Poster Abstract: Multisignatures for Cryptocurrency-Backed Tokens*

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Despite the influx of new cryptocurrencies and academic research on distributed ledgers, communication between permissionless blockchains is mostly facilitated using centralized liquidity providers, or exchanges.

Recently, XCLAIM, a protocol for issuing, trading and redeeming cryptocurrency-backed tokens was introduced as a mechanism for trustless blockchain interoperability by Zamyatin et al.[7]. Thereby, users lock units a of a *backing* cryptocurrency A, e.g. Bitcoin [5], with an non-trusted and collateralized third party (the *Issuer*) and create the equivalent amount of tokens a_b on an *issuing* cryptocurrency B, e.g. Ethereum [4]. To redeem a_b for the corresponding amount of a on chain A, users must destroy or *burn* the tokens in a publicly verifiable manner on chain B. The scheme leverages hashed time-lock contracts [1] on the backing blockchain, as well as chain relays [6] (e.g. BTC Relay [2]), collateral and smart contracts on the issuing blockchain, i.e., requires (near) Turing complete programming capabilities on chain B. While the Issuer maintains full control of the locked cryptocurrency units a for the duration of the protocol, XCLAIM guarantees that in case of Byzantine or crash failures of the Issuer, the victims will be reimbursed the equivalent monetary value of their loss from the Issuer's collateral on chain B.

In this extending work, we discuss how multisignatures can be used to further improve the safety properties of the XCLAIM protocol, preventing theft of locked units of the backing crpyptocurrency altogether, at the costs of reduced performance. Specifically, instead of cryptographically transferring ownership of units a of the backing cryptocurrency to the Issuer, a is locked using e.g. a multisignature output in Bitcoin [3]. This prevents the Issuer from withdrawing the locked a without the user's consent (i.e., stealing), while the user still cannot withdraw the funds before burning a_b. The improved safety, however, makes trading of a_b more complex, as transfer of token ownership on chain B must now be mirrored on chain A: if Alice wants to transfer a_b to Bob, she must replace herself with Bob in the multisig on A. To this end, she must create and sign a transaction $T_{replace}$ updating the state of the multisiganture and present it to both Bob and the Issuer in a publicly verifiable manner, e.g. by uploading the transaction as data on chain B. In the presented poster, we outline the multisignature version of the XCLAIM protocol and discuss possible improvements in terms of performance, cost reduction and privacy. Finally, we discuss the current disadvantages of using multisignatures and give an outlook on their applicability in future extensions of XCLAIM using off-chain payment channels.

* This works extends upon the recently introduced XCLAIM protocol for cryptocurrency-backed tokens [7].

References

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*An extension of the XCLAIM protocol. Scan QR-code to read the XCLAIM paper

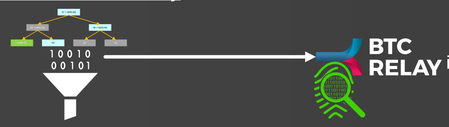
XCLAIM: Cryptocurrency-backed Tokens

In three steps to interoperability (E.g. Bitcoin-backed tokens on Ethereum)

1) Lock with Issuer

ISSUER (Non-trusted & collateralized 3rd party)

2) Prove lock to `Chain relay`

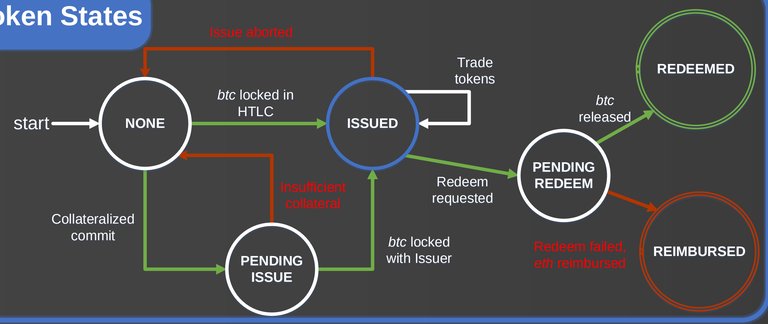


`Chain relay` verifies TX inclusion proof and informs `treasury`

3) Issue tokens

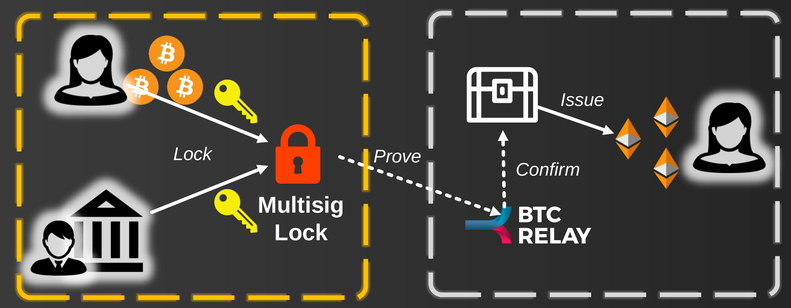
`Treasury` contract issues Bitcoin-backed ERC20 tokens

Token States



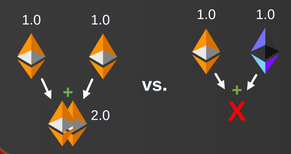
Multisignature Locks: Improving Safety

Use Bitcoin 2-of-2 multisignatures to make **theft by the Issuer impossible**



Challenges

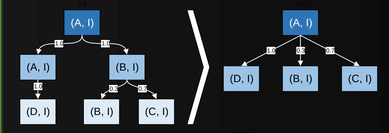
Fungibility of tokes cannot be guaranteed



Substantial amount of data stored on Ethereum

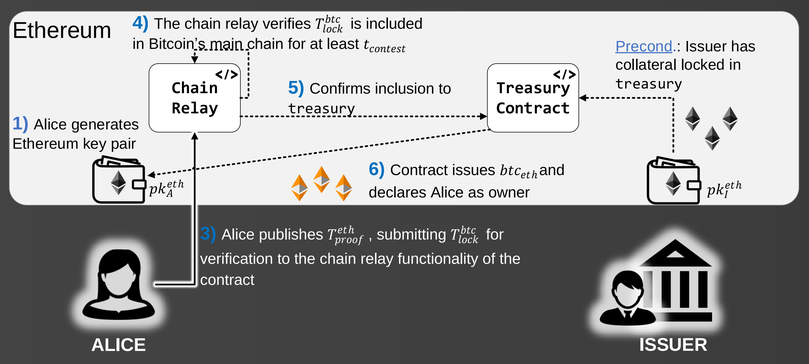
Fund freeze still possible!

Optimizations

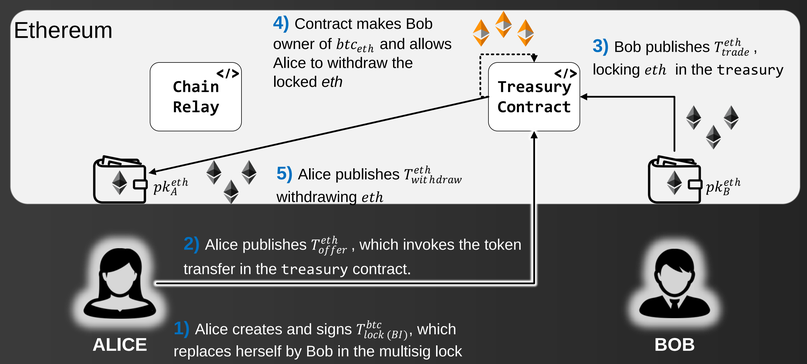
Reduce Waiting Times 	Issuer signs all TX only when token is redeemed (P2WSH - BIP141 Segregated Witness required)
Reduce Costs / Transactions 	UTXO grouping scheme: optimistic reduction of required TX to O(1). However: interactive protocol! 
Improve Incentives against fund freezing 	Additional collateral on Bitcoin: $\lvert btc^{collateral}_{ISSUER} \rvert = \lvert btc^{lock}_{USER} \rvert$

</> Protocols

Issue



Trade



Redeem