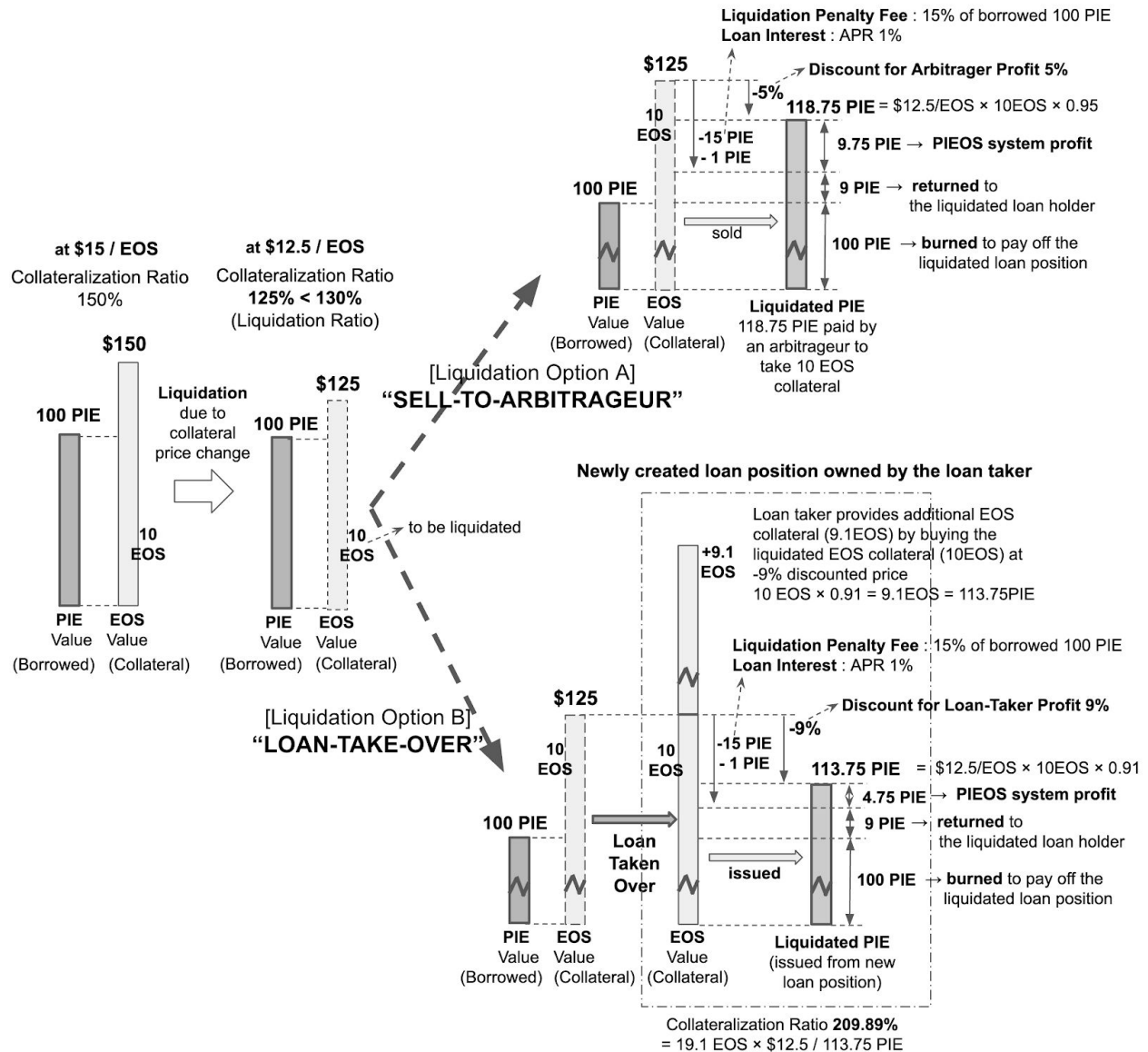
Multiple price oracles operated in a decentralized manner continuously (PIEOS will integrate external oracle services) feed the EOS token prices in USD from external cryptocurrency exchanges to the PIE stablecoin smart contract assessing the current value of collateralized EOS funds of each loan position. The EOS-collateralized PIE loan holder can add more EOS collateral or partially pay back PIE tokens to make the active loan safe. If smart contract code finds any loan positions holding insufficient collateral value,

$$\text{Collateralization Ratio} \left(= \frac{\text{Collateral Value}}{\text{Issued PIE token value}} \right) < \text{Liquidation Ratio} (130\% \sim 150\%)$$

, due to the collateral price change, the smart contract code will automatically liquidate the loan position. Then, the liquidated loan holder doesn't need to return the borrowed PIE stablecoins, but will lose the ownership of the most part (usually not whole) of his/her locked EOS collateral.

The liquidation penalty fee (15%~20% of the issued PIE token value), the unpaid loan interest and the originally issued PIE token value are deducted from the liquidated collateral. In the PIEOS stablecoin system, there are two options for how the unlocked EOS collateral from an insufficiently-collateralized loan position is liquidated, i.e. converting the liquidated collateral to PIE stablecoin funds for paying off and closing the liquidated loan position. The one liquidation option named 'SELL-TO-ARBITRAGEUR' is that, any arbitrageur (including the system itself) seeking for immediate arbitrage trading profits (by selling the collateral in on-chain DEX services or external crypto exchanges) can take the liquidated EOS collateral at a discounted price (-3%~6%) cheaper than the current oracle-fed collateral price by paying the discounted PIE token amount to stablecoin smart contract. The other liquidation option named 'LOAN-TAKE-OVER' is that, anyone (including the system itself) can take over the liquidated loan position from the liquidated loan holder by providing additional EOS collateral whose amount is at the discounted (-5%~-10%) price from the liquidated EOS collateral amount. The loan taker now gets to own the new loan position holding the liquidated EOS collateral plus the newly provided EOS collateral. From the new loan position, the new PIE tokens are issued, the issued amount should be equal to the discounted price of the liquidated EOS collateral. (Figure 3) The new loan position is locked for a predefined period to prevent immediate paying-off. The PIEOS system incentivises 'LOAN-TAKE-OVER' than 'SELL-TO-ARBITRAGEUR' by allowing more profitable discount rate for 'LOAN-TAKE-OVER', because 'LOAN-TAKE-OVER' option doesn't reduce the overall system-locked EOS collateral amount and the total circulating supply of PIE tokens. Once the liquidated EOS collateral is converted to PIE tokens by either of the two liquidation options, the originally issued PIE token amount from the liquidated position is burned, the liquidated loan holder's portion is returned and the remaining amount is saved as system profits. When the liquidated collateral fund size is too big to be liquidated by one 'arbitrageur' or 'loan-taker', the big collateral fund will be chunked into smaller partitions which can be taken by multiple participants. (mixed liquidation options are allowed for a liquidated loan position) If the liquidation is not properly executed until the EOS collateral price goes down below the issued PIE token value on loan positions, these cases lead to the system loss. The system loss will be covered by surplus system profit or the portion of PIEOS governance token reserved as a stability fund. By these mechanisms implemented on the PIEOS stablecoin smart contracts, the total value of circulating PIE stablecoins are fully covered by the total value of crypto collaterals.

The portion of PIEOS system profits allocated to the PIEOS token holders is sold to any PIEOS holder at a discounted price and the received PIEOS tokens will be burned permanently to reduce PIEOS circulation, making the PIEOS token deplationary.



[Figure 3] Liquidation of a PIE stablecoin load position having insufficient collateral value ("SELL-TO-ARBITRAGEUR" and "LOAN-TAKE-OVER" options)

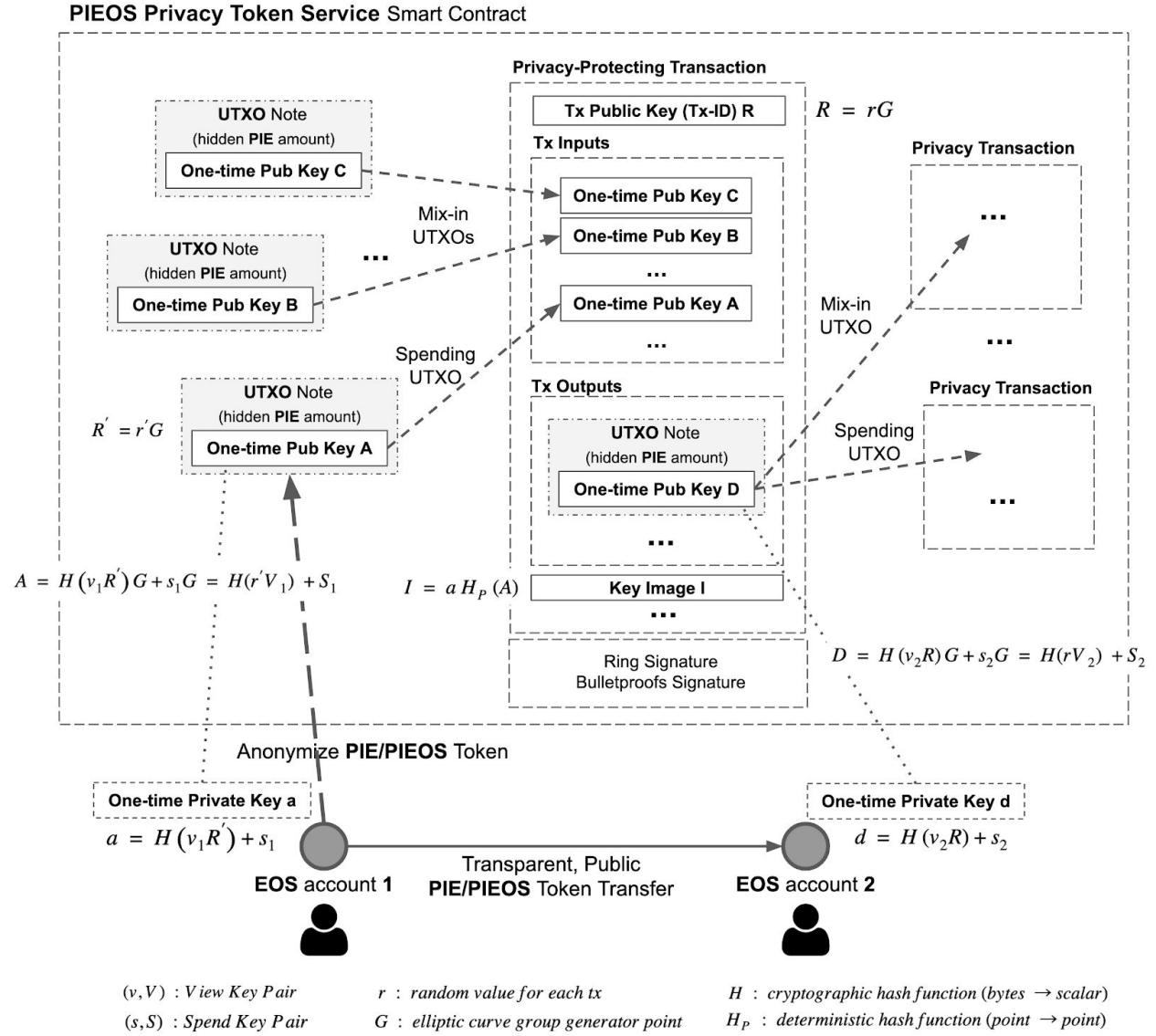
Figure 2 and 3 show an example of issuing (borrowing) 100 PIE with collateralized 10 EOS at a price of \$15/EOS. With 130% liquidation-ratio, the loan position in the example is liquidated at the price of \$12.5/EOS. Figure 3 illustrates two liquidation options (SELL-TO-ARBITRAGEUR, LOAN-TAKE-OVER) with 15% liquidation penalty fee rate, 5% discount rate for the arbitrageur and 9% discount rate for the loan-taker. The PIEOS system parameters like liquidation-ratio, loan interest rate, discount rates for arbitrageurs and loan-takers are managed by PIEOS governance token holders to keep the PIEOS system secure and stable.

The initial PIEOS stablecoin implementation will provide the EOS-backed USD-pegged stablecoin first, but it is also planned to provide multiple collateral types and pegging to other currencies or assets, e.g. PIEOS-backed PIE, VOICE-backed PIE, EOS-backed GBP-pegged stablecoin, BTC/ETH/TELOS-backed PIE (by integrating inter-blockchain token pegging techniques), and even the EOS-backed BTC-pegged coin is possible using EOS/BTC oracle price feed.

Optional Privacy-Protecting Transactions of PIE and PIEOS Token

Privacy is a requirement for a viable financial system. Every fund(token)-transfer transaction of an account is transparently traceable on public blockchains like Bitcoin. Once the identity of the blockchain account owner is revealed to the public or his/her friends, people can view the full history of the account owner's financial transactions. There are independent public blockchain networks like Monero and Zcash providing the private transactions on its blockchain core. Blockchain-based smart contract platforms (especially EOSIO blockchains) have rapidly evolved to provide a highly performant and scalable computing environment making it possible to implement computation-intensive privacy token transactions as an embedded smart contract code in a public blockchain without operating a siloed blockchain network. Privacy token in a smart contract platform can be seamlessly integrated with the other on-chain tokens and services.

PIEOS smart contracts provides the optional privacy-protecting token transfer feature for the PIE stablecoin and the PIEOS governance token. Crypto-backed stablecoin with the privacy-protecting feature can be used as an secure alternative electronic-cash not revealing the whole transaction history of payment participants without centralized entities (e.g. IOU issuer and token-mixing service) having counterparty risks. The PIEOS system charges transaction fees for the PIE/PIEOS private token transfers. The on-chain private transaction fee is another sound source for the PIEOS token holders profits and the savings-interest distributed to the on-chain PIE stablecoin savings(staking) accounts. Privacy-protecting token transaction features will be implemented to comply with the crypto-currency travel rules as much as possible by collecting the opinions from the PIEOS community. For example, privacy token features can be designed to allow only small-amount token transfer transactions to be executed by accounts for which KYC processes have not gone through.



[Figure 4] PIEOS Privacy-Protecting Transaction

PIEOS system implements the Monero-style privacy token transaction technology conformed to the EOSIO blockchain protocol as listed below.

- UTXO(Unspent Transaction Output)-based token model for private transactions
- Using two public keys combined (View-Key, Spend-Key) as the public payee address for private transactions. The authorizations for viewing the incoming(token-receiving) private transactions and privately spending the received UTXO notes can be separate.
- One-time stealth-address using ECDH(Elliptic Curve Diffie–Hellman) key exchange technique to hide the token receiver. Each untraceable one-time public-key address is

unique for each UTXO note, and only the token receiver can identify the ownership of the UTXO.

- Implementing MLSAG (Multilayered Linkable Spontaneous Anonymous Group signature) ring-signature for hiding token sender (mixing fake senders) and preventing double-spend (using linkable Key-Image)
- Small footprint Bulletproofs signature for hiding token transfer amount
- Private transaction relay to hide EOS transaction sender consuming EOS resources (CPU, NET, RAM, DISK). Receiving the privacy transaction message signed by the private UTXO note owners, the off-chain relay service adds its signature to the transaction message and submit transactions to EOS network on behalf of the private token sender.
- secp256k1, secp256r1, ed25519 elliptic curve support
- Client wallet software (CLI, Desktop, Mobile) generating private transaction signatures and monitoring private transactions on PIEOS smart contract to identify incoming (token-receiving) private transactions

Interest-Bearing PIE Savings Account

In a DeFi ecosystem, a stablecoin giving high-yield interest can be a core underlying asset that incentivizes building flourishing DeFi services utilizing the stablecoin, which creates a virtuous cycle of capital inflows. In the rapidly growing Ethereum DeFi ecosystem, the Dai stablecoin of Maker Protocol generating high-yield interest (4~8% APR USD interest, changing by governance voting) through the DSR(Dai Savings Rate) staking service has attracted many DeFi users and capital inflows on Ethereum public blockchain. Many Ethereum-based DeFi services such as crypto-lending protocols, DEX services and derivatives markets are leveraging the benefits of the interest-bearing Dai stablecoin. And, the crypto-backed stablecoin giving interest earnings can be a very attractive alternative to the traditional interest-bearing savings account, appealing to everyone not only to cryptocurrency early adopters.

PIE stablecoin holders can earn interest by locking (saving/staking) their PIE token balance on the PIEOS stablecoin system. The PIEOS stablecoin system is designed to maximize the interest rate of the PIE savings account. The source of the interest is the on-chain service profits generated from the PIEOS smart contracts service operations.

- EOS staking profits (EOS REX, BP proxy voting rewards, APR 2~3% in EOS) of collateralized EOS tokens for PIE stablecoin circulation
- PIE stablecoin paying-off fee (loan interest) accrued for the loan timespan (APR 1~3% of issued PIE amount)
- PIE stablecoin liquidation fee charged to the liquidated loan positions having insufficient collateral value (15~18% of issued PIE amount excluding liquidator (arbitrageur, loan-taker) profits)
- Private transfer transaction fee of PIE stablecoin and PIEOS governance token, Large amount transfer fee of non-private PIE stablecoin transactions
The more token transactions occurs, the more profits PIEOS system earns
- Any possible on-chain services generating on-chain profits which will be developed by additional efforts from the PIEOS community

The large portion of the PIEOS system profits listed above is accumulated to the interest pool for PIE token savings accounts to support the high-yield interest rate. And the remaining portion of the profits belongs to the PIEOS governance token holders. The interest-bearing PIE stablecoin is expected to boost the sound EOS DeFi ecosystem leveraging the PIE stablecoin as an underlying asset for DeFi services.

Plan for DeFi-centric EOSIO Sister Chain Launch

The EOSIO open source software is designed to be the top-notch general purpose blockchain node engine with which various types of blockchain networks can be launched and operated. The future created by the EOSIO software is multiple blockchain networks interconnected with each other network through standardized inter-blockchain communication (IBC) protocols. A DeFi-centric EOSIO sister chain, the PIEOS public blockchain will be launched by the PIEOS community after the PIEOS governance token distribution is completed through one year period PIEOS SCO(Stake Coin Offering). The PIEOS blockchain network will use the PIEOS governance token as native system token by snapshotting the PIEOS token distribution on EOS mainnet. The PIEOS token will have utilities to consume the PIEOS network resources (CPU, NET, RAM, DISK) to execute blockchain transactions and to have voting power for the PIEOS public network governance such as electing block producers, blockchain system upgrade and system parameter management and so on. The PIEOS blockchain network will natively provide the crypto-backed stablecoin service, the oracle service integration, inter-blockchain communication features (e.g. IBC token pegging) and privacy-enabling functions on its

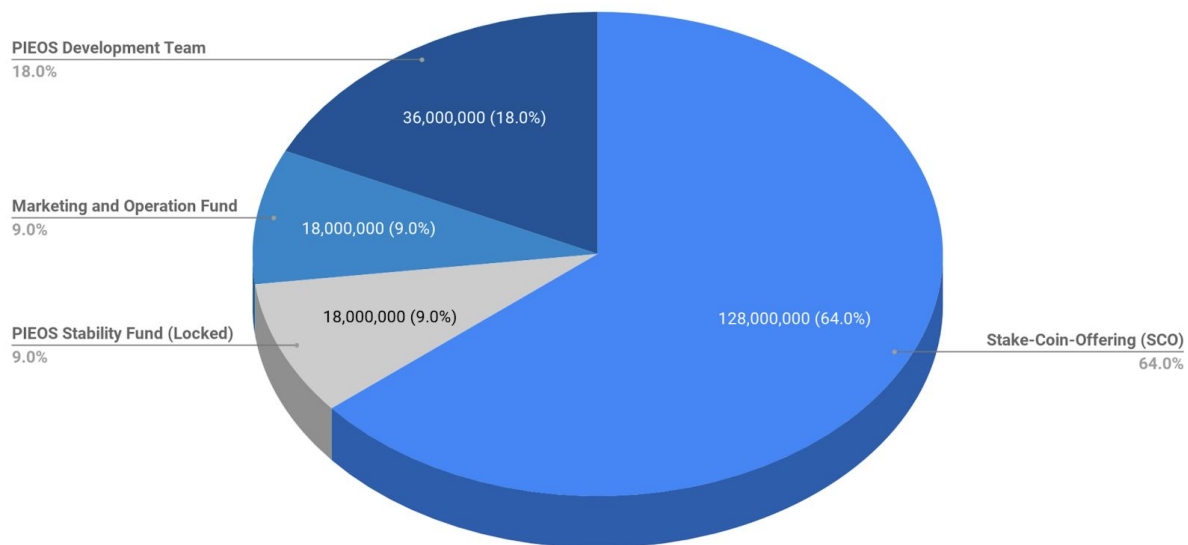
blockchain core and system-contract layer as a DeFi-ready blockchain network. When the PIEOS blockchain network is launched, airdropping additional PIEOS system tokens to Bitcoin owners (to Bitcoin's UTXO-owning secp256k1 public-key addresses) is planned to attract the Bitcoin users to involve in the EOSIO-based DeFi platform expecting the Bitcoin users and funds inflow through IBC token pegging.

Running EOS Mainnet Block Producer

The PIEOS system is expected to get a sizable amount of delegated voting power from the locked EOS collateral tokens on PIE stablecoin system and the staked/proxy-voted EOS tokens on SCO(Stake-Coin-Offering) smart contract. The PIEOS community will announce EOS block producer candidacy as the PIEOS SCO gathers a decent amount of EOS voting power delegated from the EOS-staking and proxy-vote-staking PIEOS community members. To secure more profit sources of the PIEOS system on EOS mainnet, which will be distributed to PIE savings accounts and the PIEOS community, a portion of delegated voting power pooled to the PIEOS system can be used to vote to the PIEOS block producer. PIEOS community will be dedicated to contribute to build the healthy DeFi ecosystem on EOS public blockchain. PIEOS community developers will continue to focus on research and development to implement high-quality DeFi technology and services on the EOS blockchain network on behalf of the EOS ecosystem.

PIEOS Token Distribution

Total Supply : ~ 200,000,000 PIEOS (Circulating Supply < 182,000,000 PIEOS)



[Figure 5] PIEOS Governance Token Distribution

- **Stake-Coin-Offering (SCO)** - 128,000,000 PIEOS (64%) (70%+ of circulating supply)
The most portion of the total PIEOS token supply will be distributed to EOS holders who stake their EOS tokens in the PIEOS SCO smart contract or deposit their EOS tokens as collateral to issue PIE stablecoins. The token amount received by a SCO participant will be proportional to his/her staked EOS amount and staking timespan, and inversely proportional to the total staked EOS amount.
- **PIEOS Stability Fund (Locked)** - 18,000,000 PIEOS (9%)
Locked and not circulating. It is reserved for covering the system loss resulting from the emergency situation such as sharp collateral price collapse, capital leak by system malfunction or exploitation by hackers.
- **Marketing and Operation Fund** - 18,000,000 PIEOS (9%)
Reserved for marketing activities (listing PIE/PIEOS token to crypto exchanges, writing news articles and blogs, promotion video production, influencer marketing) and funds used for system operations (buying EOS resources, running servers and EOS nodes), The unused funds will be burned after the end of SCO token distribution period.
- **PIEOS Development Team** - 36,000,000 PIEOS (18%)

Distributed to the PIEOS founders and development team contributing to the PIEOS system implementation. The PIEOS Development Team's share will be gradually unlocked until the end of SCO period.

When launching the PIEOS blockchain network, airdropping PIEOS tokens (~20M PIEOS) to Bitcoin address snapshot is planned to attract the Bitcoin users and funds to the DeFi services of PIEOS public blockchain network.

PIEOS Project Roadmap

- May, 2020 - Founding PIEOS Builders
- July 15, 2020 - Starting PIEOS SCO (Stake-Coin-Offering) on EOS Mainnet (for 1 year)
- Q4, 2020 - Deploying the PIE Stablecoin System on EOS Mainnet
- Q2, 2021 - Deploying the Optional Privacy-Protecting Token Transaction System on EOS Mainnet
- July 15, 2021 - End of PIEOS SCO Token Distribution
- Q4, 2021- Launching PIEOS Public Blockchain Network

DISCLAIMER: The PIEOS whitepaper represents the current plan for the PIEOS system design and is subject to change without notice. Any statement in this document should not be interpreted as a statement having legal force or promise to do something. This document is written to share the current thought for the PIEOS system design and plan with the EOS and PIEOS communities.