LANDANO

Cardano Mendix plug-in by the Landano team

Support Documentation

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Summary

The Cardano Mendix plugin was created to enable Mendix developers to quickly integrate with the Cardano blockchain. Next It supports the following transactions:

1. Simple
2. Metadata
3. NFT Creation
4. Multi-sig transaction
5. Smart Contract integration

In the guide we'll outline how to use these functionalities and what are the important implementation points.

General

The Cardano Mendix plugin project has been devided into a couple of modules. These are:

- CardanoMx Basic functionality for the app (I.E. admin pages)
- CardanoWallet The nuts and bolds of the Cardano Mendix plugin
- Blockfrost A Mendix native approach to supporting the Blockfrost API
- PinataIPFS Storing files on IPFS

The CardanoMx module serves as the foundation of the plugin, providing essential administrative functionalities and user interfaces. Meanwhile, the CardanoWallet module contains the core implementation logic, leveraging the Cardano Client Library to facilitate blockchain interactions.

The Blockfrost integration enables seamless access to Cardano network data, while the PinataIPFS module handles decentralized file storage needs. This modular architecture ensures maintainability and allows for future expansions of functionality.

All Java actions within the Resources folder are thoroughly documented and follow best practices for blockchain integration, making it easier for developers to understand and customize the implementation according to their specific requirements.

Mendix documents

These are the entry points for important processes within the application

- Create/Restore wallet
    - ACT_Wallet_Create
    - ACT_Wallet_Restore
    - JA_Account_GenerateMnemonics
- Create Transaction
    - ACT_Transaction_OpenStep1
    - SUB_Transaction_Confirm
    - JA_Simple_TransactionBuildSignSubmit
    - JA_MultiSig_Transaction_Build
    - JA_MultiSig_Transaction_Sign
    - JA_MultiSig_Transaction_Submit
    - JA_NFT_Mint
- Policy creation
    - Policy_Overview
    - SUB_Policy_GenerateScript
    - JA_PolicyScript_Create
- Smart Contract
    - SmartContract_Overview
    - JA_SmartContract_Lock
    - JA_SmartContract_Unlock

Simple Transaction

A simple transaction on the Cardano blockchain is a monetary transfer that occurs between one sender and one or more recipients. In these transactions, each recipient can receive both ADA (Cardano's native cryptocurrency) and various tokens as part of the transfer.

Metadata

Metadata in Cardano transactions allows you to embed additional information or data alongside the transaction. This data does not affect the transaction's validity but serves as a way to store permanent, immutable information on the blockchain.

Examples of metadata usage include:

- Storing document hashes for verification
- Adding transaction descriptions or notes
- Including references to external systems
- Attaching certificates or credentials

The metadata is stored in JSON format and can contain various data types like strings, numbers, and arrays. Each metadata entry is identified by a unique number (metadata label) and can store up to 16KB of data.

NFT Creation

NFT creation on Cardano utilizes the blockchain's native token functionality, which means NFTs are treated as first-class citizens, similar to ADA. This approach offers several advantages in terms of security and efficiency.

The creation process involves:

- Minting Policy: Defining rules that govern the creation and management of the NFT
- Asset Name: Assigning a unique identifier to the NFT within its policy
- Metadata: Adding properties, attributes, and links to the digital asset
- Quantity: Usually set to 1 to ensure uniqueness (though can be more for editions)

Unlike other blockchain platforms that require smart contracts for NFT creation, Cardano's native token approach makes the process more straightforward and cost-effective. The NFTs are tracked directly by the ledger, providing better security and reduced transaction costs.

When creating an NFT through the Mendix plugin, developers need to specify these parameters and can optionally include additional metadata to enhance the NFT's functionality and value.

Multi-sig transaction

Multi-signature (multi-sig) transactions on Cardano are transactions that require multiple parties to approve before they can be executed. These are implemented using policy scripts that specify the conditions under which a transaction can be validated.

Key aspects of multi-sig transactions include:

- Multiple Signatures: Requires a predefined number of signatures from a set of authorized participants
- Policy Scripts: Define the rules and conditions for transaction approval
- Flexibility: Can be configured to require all signatures (N-of-N) or a subset (M-of-N)
- Security: Provides enhanced security by distributing control among multiple parties

A common use case is a treasury management system where multiple stakeholders must approve fund transfers. The policy script would verify that the required number of valid signatures are present before allowing the transaction to proceed.

In the Mendix plugin, developers can create multi-sig transactions by defining the policy script parameters and managing the signature collection process through the application interface.

Smart Contract integration

Smart contracts on the Cardano blockchain are self-executing programs that run on the blockchain using a programming language called Plutus. These contracts automatically enforce and execute agreements between parties when predetermined conditions are met, without requiring intermediaries.

Key characteristics of Cardano smart contracts:

- Deterministic execution: The outcome is always the same given the same inputs
- Transparency: All contract code is visible on the blockchain
- Immutability: Once deployed, the contract code cannot be changed
- Security: Built on formal verification principles to ensure reliability

Common use cases for Cardano smart contracts include:

- Decentralized Finance (DeFi): Lending platforms, automated market makers, and yield farming
- Gaming: In-game asset ownership and trading mechanics
- Supply Chain: Tracking product authenticity and ownership
- Real Estate: Automated property transfers and rental agreements
- Governance: Decentralized voting systems and proposal management

Through the Mendix plugin, developers can interact with existing smart contracts on the Cardano blockchain or deploy new ones, enabling these automated functionalities within their applications.

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We extend our deepest gratitude to the team at Bloxbean for creating the Cardano Client Library, which forms the foundation of this plugin's interaction with the Cardano blockchain. Their excellent work and dedication to building robust blockchain tools have been instrumental in making this Mendix plugin possible.

References

https://github.com/bloxbean/cardano-client-lib

https://blockfrost.io/