Introduction

Wallet and Bank

Truly decentralized finance requires decentralized wallets and banks.

KeeperC

To provide security and convenience without compromising decentralization, we propose KeeperC, a contract wallet based on smart contracts, Chainlink Automation, and O...

Wallet and Bank

Truly decentralized finance requires decentralized wallets and banks. While we're already familiar with decentralized, non-custodial wallets such as Metamask, what about **decentralized banks**?

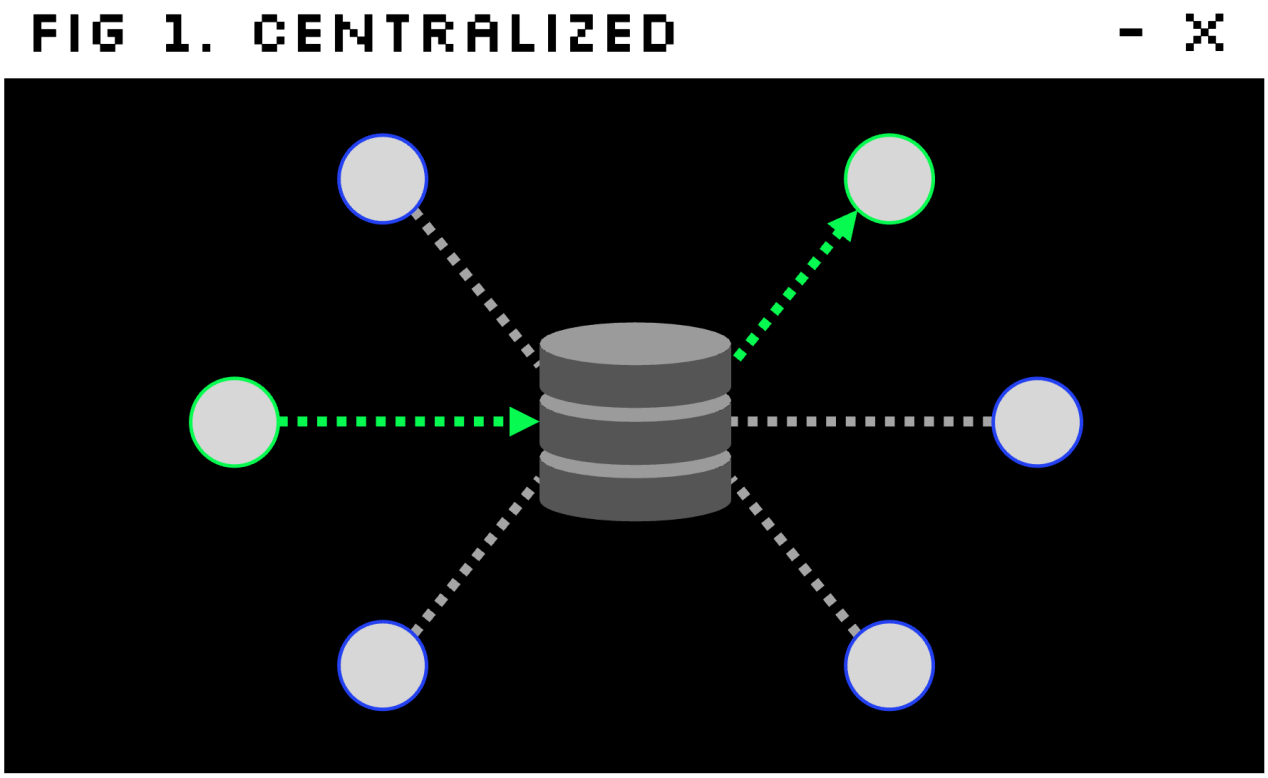
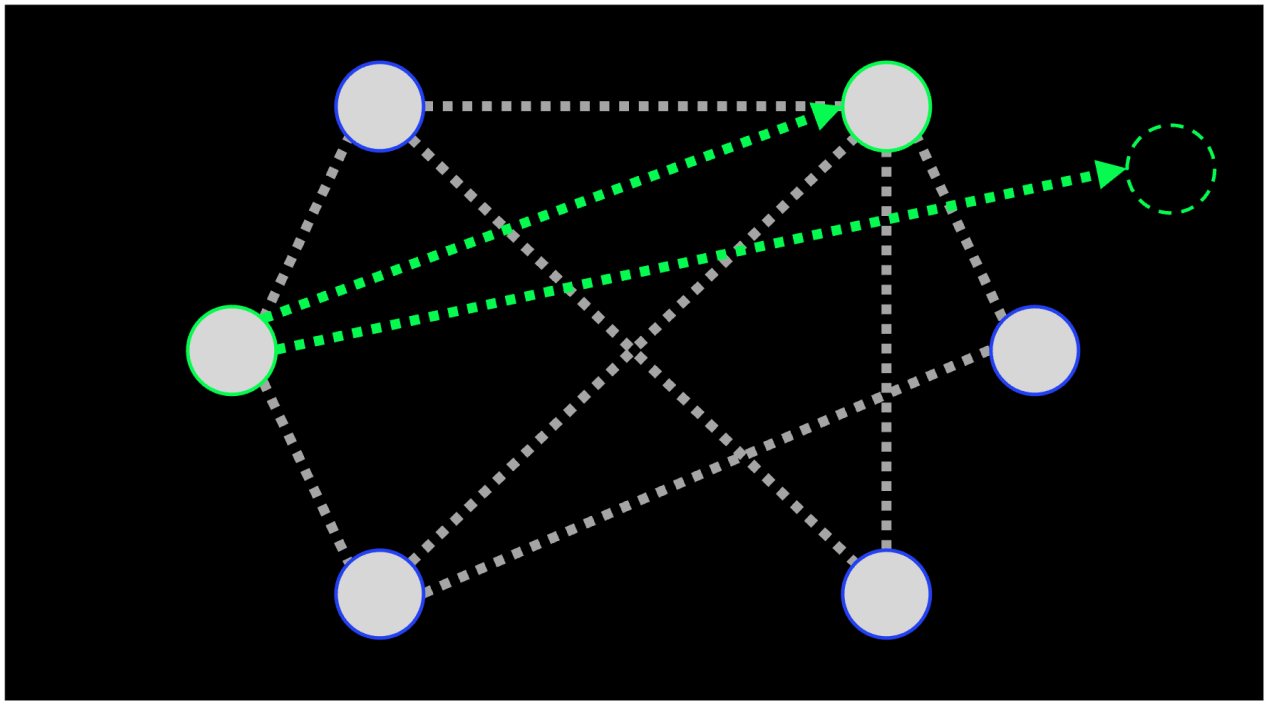


FIG 2. DECENTRALIZED - X



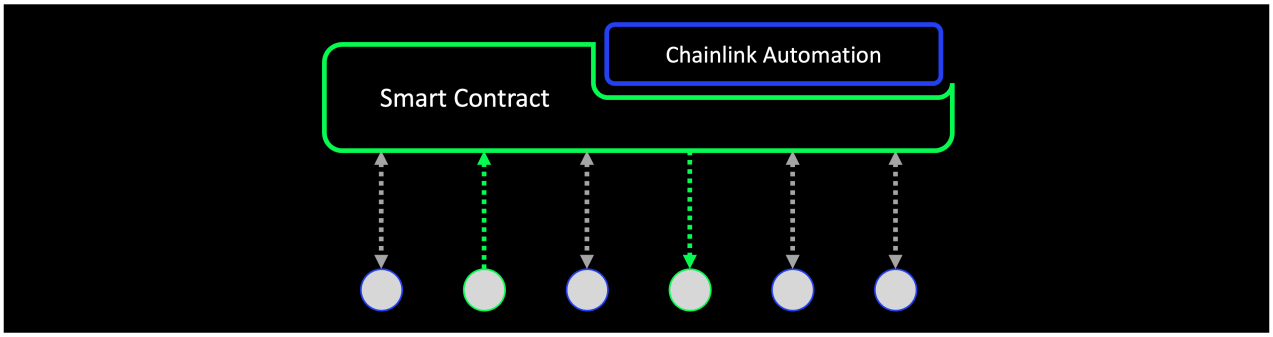
Unfortunately, the blockchain should not have a centralized player.

Therefore, blockchain users cannot enjoy the convenience of centralized institutions, such as scheduled transfer and mis-transferred asset recovery.

KeeperC

To provide security and convenience without compromising decentralization, we propose KeeperC, a contract wallet based on smart contracts, Chainlink Automation, and OpenAI API.

FIG 3. KEEPERC20



Currently, KeeperC offers the following powerful functions:

- `Scheduled Transfer`: You can schedule future transfers of your tokens, making it easier to manage your transactions.
- `Recoverable Transfer`: If you accidentally send your tokens to the wrong address, KeeperC can help you recover them.
- `Expirable Approve`: You can set a time limit for token approvals, increasing the safety of using dApps.

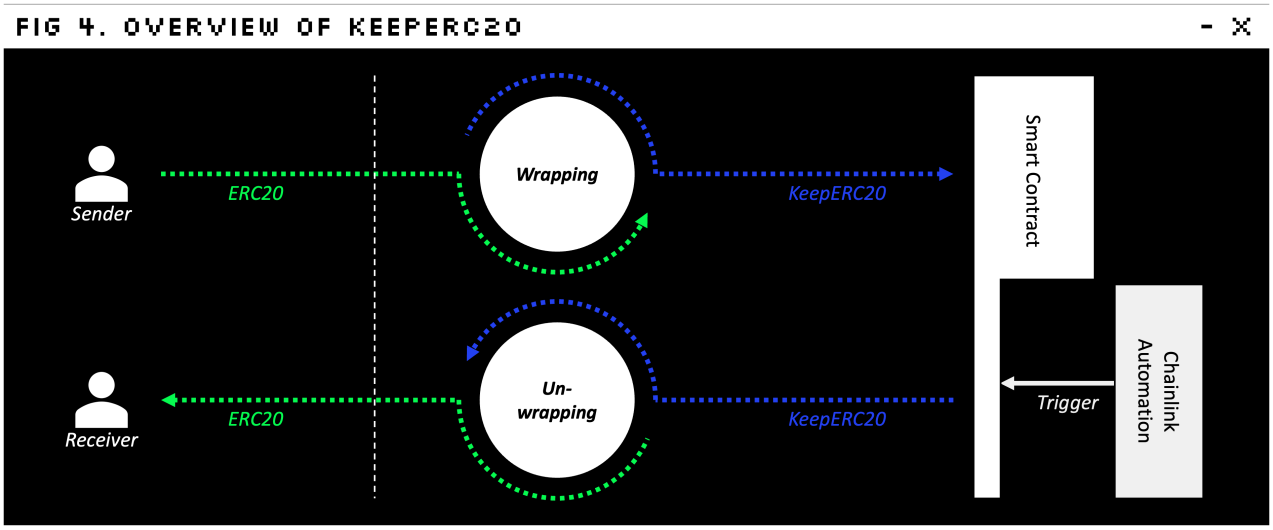
KeeperC includes a **Fraud Detection System** that monitors your transactions and alerts you if any suspicious activity is detected, protecting you against potential hacks and scams.

KeeperC comes with a **chatbot** that uses AI to provide you with natural language support and make it easier to manage your tokens. You can also use KeeperC's

chatbot via the popular messaging app, **Telegram**.

We will continuously add more convenient and secure functions to 🅺 KeeperC to ensure that your tokens remain safe and secure.

Overview



- When a user sends ERC20 tokens to KeeperC, they are wrapped into KeeperC tokens, allowing the user to take advantage of various features such as scheduled transfers, lost money recovery, expirable approval, and fraud detection through smart contracts and Chainlink Automation.
- When the recipient receives the tokens, they are automatically unwrapped back into the original ERC20 tokens, making it easy to use the tokens with other dApps.

However, in some cases, simple token wrapping may not be enough to perform certain tasks, such as ownership-related function calls.

To address these cases, KeeperC creates a safe contract wallet internally and provides these functions seamlessly to ensure the security and convenience of users' tokens.

With KeeperC, you can enjoy a secure and convenient way to manage your tokens while participating in the decentralized blockchain ecosystem.

Functions

Scheduled Transfer

The scheduled transfer is a function that automatically transfers ERC20 tokens after a few blocks. A series of bytes can be transferred together, so the contract call is also p...

Recoverable Transfer

The recoverable transfer can be treated as a kind of insurance because users can use it to prepare for mispayment.

Expirable Approve

ERC20's Approve is often the target of attack. The expirable-approve reduces the possibility of the hack by automatically canceling approval.

Scheduled Transfer

The scheduled transfer is a function that automatically transfers ERC20 tokens after a few blocks. A series of bytes can be transferred together, so the contract call is also possible. It is monitored and managed through the Upkeep of Chainlink Automation.

A predefined fee is collected as an ERC20 token when requesting a scheduled transfer.

Recoverable Transfer

The recoverable transfer can be treated as a kind of insurance because users can use it to prepare for mispayment. When the tokens were sent to an address where the private key didn’t exist or sent to the wrong contract, there was no way to recover them before.

However, if you use KeeperC's recoverable transfer, you can get them back completely. Except for some fees.

The asset transfer through this function is finalized only when the receiver publishes unwrap transaction. If tokens are sent to the wrong address so no one can access them, the tokens will automatically return to the sender through Chainlink Automation after the expiration.

Expirable Approve

ERC20's *Approve* is often the target of attack. The expirable-approve reduces the possibility of the hack by automatically canceling approval.

Since the *increase* and *decrease* in ERC20's *Allowance* is a function that only the token owner can call, a contract wallet is created internally to control it with the KeeperC contract and Chainlink automation.

Fraud Detection

KeeperC comes with a fraud detection system that monitors your transactions and alerts you if any suspicious activity is detected. This feature helps protect you from potential hacks, scams, and phishing attacks.

Current fraud detection in KeeperC is denylist-based phishing address detection. This feature compares the address you are sending tokens to against a denylist of known phishing addresses. If a match is found, KeeperC will alert you and prevent the transaction from going through, protecting your tokens from being sent to a fraudulent address.

To ensure the highest level of security, KeeperC's denylist is constantly updated to include the latest phishing addresses. Additionally, if you encounter a new phishing address that is not on the denylist, you can report it to KeeperC's support team, and they will investigate and add it to the denylist if necessary.

Chatbot

Integrated Chatbot

KeeperC's chatbot is integrated into both the web app and the extension to provide users with convenient natural language support.

Telegram Bot

In addition to the chatbot integrated into the web app and extension, KeeperC also provides a Telegram bot (@keeperc_bot) that allows you to use the chatbot via the popul...

Integrated Chatbot

KeeperC's chatbot is integrated into both the web app and the extension to provide users with convenient natural language support. If you need help with anything related to KeeperC, simply type your query into the chatbot, and it will suggest features and functions on KeeperC that you can use.

For example, if you're worried about losing your money by accidentally sending it to the wrong address, you can ask the chatbot for help. The chatbot will recommend the "Recoverable Transfer" function of KeeperC, which allows you to recover your tokens if you accidentally send them to the wrong address. The chatbot will also provide a brief explanation of how the function works and why it's a good option for you.

Telegram Bot

In addition to the chatbot integrated into the web app and extension, KeeperC also provides a Telegram bot (@keeperc_bot) that allows you to use the chatbot via the popular messaging app. You can join KeeperC's Telegram group (https://t.me/+8l6TVyQhoSI4YWJl) to access the KeeperC chatbot and connect with other users to discuss the latest updates and features of the wallet.

The bot works in the same way as the chatbot in the web app and extension, providing natural language support and suggesting features and functions on KeeperC that you can use.

Live Demo

Web App

KeeperC is a contract wallet that allows users to participate in the system with any ERC20 token. However, for test purposes, KeeperC currently only supports the TERC20 to...

Chrome Extension

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Information

The KeeperC is a work-in-progress and is provided as-is, without any warranties or guarantees of its effectiveness. Its use is entirely at your own risk. Use the web app and e...

Web App

> **CAUTION**
>
> KeeperC is a contract wallet that allows users to participate in the system with any ERC20 token. However, for test purposes, KeeperC currently only supports the `TERC20` token.

Mumbai testnet is used for a concrete example.

- 🔗 WebApp
- ✉️ Feedback: lukepark327@gmail.com

Faucet

The faucet for Test ERC20 (TERC20) tokens is available! First, click the "Connect Wallet" button. Then, click the "Faucet" button appearing at the same location.

Features

You can check your transaction history in the TASKS window.

Chrome Extension

> **CAUTION**
>
> KeeperC is a contract wallet that allows users to participate in the system with any ERC20 token. However, for test purposes, KeeperC currently only supports the `TERC20` token.

Mumbai testnet is used for a concrete example.

- 💻 Download (Code)
- ✉️ Feedback: lukepark327@gmail.com

Faucet

The faucet for Test ERC20 (TERC20) tokens is available! First, please login. Then, click the "TERC20 / <YOUR_BALANCE>" button to receive 100 TERC20 tokens.

Features

The KeeperC Chrome Extension provides a user-friendly interface to interact with the KeeperC protocol. It has its own wallet functionalities, so you don't need other wallets!

Here's how to use it:

1. Download the KeeperC Chrome Extension from the GitHub repository. Please

note that it's not available on the Chrome Web Store yet.

2. Run `npm run build` to update the `dist` folder, then navigate to chrome://extensions/ and click on "Load unpacked" to import the updated `dist` folder. You'll need to enable **Developer mode** first.
3. Get test tokens by clicking the "FAUCET / 0x1234..." button.
4. Enjoy 🇰 KeeperC!

Information

> **DANGER**
>
> The KeeperC is a work-in-progress and is provided as-is, without any warranties or guarantees of its effectiveness. Its use is entirely at your own risk. Use the web app and extension with caution and thoroughly review its code before use to avoid potential loss of funds.

Contracts

> **INFO**
>
> You'll need to give allowance to KeeperC contract on TERC20 and KTERC20 contracts for the first time usage.

ERC20 Token

- address: "0x6f7ebA5Ccf6c1e524df9F0f353843B233f82e48F"
- name: "Test ERC20"
- symbol: "TERC20"

KeepERC20 Token (about TERC20)

- address: "0x09955185759C8A5d1668AE9C843185a063b39516"
- name: "Keep Test ERC20"
- symbol: "KTERC20"

KeepERC20 Factory

- address: "0x516e99AccB8Ebd6FC04C5FE4C516b8fF172a37e7"

Chainlink Automation

- KeepERC20-TERC20 Upkeep
- Register New Upkeep

Register Upkeeps

Mumbai testnet is used for a concrete example.

Mumbai Testnet MATIC and LINK

You need sufficient MATICs and LINKs for registering Upkeep.

Mumbai Faucet

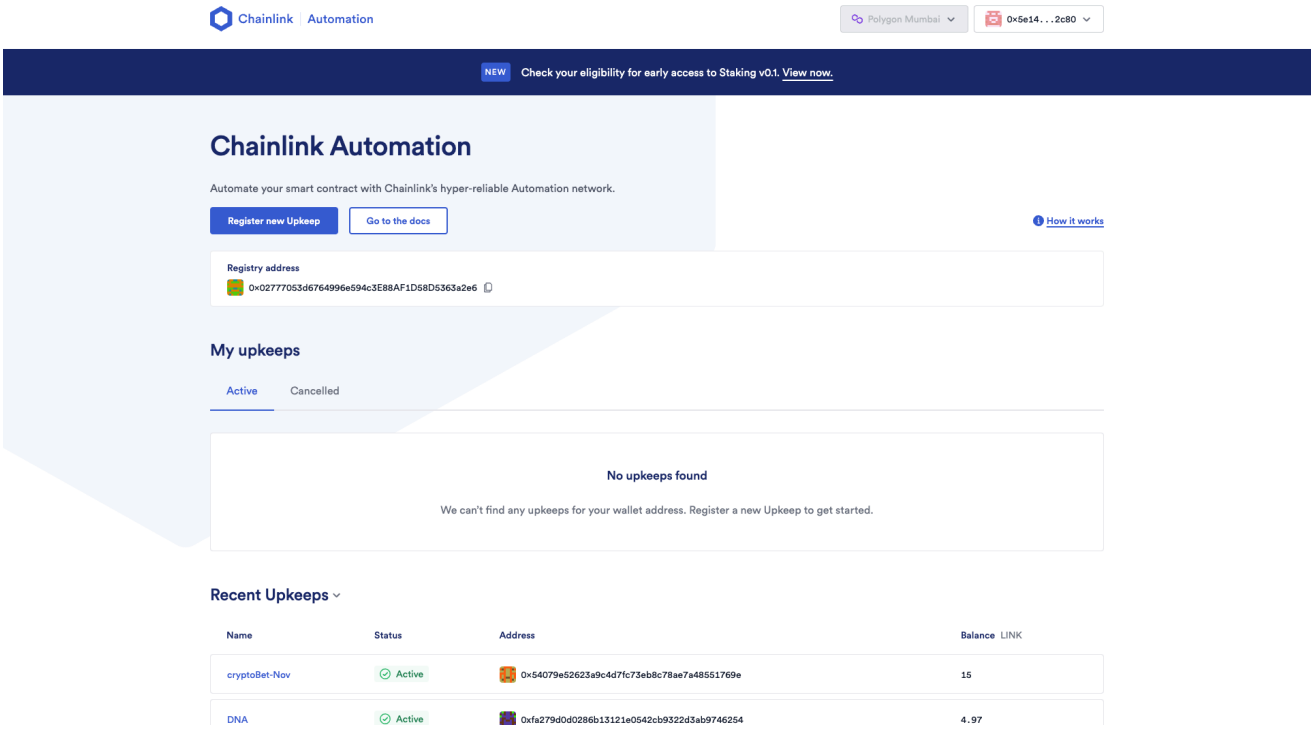
- Polygon
- Alchemy

LINK Faucet

- Chainlink

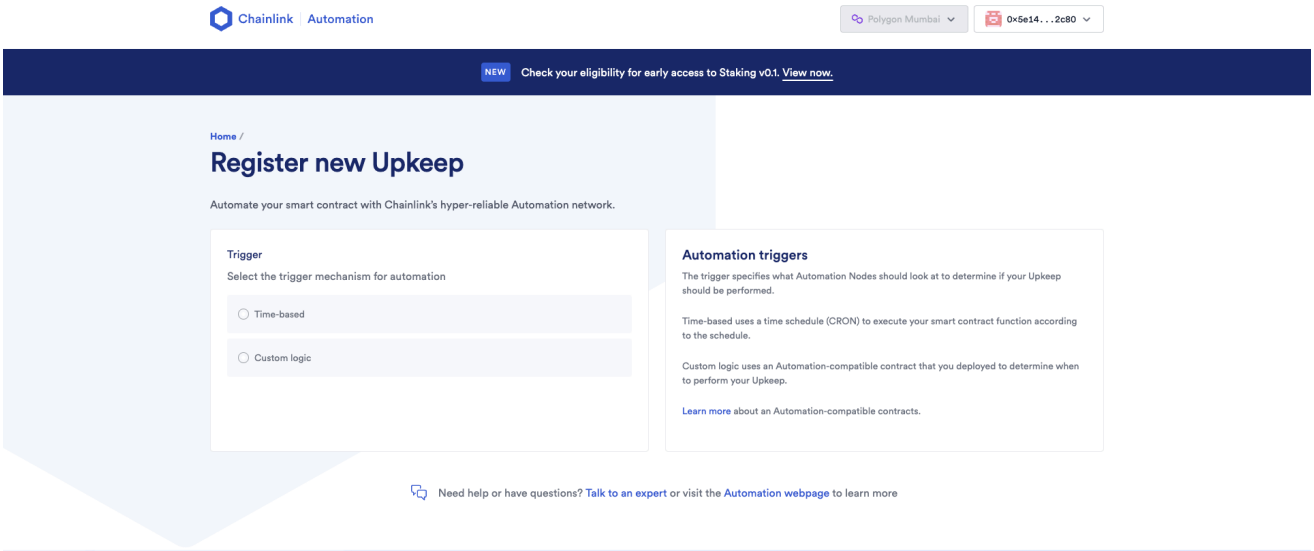
Register Upkeep

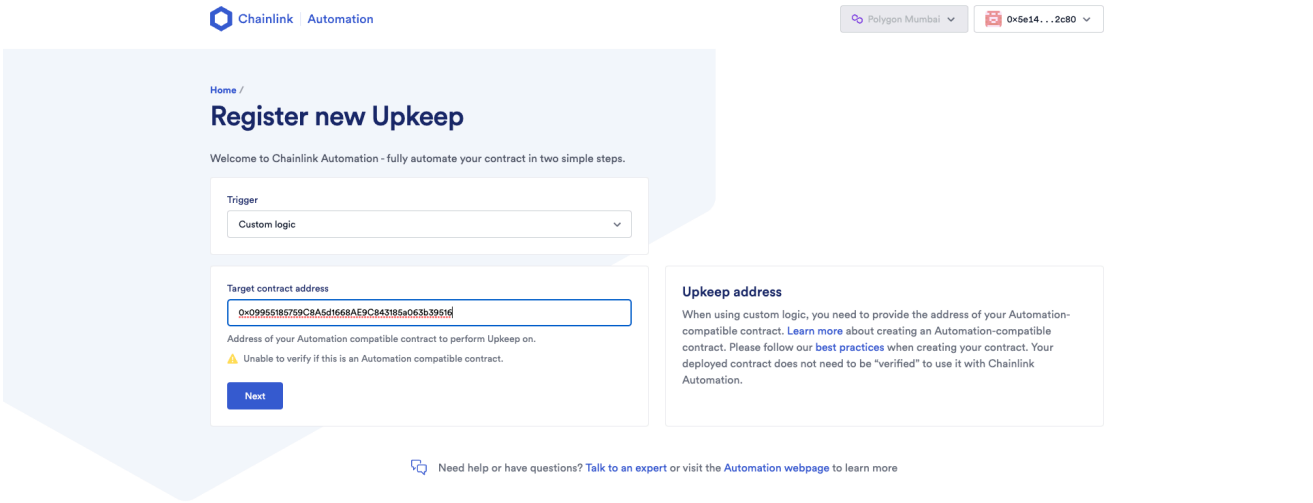
Goto Chainlink Automation page.



Register new upkeep through:

- Select `Custom logic`
- Input address of KeepERC20 contact to perform Upkeep on

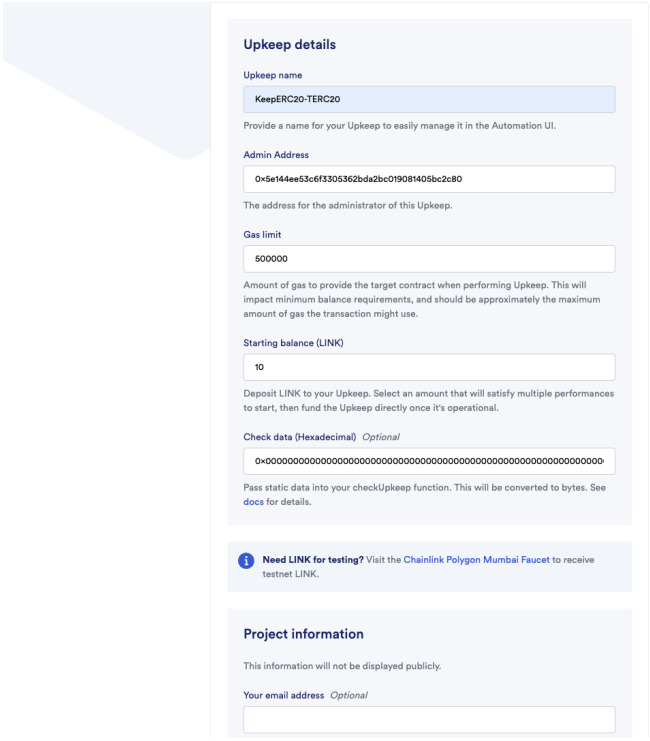




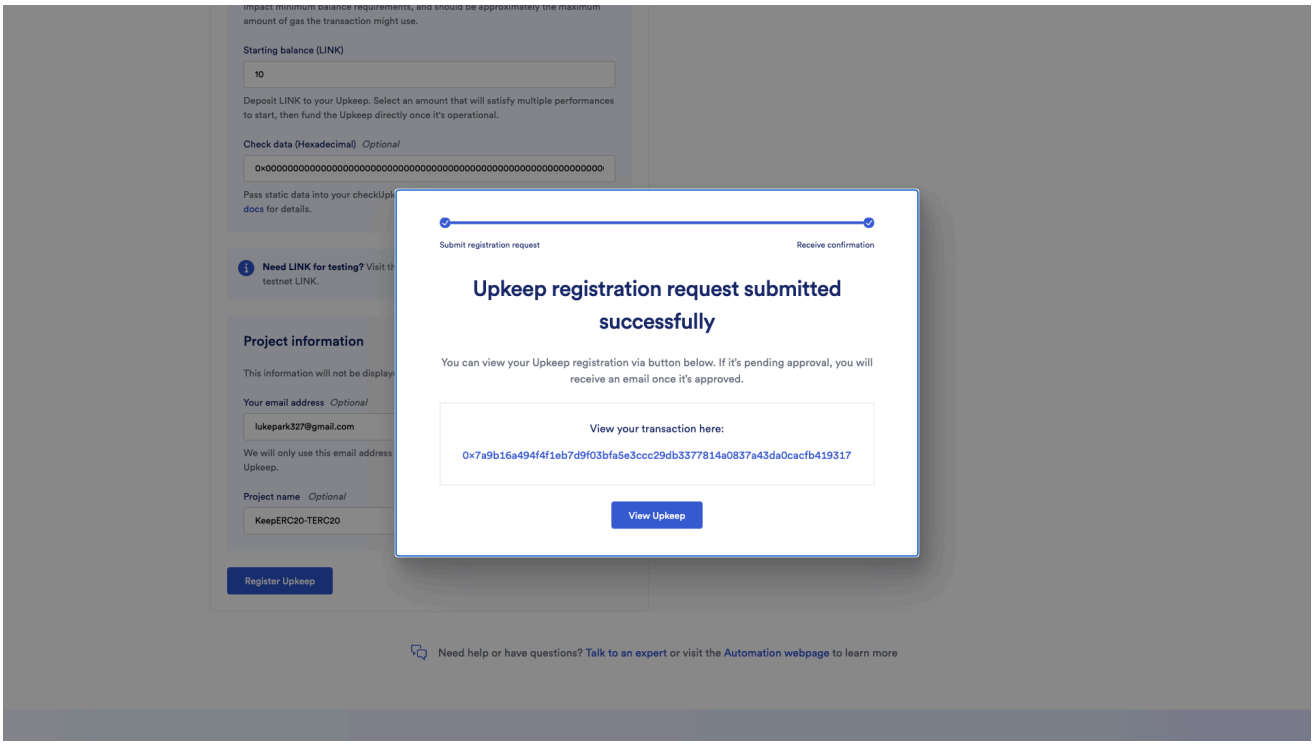
Set `check data` for pagination (lowerBound, upperBound) For example, `0x0000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000a` for 0-to-10.

> **TIP**
>
> You can submit multiple Upkeeps for one KeepERC20 contact with different pagination.

> **⚠ CAUTION**
>
> Registering the same contract's Upkeeps with the same `check data` is possible but useless and inefficient.

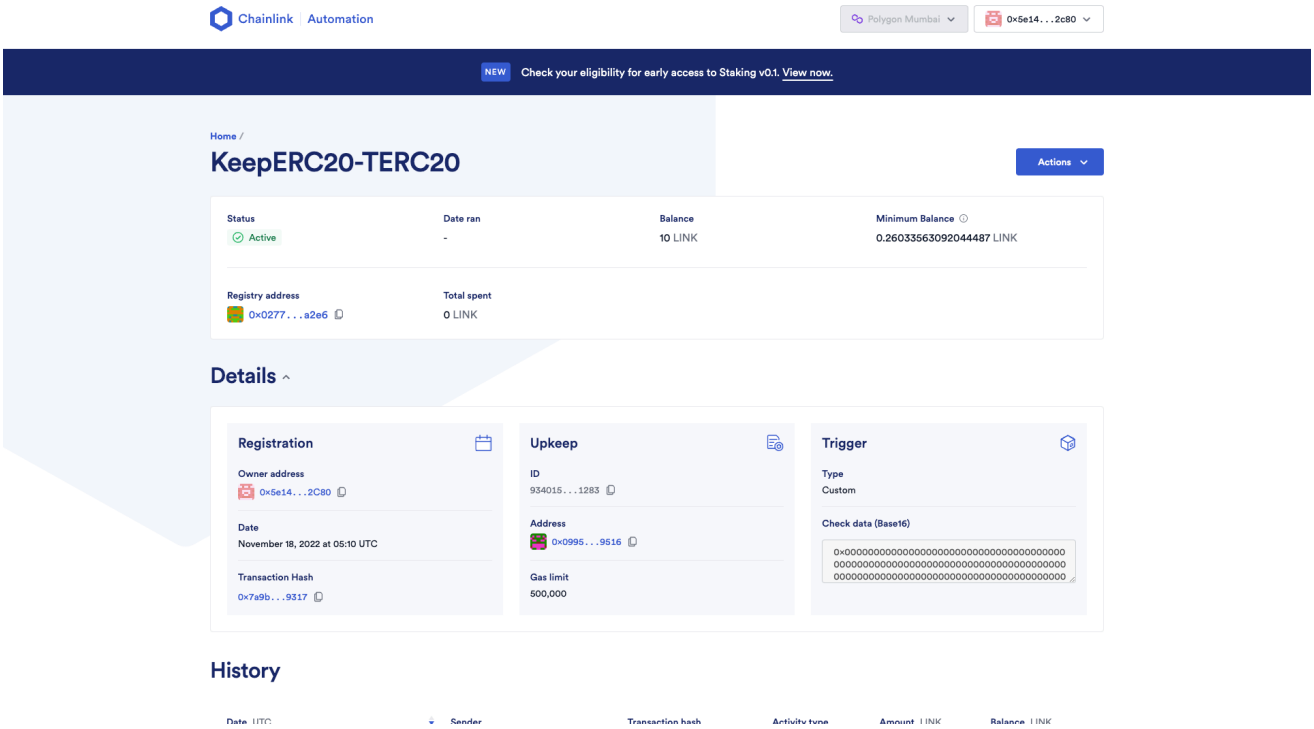


Finally, register Upkeep.

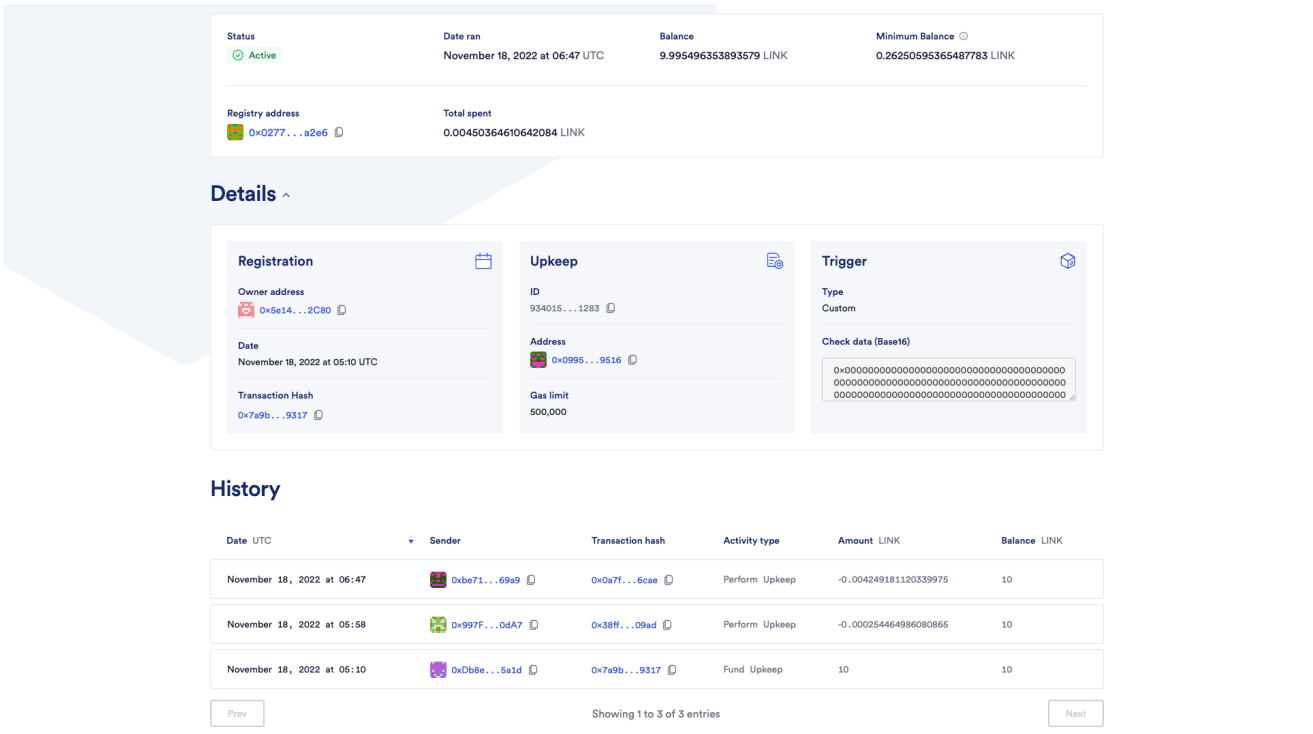


You can manage your Upkeeps through Chainlink Automation page.

This is the sample Upkeep service named **KeepERC20-TERC20**.



You can see the Upkeep's transaction history:



For Developers

Intefaces

Please refer to GitHub.

Deploy

See KeepERC20-wrapper for more details.

Intefaces

Please refer to GitHub.

`IKeepERC20.sol`

```
// SPDX-License-Identifier: MIT

pragma solidity 0.8.17;

interface IKeepERC20 {
    //============ Params ============//

    enum TaskType {
        Schedule,
        Recovery,
        Expire
    }

    struct Task {
        TaskType taskType;
        address sender;
        address receiver;
        uint256 amount;
        bytes extraField;
        bool active;
    }

    //============ Events ============//
```

IKeepERC20Factory.sol

```
// SPDX-License-Identifier: MIT

pragma solidity 0.8.17;

interface IKeepERC20Factory {
    //============ Events ============//

    event SetScheduleFeeRatio(uint256 prev, uint256 curr);
    event SetRecoveryFeeRatio(uint256 prev, uint256 curr);
    event SetFeeTo(address prev, address curr);

    event NewKeepERC20(
        address originalToken,
        uint256 scheduleFeeRatio,
        uint256 recoverFeeRatio,
        address feeTo
    );

    //============ Initialize ============//

    function setScheduleFeeRatio(uint256 newScheduleFeeRatio_)
external;

    function setRecoveryFeeRatio(uint256 newRecoveryFeeRatio_)
external;

    function setFeeTo(address newFeeTo_) external;

    //============ View Functions ============//

    function keepOf(address token) external view returns
(address);
```

IKeepERC20Upkeep.sol

```
// SPDX-License-Identifier: MIT

pragma solidity 0.8.17;

interface IKeepERC20Factory {
    //============ Automation ============//

    function pagination(uint256 lowerBound, uint256 upperBound)
        external
        pure
        returns (bytes memory);

    function checkUpkeep(bytes calldata checkData)
        external
        view
        returns (bool upkeepNeeded, bytes memory performData);

    function performUpkeep(bytes calldata performData) external;
}
```

IWallet.sol

```
// SPDX-License-Identifier: MIT

pragma solidity 0.8.17;

import "@openzeppelin/contracts/access/Ownable.sol";

interface IWallet {
```

Deploy

See KeepERC20-wrapper for more details.

Requirements

```
$ npm install
```

Set `.env`

and/or `.env.test` for test environment.

Now we can use pre-defined values as environment variable, with a prefix `dotenv -e <ENV> --`. For example, `dotenv -e .env.test --`.

Run Node

```
$ dotenv -e .env.test -- npx hardhat node --network hardhat
```

Deploy

```
$ dotenv -e .env -- npx hardhat run scripts/deploy.js --network
localhost
```

Mumbai testnet is used for a concrete example.

```
$ dotenv -e .env.test -- npx hardhat run scripts/deploy.js --
network mumbai

Compiled 2 Solidity files successfully

<Set>
Owner:   0x1ccE14942bD77f5c8EdFe408f7116595E18ccaF4
(0.19886533549475788 ETH)
User1:   0x0E723d5710E79907b0E6D3661F3fed0D3452C04c
(0.8923594874453868 ETH)
User2:   0xdBf13a0374E70f01DB7d1a570Be84e067B9E1Be1 (0 ETH)
Fee:     0x21De12f081958D5590AB70C172703345286bcDc9 (0 ETH)

<Deploy>
Deploy Token:
0x6f7ebA5Ccf6c1e524df9F0f353843B233f82e48F
Deploy Factory:
0x516e99AccB8Ebd6FC04C5FE4C516b8fF172a37e7
Deploy KeepToken:
0x09955185759C8A5d1668AE9C843185a063b39516
```

Usecase

There can be many use-cases of KeeperC.

For example, it is possible to invest in **Dollar Cost Averaging** that purchases a certain amount of cryptocurrency periodically through DEX.

KeeperC allows users to use blockchain more conveniently and safely. We expect that KeeperC will open a new horizon for using blockchain and DApp.