

BloodLedger

Requirements

Required features

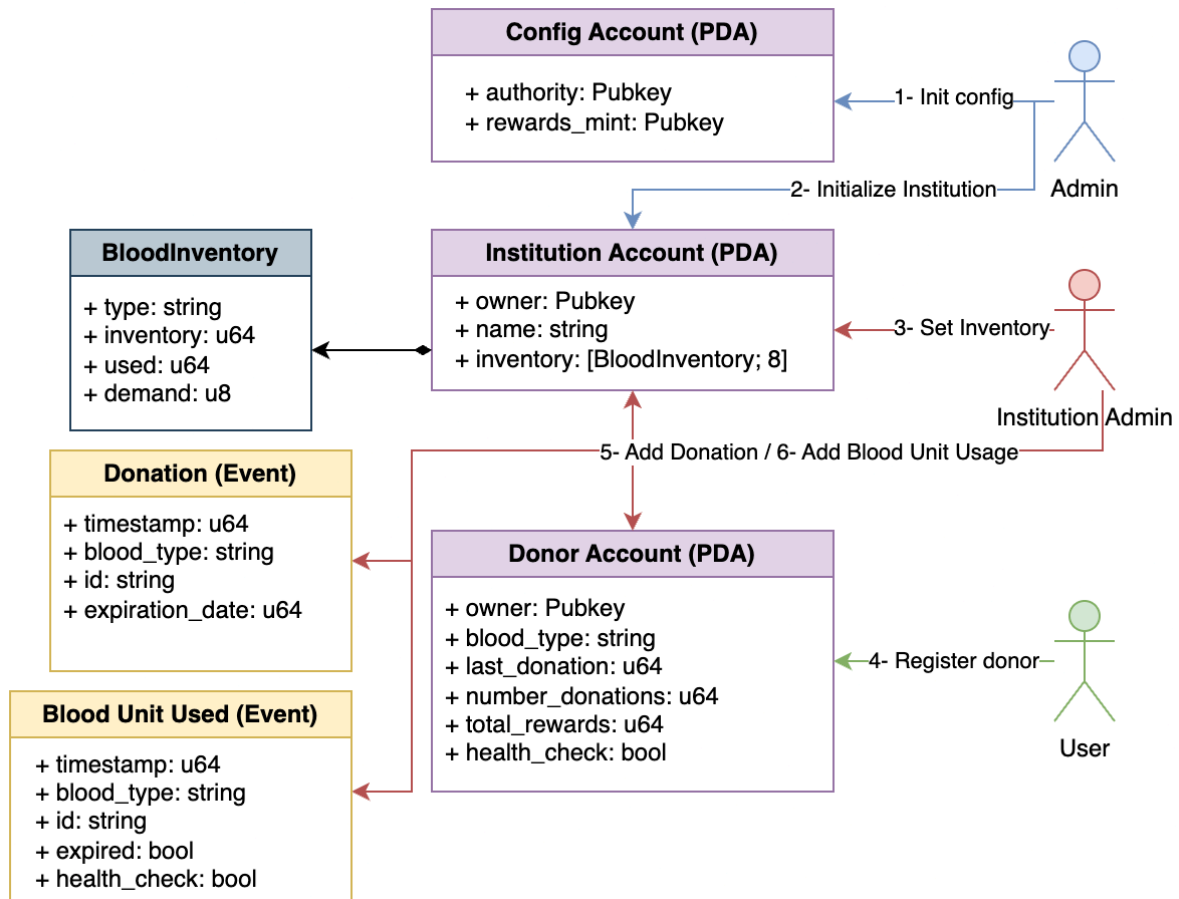
- The protocol shall have a program admin.
- The protocol shall allow a user to register as a blood donor using a Solana wallet.
- The protocol shall allow the program admin to register an institution (hospital, blood bank and other healthcare organizations) as an authorized entity.
- The protocol shall distribute **SPL token rewards** to donors upon successful donation and blood unit used.
- The protocol shall record each blood donation on the solana blockchain in an immutable ledger.
- The protocol shall maintain a global blood inventory ledger, tracking available units per institution.
- The protocol shall allow institutions to request blood units by specifying blood type and urgency level and the donors should be rewarded with bonus tokens.
- The protocol shall enable real-time data access for institutions to check current blood stock availability.

Optional features

- The protocol may ensure that donor personal information is protected using **Zero-Knowledge Proofs (ZKPs)**.
- The protocol shall provide **bonus rewards for frequent donors** based on demand.

Design

Overview



Caption:

Event
PDA Account
struct

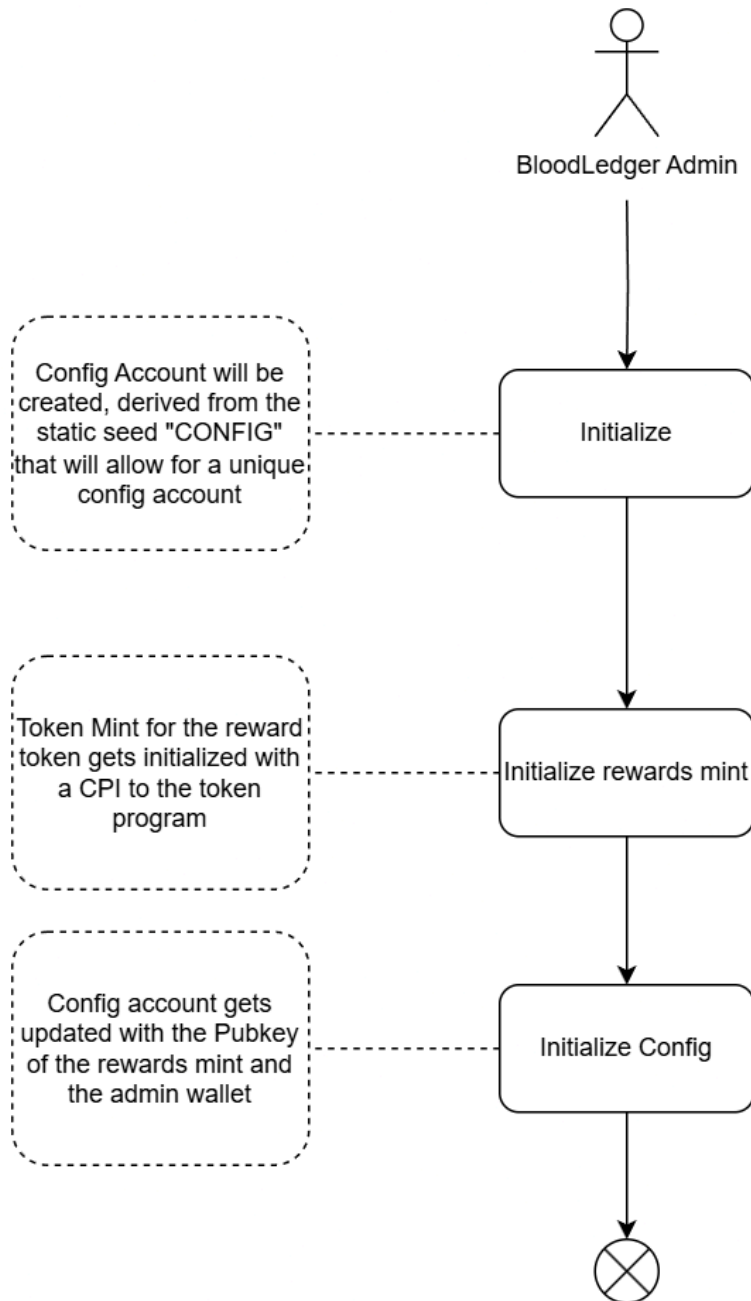
- ❖ Config Account PDA Derivation: "CONFIG"
- ❖ Institution Account PDA Derivation: "INSTITUTION", name
- ❖ Donor Account PDA Derivation: "DONOR", owner

1. Init Config

- Initializes config account.
- Initializes rewards mint with a CPI to the token program.

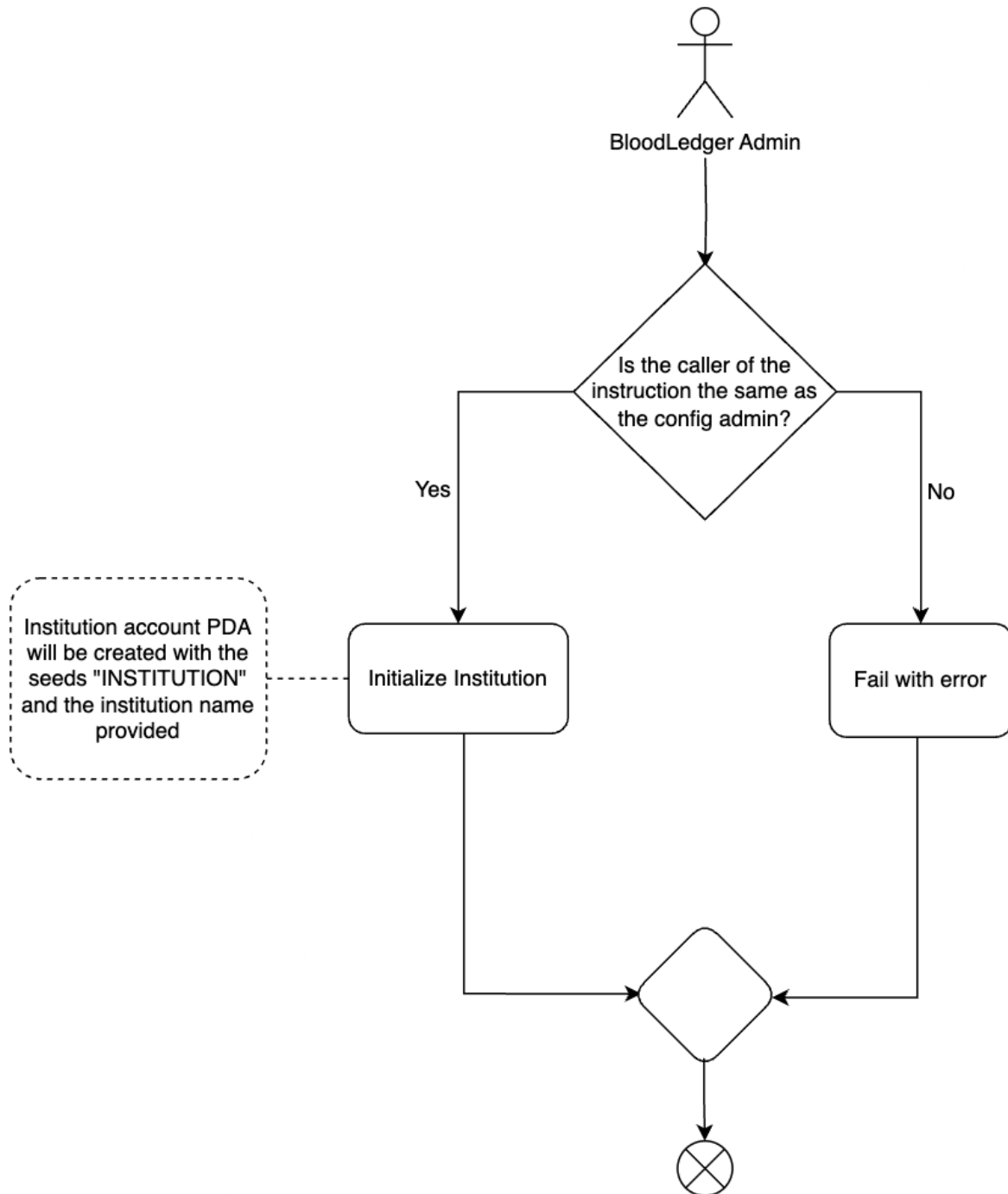
2. Initialize Institution
 - Initializes a new institution account.
3. Set Inventory
 - After an admin initializes the institution account, the institution admin needs to set current inventory and demand.
 - Admin can use this anytime to set demand values.
4. Register Donor
 - A blood donor can register at any time.
5. Add Donation
 - An institution admin can add a user donation to the system.
 - The contract will update the donor and the institution inventory records.
 - A small reward in the form of tokens will be issued by executing a CPI into the token program, proportional to the demand value.
 - A Donation event will be issued with the blood donation data.
6. Add Blood Unit used
 - An institution admin can set a blood unit as used in patients or as discarded (by health check or expiry date).
 - The contract will update the donor and the institution inventory records.
 - If the blood unit was used, extra rewards in the form of tokens will be issued to the donor by executing a CPI into the token program, proportional to the demand value.
 - A Blood Unit Used event will be issued with the relevant data.

1. Init Config



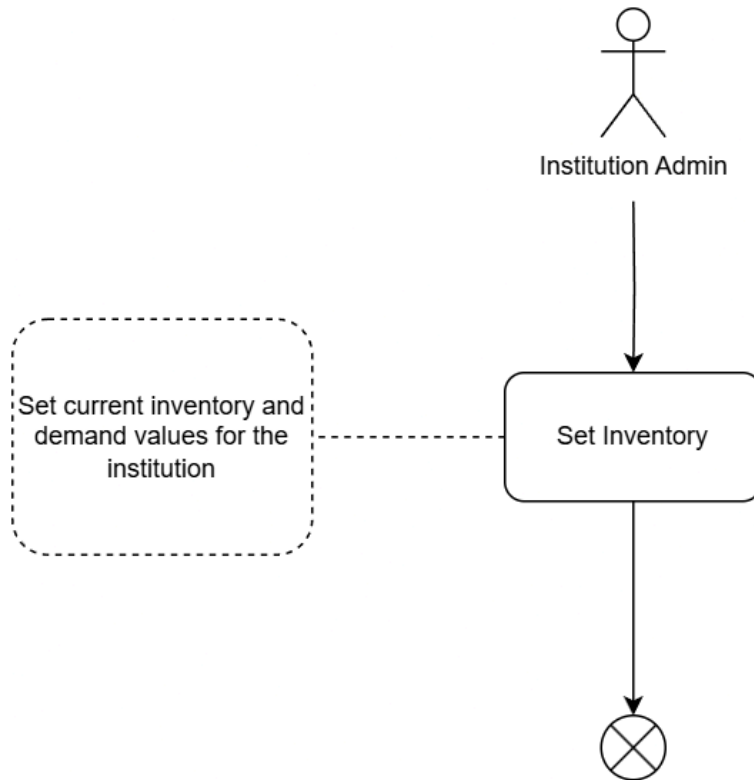
The BloodLedger program admin will initialize the config account and reward token mint.

2. Initialize Institution



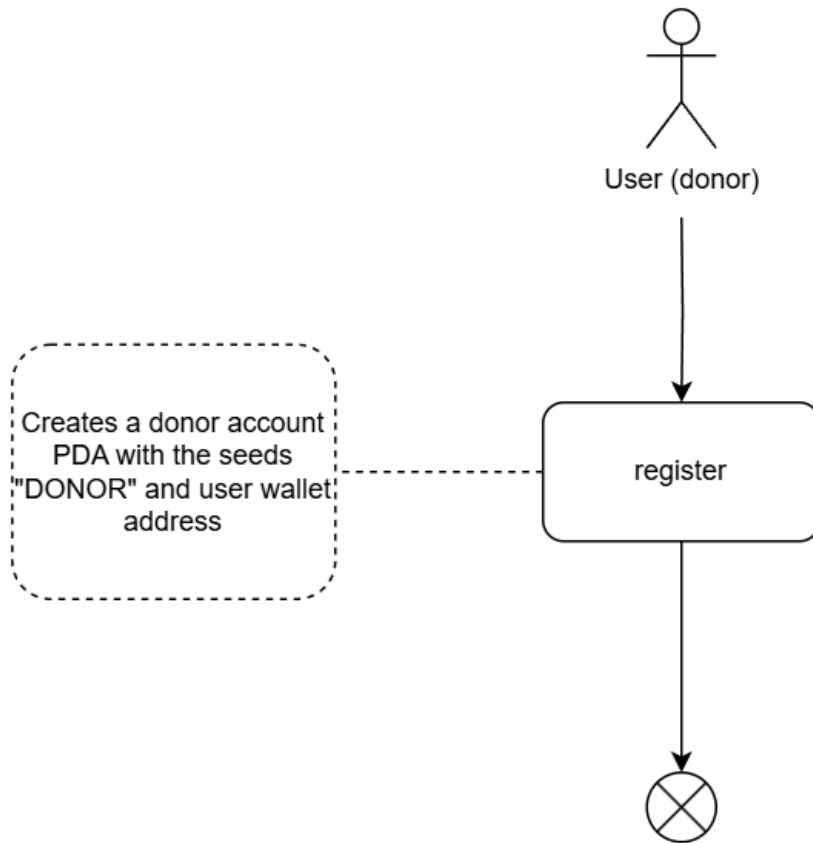
The Program Admin will register each Healthcare institution. Before that, the program verifies if the caller is the config admin.

3. Set Inventory



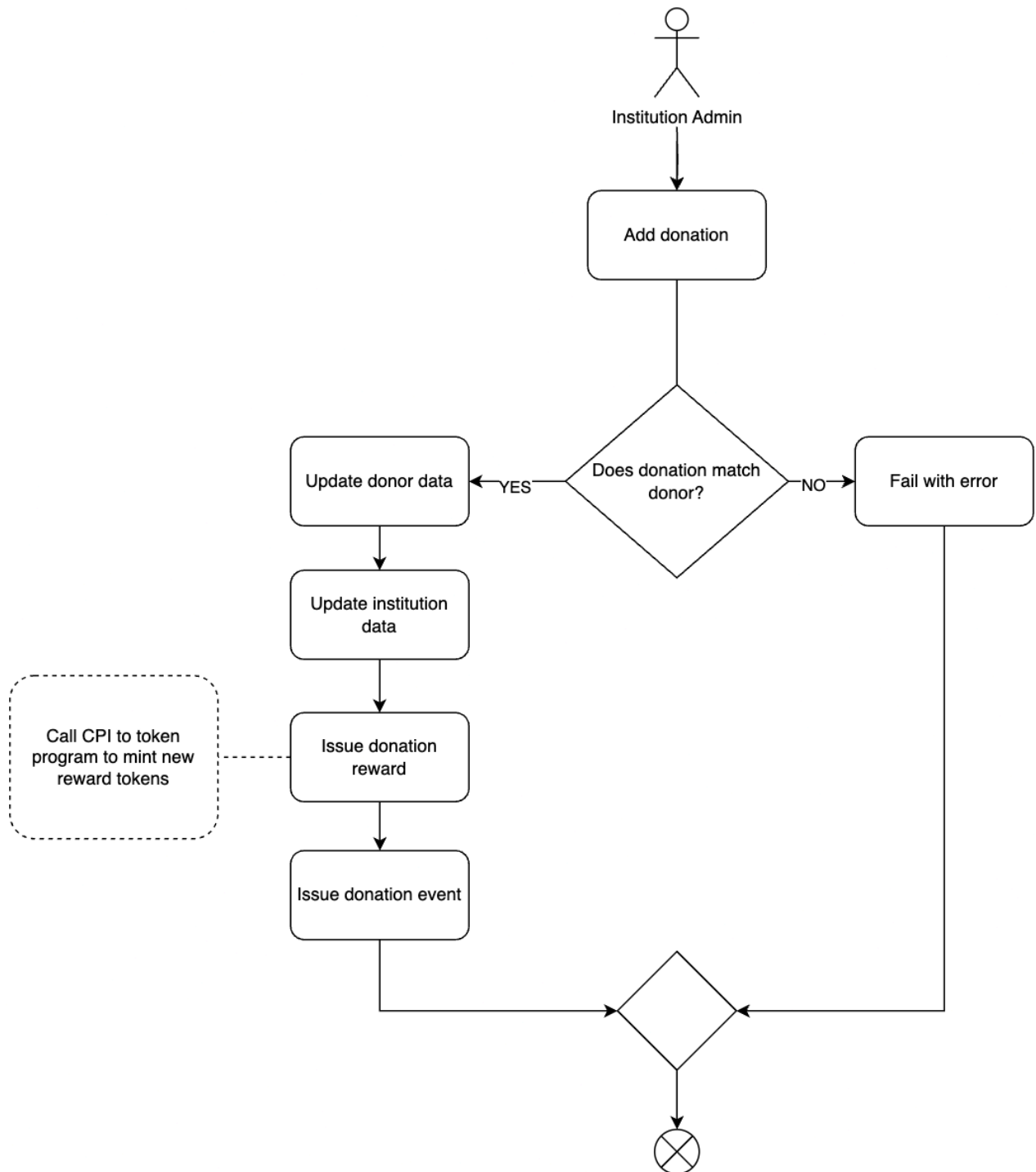
The Institution admin (from a hospital or a blood bank, for example) will set the current inventory - which will be an array where each blood type contains a counter for its amount, how many blood units have already been used of that blood type and a demand flag of 1 byte where values are from 0 to 255, with 255 being the highest demand.

4. Register Donor



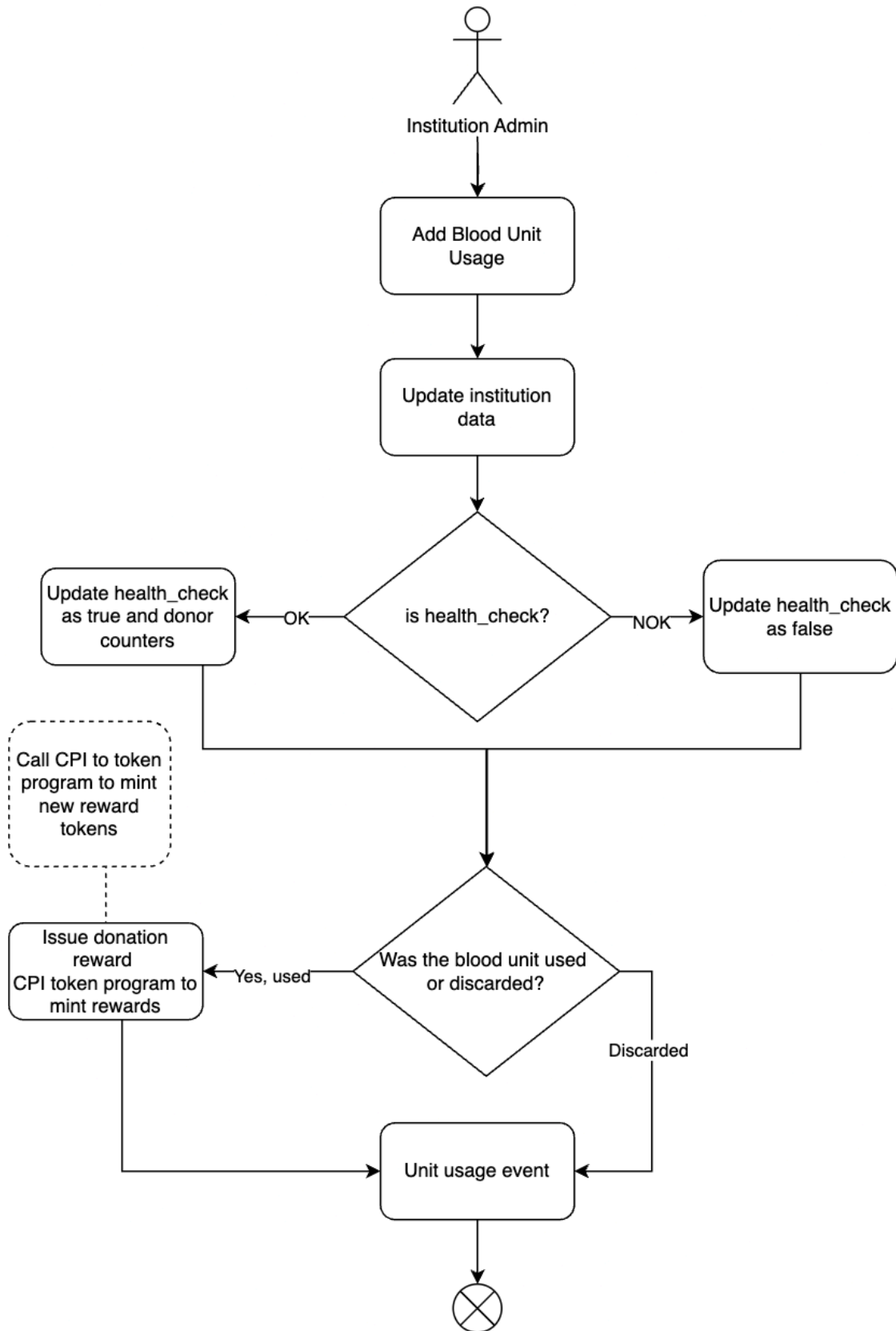
A blood donor can register at any time. Their PDA account will store details such as blood type, last donation date, total donations made, total rewards earned, and a flag (indicating whether the blood analysis being done during *Blood Unit Used* event confirms the donor's health status as suitable for transfusion).

5. Add Donation



An institution admin will add a blood donation to the system. It will check if the blood type of the donation matches the donor's. If it does, it will update the donor data (last donation time, number of donations and total rewards). Plus, it will update the institution inventory records, adding 1 blood unit of its respective type. A small reward in the form of tokens will be issued by executing a CPI into the token program, proportional to the demand value. If instruction succeeds, it will issue a *donation* event. Else, it will fail with error.

6. Add Blood Unit Usage



When an institution admin removes a blood unit from its inventory, it will update the Institution PDA account, i.e., removing 1 blood unit of its respective type. It will then check if the blood unit passes the health tests. If it does, it will update the flag *health_check* as TRUE and increase the donor counter - total number of donations. If it doesn't, it will update the donor *health_check* as FALSE.

It will then check if the blood was used in patient(s) or was discarded (by health check being false or expiry date). If it was used, then it will issue extra donation rewards proportional to the demand flag.

In the end, even if the blood unit was discarded, it will issue a *Blood Unit Used* event.