

Implementation of Digital Passports using Blockchain Technology

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Abstract—In this Growing technology era, everything is possible and people are making it use in a dark manner. One of such domains is associated with Passports. Passport is a very important document , it serves as a unique identity of a person, It plays very important role in National Security. We all know without a valid and legitimate Passport we cannot travel to foreign countries. But with new technology people can tamper passport information , create fake passports and change identities in passport for dark purposes like terrorist entry and attacks, a person escaping from his/her hometown after committing crimes .So in order to resolve these loopholes in the domain . We can devalue the issuing of passports to public and use Blockchain to validate and test the integrity of passport

I. INTRODUCTION

The purpose of using Blockchain in this project is because of its inherent properties like:

1. Blockchain contains data for eternity , this means data is available for a long period of time unless all nodes in the chain crashes. This property can be used to store passport data of each user for a long time.
2. Blockchain being decentralized, Censorship of Data cannot be done and data is available in the chain even if one of the node in the chain is not working. Hence passports can be validated at any point of time , irrespective of the region and circumstances.
3. Blockchain being tamper-proof, we can leverage this property to ensure the passport's integrity is not compromised.
4. The travel history can be converted to a transaction and this data can be used for threat analysis and inspect people with suspicious activity.

II. THE SOLANA BLOCKCHAIN

We will be using Solana blockchain for our implementation because:

1. Solana Blockchain uses Rust language to interact with the chain .Rust is a very low level language like 'c' and have efficient memory and concurrency control. Hence transactions are very fast with minimum defects and very low failure rate.
2. The gas fee is very less in Solana when compared to other Blockchains like Ethereum.
3. Solana uses proof of stake and proof of history making it more faster and secure

III. A BASIC VIEW OF IMPLEMENTATION

Initially the passport Application phase is carried out as normal according to the procedures. When all information related to the passport application is validated and verified for legitimacy. The next phase comes which is to store this information on the chain. Note The passport issuing authority won't have any special privileges or access to the chain. In order to maintain confidentiality of the data on chain data is encrypted using public key encryption. The person applying for passport is required to possess a Solana Crypto-Wallet. Phantom ,Solflare are few Solana wallets which are efficient . This generated data along with its ownership will be transferred to the users wallet confirming that it was issued by the government and it was issued to this person on chain.

IV. STORING DATA ON CHAIN

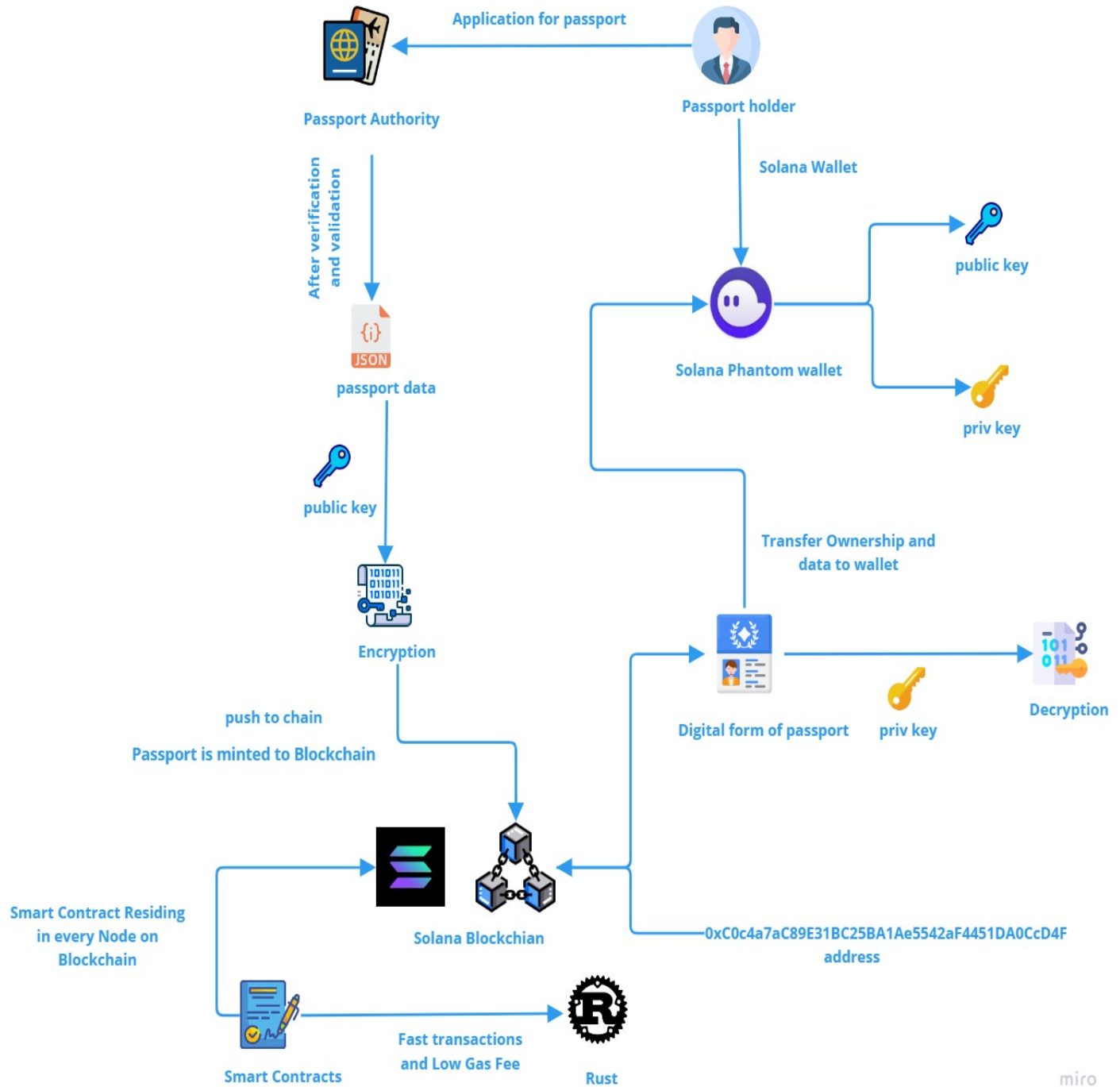
We can think this phase as creating a NFT where the NFT holds each users data. The Passport authority will have access to Solana chain so that they can mint data to the chain. basically we can imagine the users data like a json or a dictionary type data. This data will be encrypted using the passport holder's public key. So the data is now secured and confidential. We have to build a smart contract initially to interact with the chain so that we can store data , retrieve data and modify data. This smart contract is written in Rust language and it offers many functionalities for interaction with chain. The passport authority pushes these data to the chain and digitally signs this transaction meaning that the passport was minted by government and then its ownership was transferred to that particular passport holder. At this stage there is an NFT present on the user's wallet which is the encrypted data of his passport. The user can use his private keys to decrypt the NFT to view it as clear text.

V. PASSPORT VERIFICATION AT AIRPORT TERMINALS

At this stage the passport is a NFT which resides on chain and the owner of this NFT being the passport bearer. In Solana and Other blockchains every entity has an address associated with it. the addresses are a sequence of hexadecimal numbers. And using them we can find any data on the chain. So the NFT which is the passport also has an address associated with it . when we enter this address on the SolScan we get details about that NFT along with data.

A decryptor tool can be used to decrypt the passport data with private key . And this can be used for verification ,later a transaction is created to record travel history.

VI. PROCESS DIAGRAM



VII. TECHNOLOGY STACK

1. Solana Blockchain
2. Anchor framework for building rust smart contracts
3. Solana Crypto-Wallet
4. An UI for The passport Issuing Authority
5. Cryptography
6. Django , node framework
7. python ,JavaScript,rust

VIII. FUTURE SCOPE

This project's idea can be extended to build a private blockchain upon Solana where the whole passport data and transactions can be handled and Government authority can assume the part of being validators or miners on the chain.

IX. CONCLUSIONS

In this time of rapid changes in Technology many advancements are emerging and if we use them properly we can provide value service to the world. This project's goal is to minimize the problems and threats associated with Air Travel domain. And implementing this idea could open doors to handle problems in other domains as well.

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