CREDIT SCORING PROJECT
Plutus Smart Contracts

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Document Revisions

Date	Revision	Content	Author
2023-08-03	1.0	Initial version.	Cong Le

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1. Introduction

This project is to calculate the credit scoring for user in our system, using both onchain and offchain data. After that, the scoring will be used in other systems, for example: to borrow money from Lending contract, etc.

There are three parts of this project:

+ First, collect user data.

This part is out of scope of Plutus smart contracts, it's more about data mining / data processing than smart contract. Because we need to collect all of user data, including both onchain and offchain data, then use a framework to process data, for example: CRISP-DM with 6 steps [2]:

- Business understanding
- Data understanding
- Data preparation
- Modeling
- Evaluation
- Deployment

There are some onchain data that we can collect based on user address, for example:

- Address balance
- Transaction history (send, receive, stake, …)
- Staking reward

There are some offchain data that we can collect, for example:

- Age
- Salary
- Employment history

+ Second, mint a new Scoring NFT for user with score attached in datum.

The user's score will be calculated, and then, if the score is greater than a threshold that we defined, we will mint a new Scoring NFT for user with score attached in datum.

+ Third, demonstrate how to use the Scoring NFT in other systems.

Give an example on how to use the Scoring NFT, for example: use it to borrow money from Lending contract.

2. Architecture

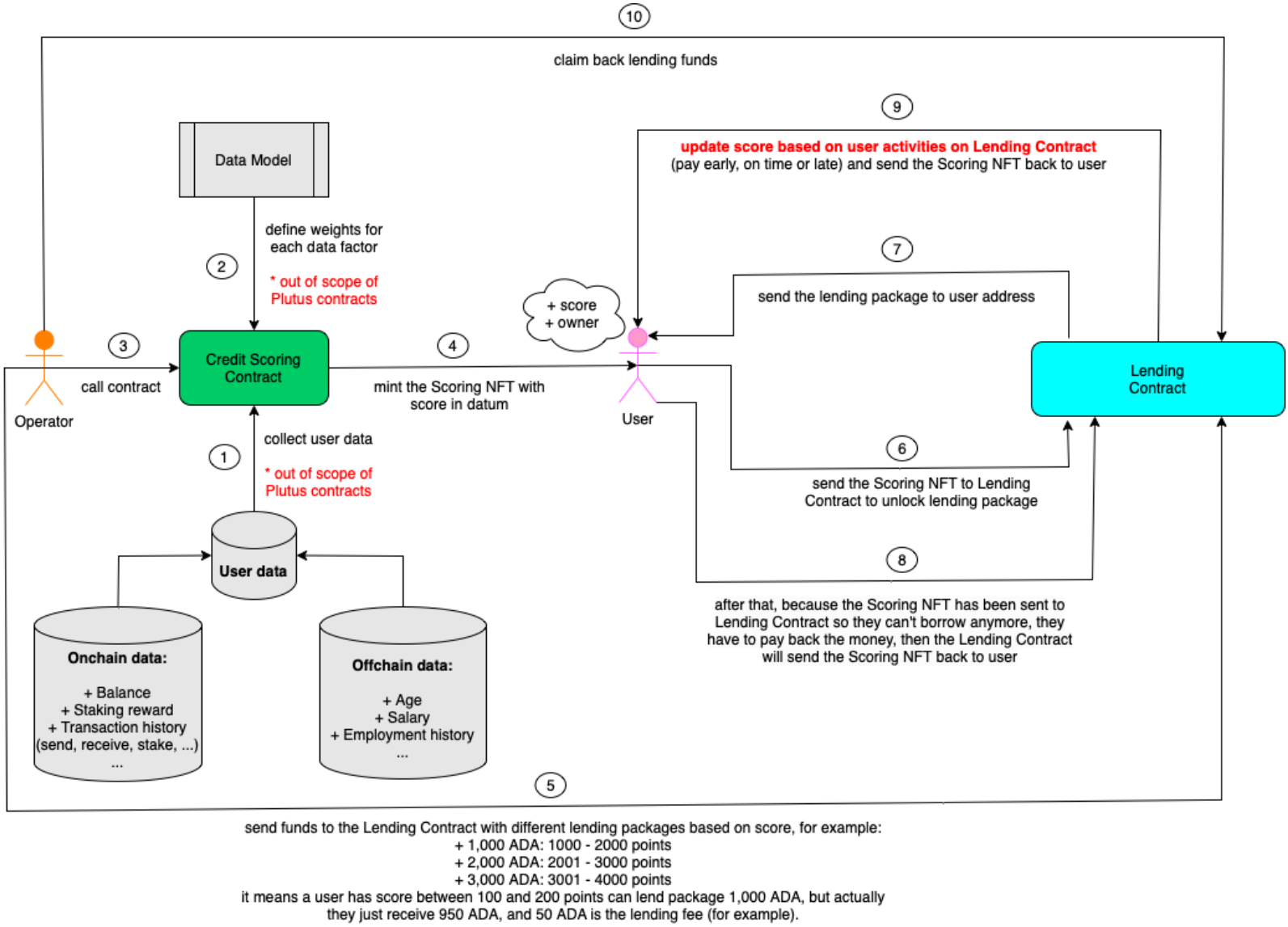

Figure 1. All the scenarios related to Plutus Smart Contracts in the system

2.1. Actors

+ Operator: only this actor has permission to calculate the score, and mint the Scoring NFT for user. They also send funds to Lending contract to create some lending packages, and then claim it back if they want.

+ User: this actor is able to use the Scoring NFT to borrow money from Lending contract, and then pay back the money and receive the Scoring NFT.

2.2. Scenarios

+ Step 1: Collect user data (this is out of scope of Plutus smart contracts).

+ Step 2: Define a data model to set weights for each data factor (this is out of scope of Plutus smart contracts).

+ Step 3: The operator interacts with Credit Scoring contract to calculate user's score based on data and model from step 1 & 2

+ Step 4: If user's score is good enough (greater than or equal a threshold that we defined), the operator will mint a new Scoring NFT and send it to user address with score attached in datum.

+ Step 5: The operator sends funds to the Lending contract to create some lending packages.

+ Step 6: User will use the Scoring NFT to unlock the lending package that they want to borrow. This Scoring NFT will be sent to Lending contract, it means, user cannot borrow money anymore after that, they have to pay back the money, and then Lending contract will send back the Scoring NFT for user.

+ Step 7: Money has been sent to user address based on the lending package that user chose.

+ Step 8: User pay back the money that borrowed from Lending contract.

+ Step 9: Lending contract send back the Scoring NFT for user, and based on user's activities on Lending contract (pay early / on time / late), it will re-calculate the score for user.

+ Step 10: The operator claims back their funds (for which lending packages are still available but nobody wants to borrow).

3. Smart Contract Constraints

Each contract has its own constraints to ensure that everything works correctly.

3.1. Credit Scoring Contract

All the constraints in this contract:

+ Only the operator is able to mint a new Scoring NFT.

+ Minted amount must be one.

+ The user’s score must be good enough to receive the Scoring NFT (greater than or equal the threshold we defined).

+ Output datum must be correct:

- Output score must be equal the total score has been calculated.
- Owner must not be empty.
- Lending package must be 0 in initialize.

3.2. Lending Contract

All the constraints in this contract:

+ In case of borrow:

- Only the Scoring NFT’s owner is able to do this action.
- The Scoring NFT must be in inputs (belongs to user address).
- Check if the user's score is suitable with the lending package that user want to borrow or not.
- The value has been sent to user address must be correct.
- The Scoring NFT must be sent to Lending contract.
- Output datum attached with the Scoring NFT must be correct:
    - Score must be unchanged.

    - Owner must be unchanged.
    - Lending package must be updated with the package that user borrowed.

+ In case of payback:

- Only the Scoring NFT's owner is able to do this action.
- The Scoring NFT must be in inputs (belongs to Lending contract).
- Money must be sent back to Lending contract with correct value, and the datum (package number) must be correct to restore the lending package.
- The Scoring NFT must be sent back to user address.
- Output datum attached with the Scoring NFT must be correct:
    - Score must be unchanged.
    - Owner must be unchanged.
    - Lending package must be reset to 0.

+ In case of claim:

- Only the operator is able to claim back their funds.

Reference

[1].https://altair.com/newsroom/articles/credit-scoring-series-part-one-introduction-to-credit-scoring

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[4].https://altair.com/newsroom/articles/credit-scoring-series-part-four-variable-selection?_ga=2.62124844.1091495111.1691048390-964495892.1690458433

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