

Plutus vs Solidity: Property Smart Contract

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Bernard Sibanda edited this page on Sep 10, 2024 · 1 revision

Solidity and Plutus Smart Contracts

Ethereum (Solidity) and Cardano (Plutus)

Combined Example: Fractionalizing Property

1. Solidity Smart Contract (Ethereum)

Key Features:

- Written in Solidity.
- Uses the ERC20 token standard.
- Functions for issuing and transferring tokens.
- Simple ownership model.

```
// SPDX-License-Identifier: MIT
pragma solidity ^0.8.0;
import "@openzeppelin/contracts/token/ERC20/ERC20.sol";
import "@openzeppelin/contracts/access/Ownable.sol";

contract PropertyToken is ERC20, Ownable {
   address public propertyOwner;
   uint256 public totalTokens;

   event SharesIssued(address indexed to, uint256 amount);

   constructor(string memory name, string memory symbol, uint256 _totalTokens) ERC20(name, s
        propertyOwner = msg.sender;
        totalTokens = _totalTokens;
        _mint(propertyOwner, totalTokens);
}
```

```
function issueShares(address to, uint256 amount) public onlyOwner {
    require(amount > 0, "Amount must be greater than 0");
    require(balanceOf(propertyOwner) >= amount, "Insufficient balance to issue shares");
    _transfer(propertyOwner, to, amount);
    emit SharesIssued(to, amount);
}

function sellShares(address from, address to, uint256 amount) public onlyOwner {
    require(amount > 0, "Amount must be greater than 0");
    require(balanceOf(from) >= amount, "Insufficient balance to sell shares");
    _transfer(from, to, amount);
}
```

2. Plutus Smart Contract (Cardano)

Key Features:

- Written in Haskell.
- Uses Plutus for token management and smart contract execution.
- Functions for minting and transferring tokens.
- Involves Plutus data types and on-chain validation.

```
{-# LANGUAGE DataKinds
                                  #-}
{-# LANGUAGE NoImplicitPrelude
                                  #-}
{-# LANGUAGE OverloadedStrings
                                  #-}
{-# LANGUAGE ScopedTypeVariables #-}
{-# LANGUAGE TemplateHaskell
                                  #-}
{-# LANGUAGE TypeApplications
                                  #-}
{-# LANGUAGE TypeFamilies
                                  #-}
{-# LANGUAGE FlexibleContexts
                                  #-}
module PropertyToken where
import
                 PlutusTx
import
                 PlutusTx.Prelude
import
                 Ledger
import
                 Ledger. Value as Value
import
                 Ledger.Typed.Scripts as Scripts
import
                 Ledger.Constraints as Constraints
import
                 Playground.Contract
                 Plutus.Contract
import
-- Define the currency symbol and token name
propertyTokenSymbol :: CurrencySymbol
```

```
propertyTokenSymbol = "propertyToken"
propertyTokenName :: TokenName
propertyTokenName = "Property"
-- Define the schema for the contract
data PropertyTokenSchema =
    MintToken Integer | TransferToken Integer PubKeyHash deriving (Show, Eq)
PlutusTx.unstableMakeIsData ''PropertyTokenSchema
-- Define the contract
mkPropertyToken :: Integer -> Contract w s Text ()
mkPropertyToken amount = do
    let token = Value.singleton propertyTokenSymbol propertyTokenName amount
    let lookups = Constraints.mintingPolicy (mintPolicy amount)
    let tx = Constraints.mustMintValue token
    ledgerTx <- submitTxConstraintsWith @Scripts.MintingPolicy lookups tx</pre>
    awaitTxConfirmed $ getCardanoTxId ledgerTx
    logInfo @String $ "Minted " ++ show amount ++ " tokens"
transferToken :: Integer -> PubKeyHash -> Contract w s Text ()
transferToken amount recipient = do
    let token = Value.singleton propertyTokenSymbol propertyTokenName amount
    let lookups = Constraints.ownPaymentPubKeyHash
    let tx = Constraints.mustPayToPubKey recipient token
    ledgerTx <- submitTxConstraintsWith @Scripts.MintingPolicy lookups tx</pre>
    awaitTxConfirmed $ getCardanoTxId ledgerTx
    logInfo @String $ "Transferred " ++ show amount ++ " tokens to " ++ show recipient
mintPolicy :: Integer -> MintingPolicy
mintPolicy amount = Scripts.wrapMintingPolicy $ \_ _ _ -> if amount > 0 then () else error ()
-- Boilerplate code for Plutus Contract
endpoints :: Contract () PropertyTokenSchema Text ()
endpoints = do
    logInfo @String "Property Token Contract started"
    awaitPromise
        (mintToken `select` transferToken)
    where
        mintToken = endpoint @"mint" >>= mkPropertyToken
        transferToken = endpoint @"transfer" >>= \(amount, recipient) -> transferToken amount
{\tt mkSchemaDefinitions} \ {\tt ''PropertyTokenSchema}
mkKnownCurrencies []
```

Key Differences

1. Language:

- **Solidity**: Uses a contract-oriented language specifically designed for Ethereum.
- Plutus: Uses Haskell and the Plutus smart contract framework tailored for Cardano.

2. Token Management:

- Solidity: Uses ERC20 standard functions like mint, transfer, and approve.
- Plutus: Uses Plutus-specific constructs like Value.singleton and custom minting policies.

3. Contract Deployment:

- Solidity: Contracts are deployed and interacted with through transactions on the Ethereum network.
- Plutus: Contracts are written in Haskell and deployed on the Cardano blockchain, involving on-chain validation and custom minting policies.

4. Ownership and Permissions:

- **Solidity**: Ownable modifier controls who can call certain functions.
- Plutus: Uses on-chain validation and constraints, and transactions are validated based on the script's logic.

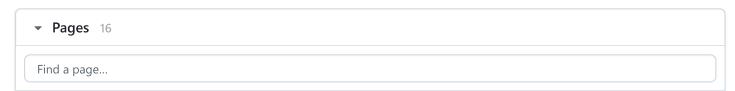
5. Minting and Transfer:

- o Solidity: Functions are straightforward with checks performed in the contract logic.
- **Plutus**: Minting and transferring involve building and submitting transactions with specific constraints and policies.

6. Testing and Verification:

- Solidity: Typically tested using frameworks like Truffle or Hardhat.
- Plutus: Tested using the Plutus Playground or Cardano's testnet, focusing on Haskell-based testing.

This comparison should give a clear idea of how property fractionalization is approached differently in Ethereum and Cardano ecosystems. Each platform has its unique features and methodologies for handling smart contracts and tokens.



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https://github.com/besiwims/plutus-tx-template.wiki.git