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Tainted digital evidence and privacy protection in blockchain-based systems

Abstract

Your law enforcement officer introduces a digital evidence into the chain of custody blockchain.
The court invalidates this evidence and all the attached evidence.
We show how to dismiss this tainted evidence from a blockchain which by default does not allow for alteration, deletion or cancellation.

Instead of modifying the structure of the blockchain or its purpose, **we prevent a user to access tainted evidence.**

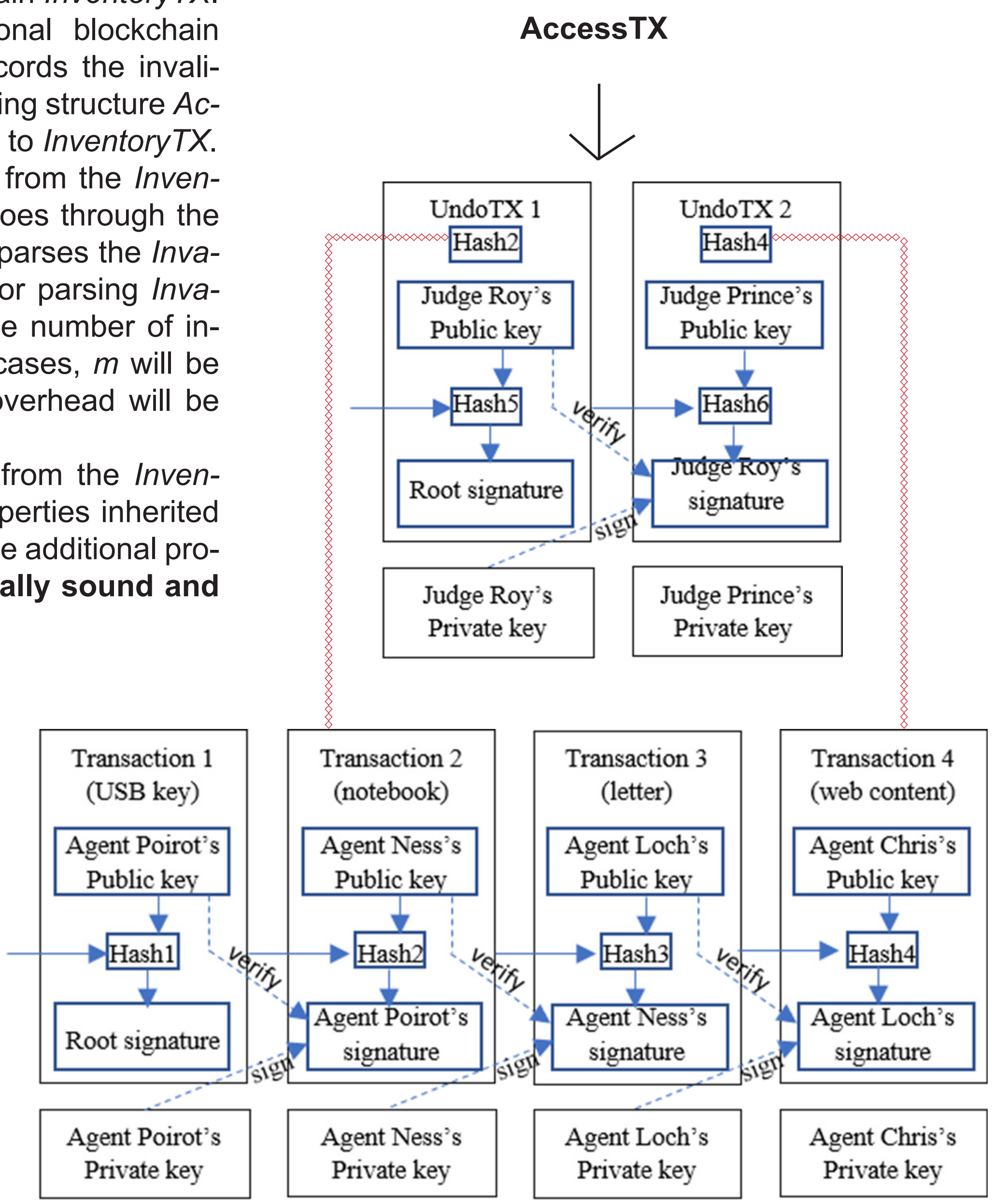
Let's name the evidence blockchain *InventoryTX*. We propose to add an additional blockchain structure, *InvalidatedTX*, that records the invalidated transactions, and a controlling structure *AccessTX* which is the access point to *InventoryTX*. In order to access a transaction from the *InventoryTX* blockchain, the request goes through the *AccessTX* access point that first parses the *InvalidatedTX* blockchain. The cost for parsing *InvalidatedTX* is *O(m)* where *m* is the number of invalidated transactions. In usual cases, *m* will be close to zero, thus the search overhead will be insignificant.
When a transaction is returned from the *InventoryTX* blockchain, it has the properties inherited from being in a blockchain, and the additional property that the **transaction is legally sound and has not been voided**.

Conclusion

In this paper, we presented a cost-effective solution for obliterating blockchain transactions from a case, in the presence of tainted evidence.
Our solution for dismissing tainted evidence does not erase the fact that the evidence was once part of the procedure, but it will prevent the use of this evidence by the parties.

Example

Transaction 2 is invalidated by Judge Roy and Transaction 4 is invalidated by Judge Prince


AccessTX
UndoTX 1
Hash2
Judge Roy's Public key
Hash5
Root signature
verify
sign
Judge Roy's Private key
UndoTX 2
Hash4
Judge Prince's Public key
Hash6
Judge Roy's signature
Judge Prince's Private key
Transaction 1 (USB key)
Agent Poirot's Public key
Hash1
Root signature
verify
sign
Agent Poirot's Private key
Transaction 2 (notebook)
Agent Ness's Public key
Hash2
Agent Poirot's signature
verify
sign
Agent Ness's Private key
Transaction 3 (letter)
Agent Loch's Public key
Hash3
Agent Ness's signature
verify
sign
Agent Loch's Private key
Transaction 4 (web content)
Agent Chris's Public key
Hash4
Agent Loch's signature
Agent Chris's Private key