APRIL 28, 2021

Ollscoil Chathair
Bhaile Átha Cliath
Dublin City University

Decentralised Application for Crowdfunding on a Blockchain

USER MANUAL

Student: Karl Whelan
Supervisor: Geoff Hamilton
Student Number: 15561423

Contents

1. Introduction

This Document outlines the steps involved in installing, configuring, using, and testing this application. To compile, deploy, test, and configure this project you need to be in a Linux environment. This application can be deployed to the Ethereum Mainnet, any of its test networks or a locally running Ganache blockchain.

Once deployed live on a blockchain the user interface can be used in any browser that supports the Metamask extension. The currently supported browsers are Chrome, Firefox, Microsoft Edge and Brave. The UI can also be used on mobile however mobile browsers do not currently support extensions so a mobile user must download the Metamask App and use that apps browser to open the UI.

A live version of the user interface connected to the smart contracts deployed on the Rinkeby testnet can be found here:

https://main.d3oz5l3o8ahlw9.amplifyapp.com/

To use this application, you must have Metamask installed. For more information see the UI landing page or the installation section below.

2. Installation

The following installation guide is for Linux operating systems. The project can be cloned with HTTPS using:

```
:~$ git clone https://gitlab.computing.dcu.ie/whelak26/2021-ca400-whelak26.git
```

2.1. Hardware requirements

To connect to the smart contracts that are already deployed on the Rinkeby testnet or to compile and deploy to a local Ganache blockchain there are no special hardware requirements beyond a Linux operating system.

To compile and deploy the contracts yourself to the Ethereum Mainnet or one of its test networks you will need to be running a local node of that blockchain on your machine. To run a local node of a blockchain requires a large amount of free Solid State Drive space. The amount of space needed will vary by network and over time. Bellow is an estimation of the requirements for a local full node for the Rinkeby testnet:

- 50G+ SSD Storage
- 4G+ Ram also recommended.

2.2. Software requirements

Below is a list of the software requirements for the various stages of installation along with directions to download the software. I have broken them down into subheadings, so the user need only download the software for what they are trying to achieve.

2.2.1. Compiling and deploying smart contracts locally

- Truffle:
  ```
  :~$ npm install -g truffle
  ```

- Ganache. Install the self-contained prebuilt binary located here: https://www.trufflesuite.com/ganache

2.2.2. Compiling and deploying smart contracts to a public blockchain

- Truffle:
```
:~$ npm install -g truffle
```

- Go Ethereum (Geth). See the installation guide below for how to install Geth: https://geth.ethereum.org/docs/install-and-build/installing-geth

2.2.3. Installing and building the user interface

- Node and npm:
```
:~$ sudo apt install node.js
```

- Metamask. Add the Metamask extension to the browser of your choice: https://metamask.io/download.html

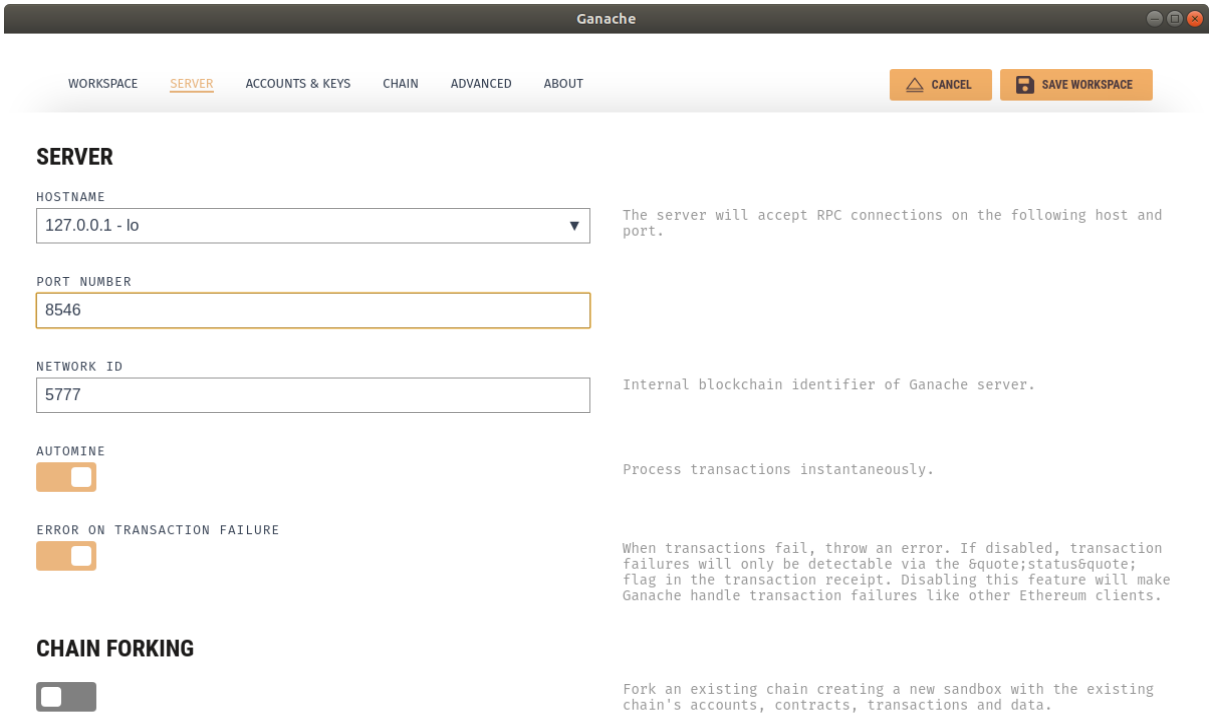
2.3. Compiling and deploying the smart contracts

To compile the smart contracts using truffle navigate to the /src folder and use:

```
:~/ca400/2021-ca400-whelak26/src$ truffle compile
```

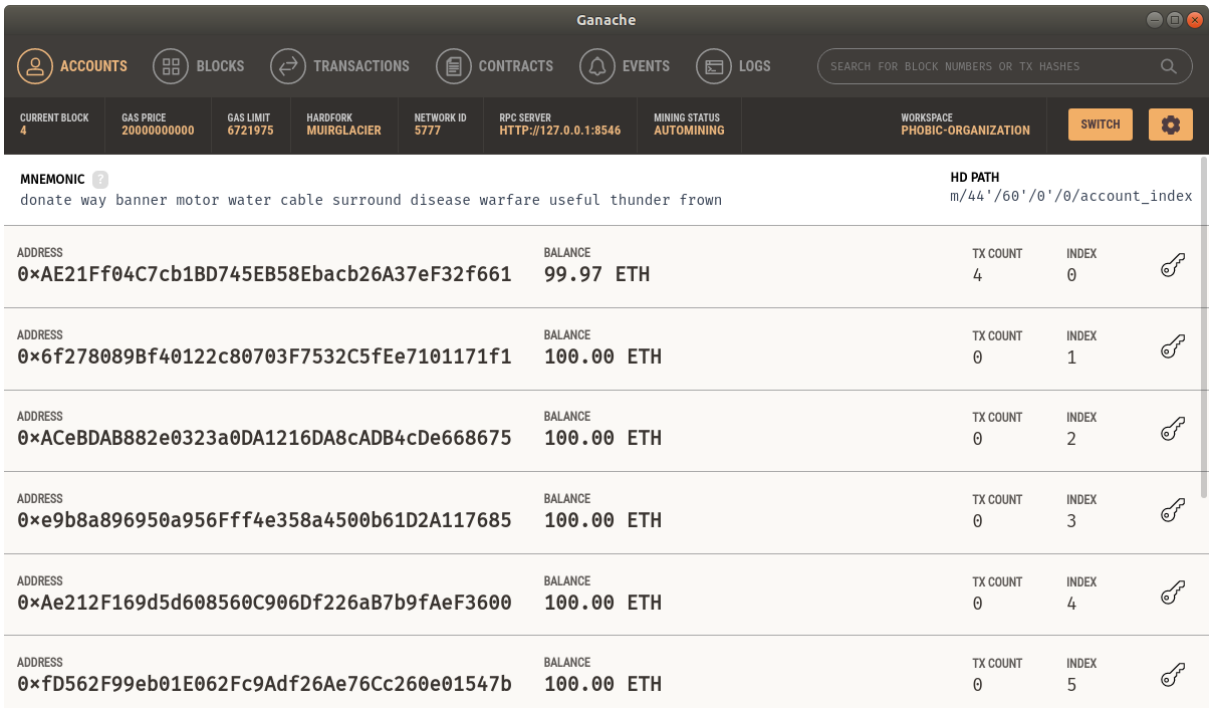
2.3.1. Deploying to a local Ganache blockchain

Open the Ganache application and run a local blockchain on port 8546. What you choose for the other settings does not matter.



This will also generate a list of accounts, by default 10 accounts, which contain some test ether. Using the following command will deploy the smart contracts to the local blockchain using the first account in the list:

```
:~/ca400/2021-ca400-whelak26/src$ truffle migrate --network development
```



2.3.2. Deploying to public Rinkeby blockchain

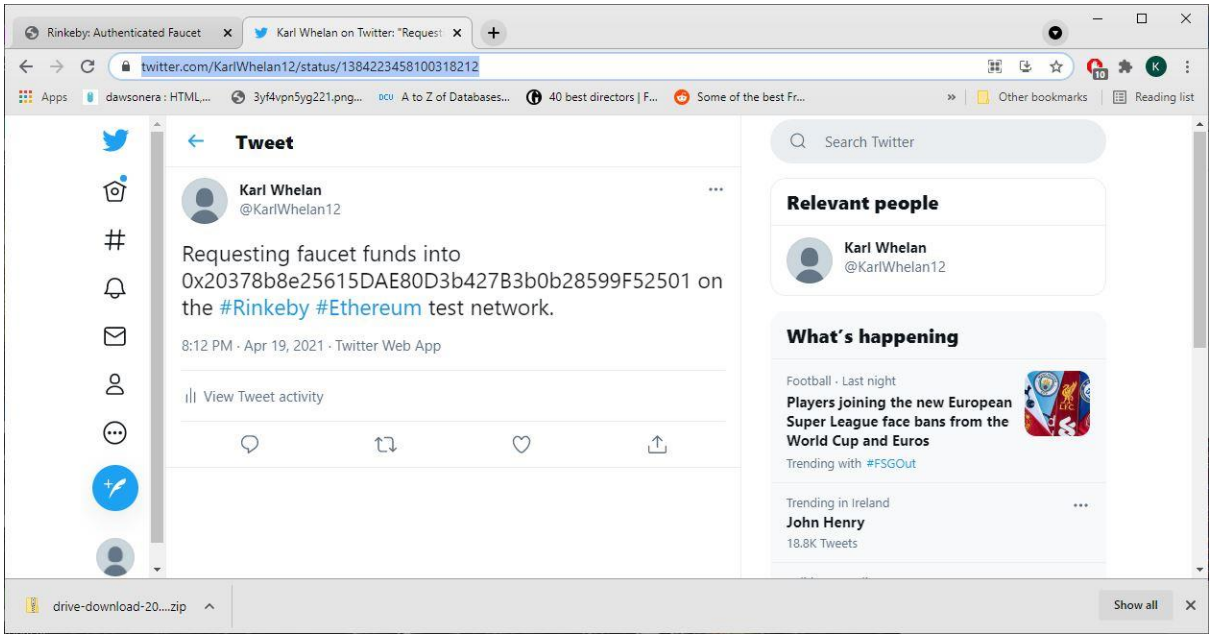
To deploy to the Rinkeby testnet you must have a local node running on your machine at port 8545. To see how to connect yourself to Rinkeby see here: https://www.rinkeby.io/#geth

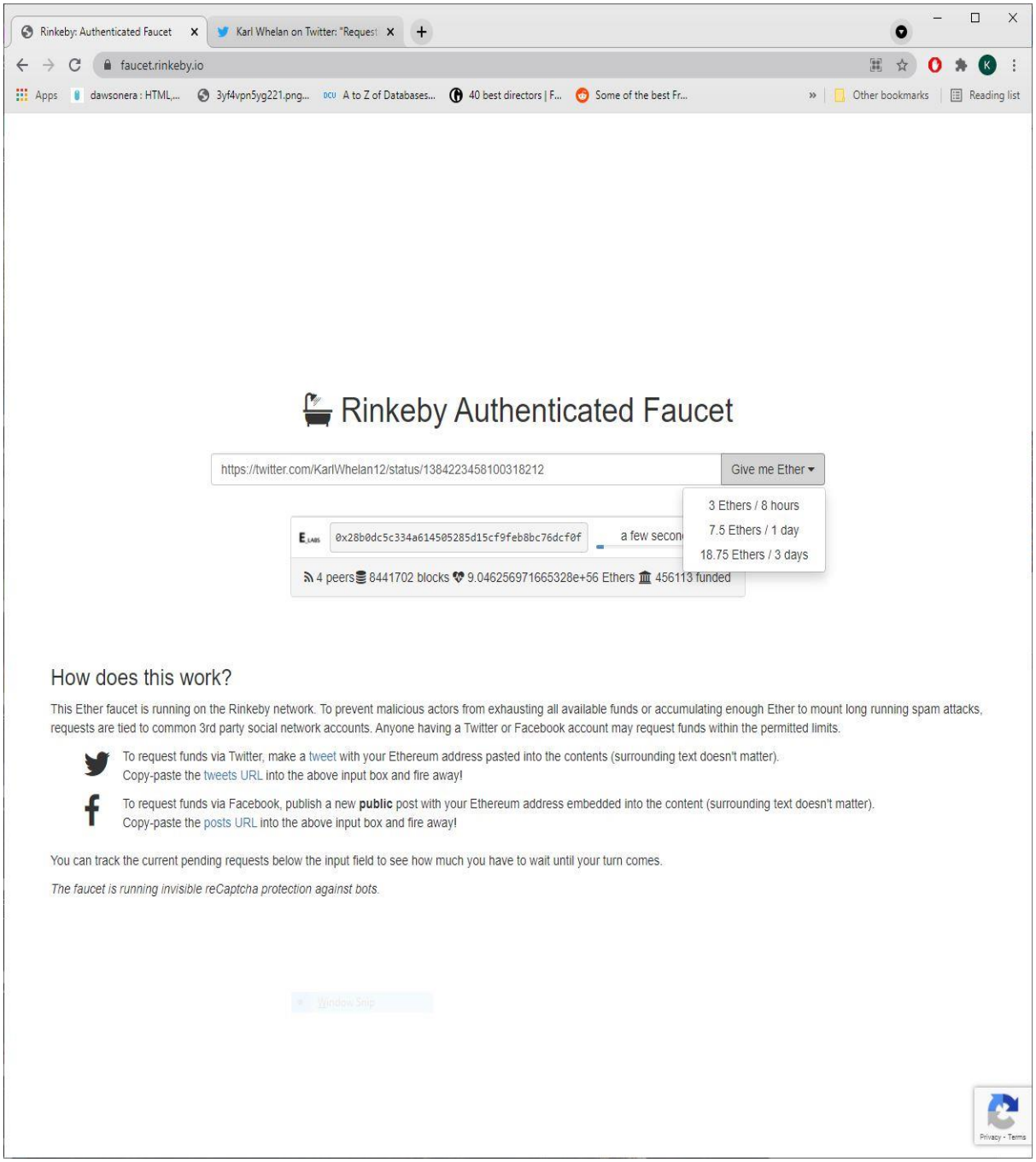
You'll also need to create an ethereum account and password:

```
$ geth account new
```

```
Your new account is locked with a password. Please give a password. Do not forget this password.
Password:
Repeat password:

Your new key was generated

Public address of the key:   0x20378b0e25615DAE80D3b427B3b0b28599F52501
Path of the secret key file: /home/karl/.ethereum/keystore/UTC--2021-04-19T18-52-18.712901157Z--20378b0e25615dae80d3b427b3b0b28599f52501

- You can share your public address with anyone. Others need it to interact with you.
- You must NEVER share the secret key with anyone! The key controls access to your funds!
- You must BACKUP your key file! Without the key, it's impossible to access account funds!
- You must REMEMBER your password! Without the password, it's impossible to decrypt the key!
```

Now that you have your new account. You can use the public key to request funds from the Rinkeby faucet. You will need these funds to deploy the contracts. To do this you need to make a public media post containing your accounts public key, save the URL of that post and paste the URL into the Rinkeby faucet here as shown in the images below:
https://faucet.rinkeby.io/





Once you have test ether in your account you should unlock the account with your password and use truffle to deploy to the Rinkeby testnet as below:

```
~/ca400/2021-ca400-whelak26/src$ truffle migrate --network Rinkeby
```

2.3.3. Deploying to other public blockchain

This project can also be deployed, with truffle, to the Ethereum Mainnet or any of its test networks by configuring the truffle-config.js file in /src. For more info about how to do this and other configurations like changing the ports used see the truffle docs: https://www.trufflesuite.com/docs/truffle/reference/configuration

2.4. Installing and building the user interface

Compiling the smart contracts will create a folder /src/client/src/builtContracts containing json files that the user interface needs to connect to the blockchain. To install the user interface, navigate to the /src/client folder and use:

```
:~/ca400/2021-ca400-whelak26/src/client$ npm install
```

To run the app in development mode use:

```
:~/ca400/2021-ca400-whelak26/src/client$ npm start
```

This will run the app here: http://localhost:3000/

To build the app for production use:

```
:~/ca400/2021-ca400-whelak26/src/client$ npm run build
```

This will build the app, so it is ready for production and place the build files in /src/client/build.

2.4.1. Installing Metamask

To use the UI, you must have the Metamask extension installed on your browser: https://metamask.io/download.html

3. Testing

3.1. Testing the user interface

Each component in the frontend has tests associated with it that test that it renders correctly given certain conditions. There are also end-to-end tests that test the navigation elements of the UI. For the end-to-end tests you must first have a local ganache blockchain running on port 8546. To run all tests for the UI navigate to /src/client and use:

```
:~/ca400/2021-ca400-whelak26/src/client$ npm test
```

This will open the console. Type 'a' to run all tests. You should receive feedback of all tests passing as shown below.

```
No tests found related to files changed since last commit.
Press `a` to run all tests, or run Jest with `--watchAll`.

Watch Usage
 › Press a to run all tests.
 › Press f to run only failed tests.
 › Press q to quit watch mode.
 › Press p to filter by a filename regex pattern.
 › Press t to filter by a test name regex pattern.
 › Press Enter to trigger a test run.
```

```
 PASS  src/components/__test__/Navbar.test.js
 PASS  src/components/__test__/ViewProject.test.js
 PASS  src/components/__test__/MetamaskInfo.test.js
 PASS  src/components/__test__/ViewProjectsPageBody.test.js
 PASS  src/components/__test__/CreateProjectPageBody.test.js
 PASS  src/components/__test__/GettingFundsInfo.test.js
 PASS  src/components/__test__/HomePage.test.js
 PASS  src/components/__test__/Input.test.js
 PASS  src/components/__test__/Header.test.js
 PASS  src/components/__test__/AboutPage.test.js
 PASS  src/components/__test__/ToolTipIcon.test.js
 PASS  src/App.test.js

Test Suites: 12 passed, 12 total
Tests:       34 passed, 34 total
Snapshots:   0 total
Time:        2.038 s
Ran all test suites.
```

3.2. Unit testing and end-to-end testing for smart contracts

To run the Unit tests and end-to-end tests for the smart contracts you must also have a local Ganache blockchain running on port 8546. Navigate to /src and use:

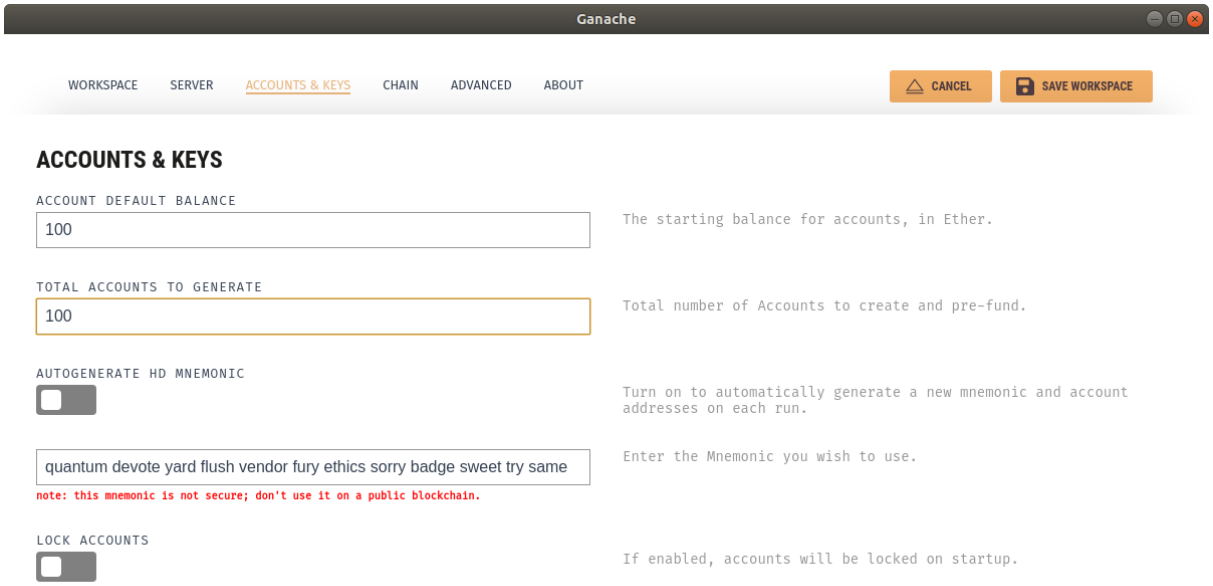
```
:~/ca400/2021-ca400-whelak26/src$ truffle test ./test/projects.js
```

You should receive feedback of what tests are running and passing like below.

```
Compiling your contracts...
===========================
> Everything is up to date, there is nothing to compile.


  Contract: Projects
    ✓ should deploy the contract properly
    ✓ Should create a Project correctly (73ms)
    ✓ Should create 3 more Projects correctly (204ms)
    ✓ Should return 4 projects in the correct format (77ms)
    ✓ Should donate 1 ether to each project (349ms)
    ✓ Should check that the balance of the contract is 4 eth
    ✓ should advance time
    ✓ Should create a project that ends in two days (109ms)
    ✓ Should advance time by 2 days and the project should have ended
    ✓ Should test payOut function (139ms)
    ✓ Should test payRefunds function (361ms)


  11 passing (2s)
```

3.3. Scalability and gas usage testing for smart contracts

For the scalability and gas usage testing you should run a local Ganache blockchain with 100 accounts, instead of the default 10, on port 8546.



Navigate to /src and use:

```
~/ca400/2021-ca400-whelak26/src$ truffle test ./test/scalability.js
```

This should give you feedback in the console like below. It also will write the results of the testing to 3 separate files in the /src/test/logs folder. The tests measure gas usage when calling functions multiple times. If the gas usage can be shown to be linear then the functions are scalable.

```
Compiling your contracts...
===========================
> Everything is up to date, there is nothing to compile.


  Contract: Scalability
    Scalability test
      ✓ tests creating 100 projects (5884ms)
      ✓ tests donating 99 times to 1 project (10701ms)
      ✓ tests donating 1 time to 99 projects (16519ms)


  3 passing (33s)
```

create-project-function-scalability.log

transactionNumber	GasUsed	GasPrice	Exchange rate	Cost in Ether	Cost in Euro
0	132641	1	1870	0.000132641	0.24803867
9	117641	1	1870	0.000117641	0.21998867
19	117641	1	1870	0.000117641	0.21998867
29	117641	1	1870	0.000117641	0.21998867
39	117641	1	1870	0.000117641	0.21998867
49	117641	1	1870	0.000117641	0.21998867
59	117641	1	1870	0.000117641	0.21998867
69	117641	1	1870	0.000117641	0.21998867
79	117641	1	1870	0.000117641	0.21998867
89	117641	1	1870	0.000117641	0.21998867
99	117641	1	1870	0.000117641	0.21998867

donate-to-project-function-scalability.log

transactionNumber	GasUsed	GasPrice	Exchange rate	Cost in Ether	Cost in Euro
1	109776	1	1870	0.000109776	0.20528112
9	79776	1	1870	0.000079776	0.14918112
19	79776	1	1870	0.000079776	0.14918112
29	79776	1	1870	0.000079776	0.14918112
39	79776	1	1870	0.000079776	0.14918112
49	79776	1	1870	0.000079776	0.14918112
59	79776	1	1870	0.000079776	0.14918112
69	79776	1	1870	0.000079776	0.14918112
79	79776	1	1870	0.000079776	0.14918112
89	79776	1	1870	0.000079776	0.14918112
99	79776	1	1870	0.000079776	0.14918112

donate-to-all-project-function-scalability.log

transactionNumber	GasUsed	GasPrice	Exchange rate	Cost in Ether	Cost in Euro
1	64776	1	1870	0.000064776	0.12113112000000001
9	109788	1	1870	0.000109788	0.20530356
19	109788	1	1870	0.000109788	0.20530356
29	109788	1	1870	0.000109788	0.20530356
39	109788	1	1870	0.000109788	0.20530356
49	109788	1	1870	0.000109788	0.20530356
59	109788	1	1870	0.000109788	0.20530356
69	109788	1	1870	0.000109788	0.20530356
79	109788	1	1870	0.000109788	0.20530356
89	109788	1	1870	0.000109788	0.20530356
99	109788	1	1870	0.000109788	0.20530356

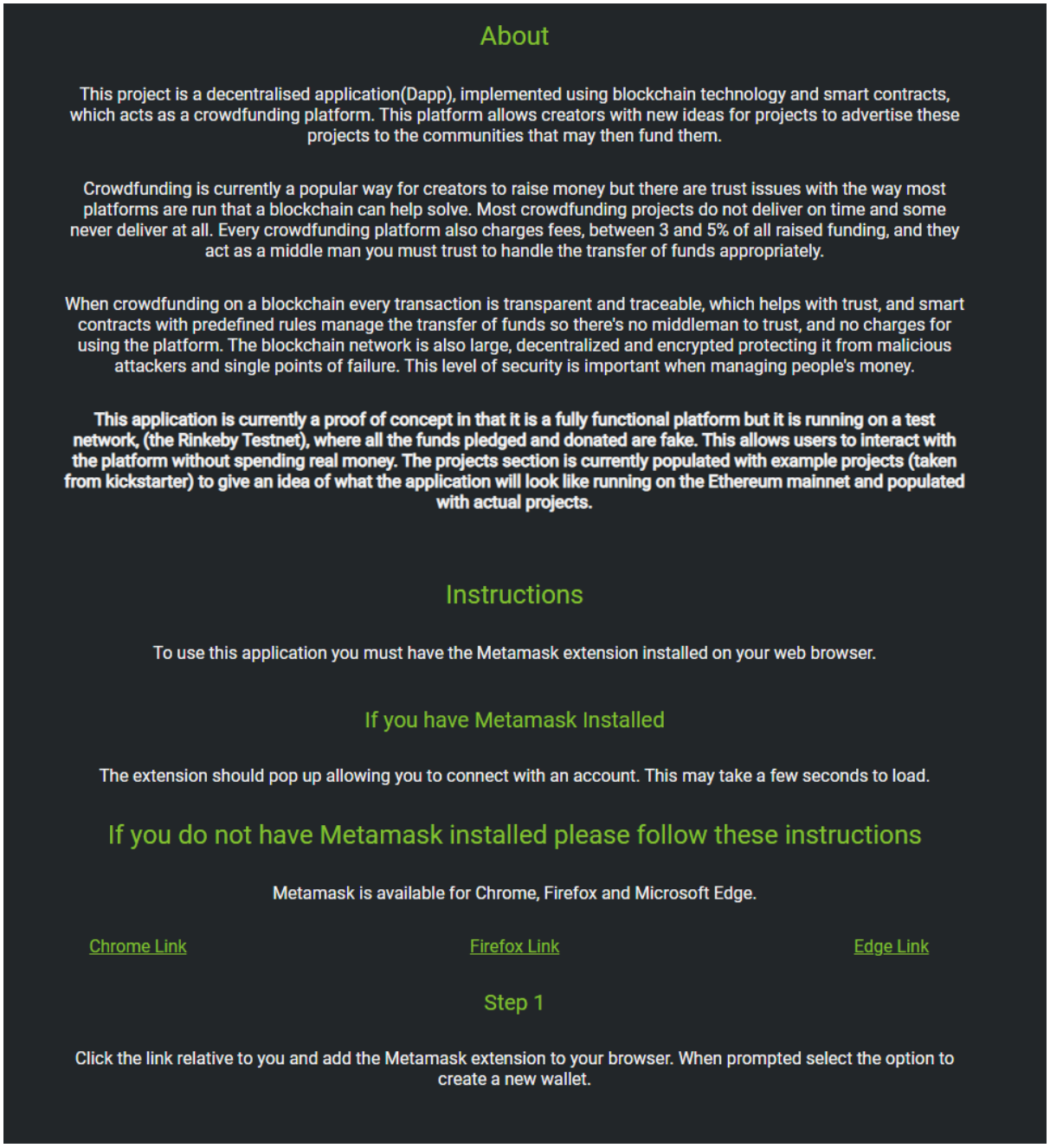
4. Usage

This section describes the layout and functionality of the User Interface. A live version connected to the Rinkeby testnet blockchain can be found here: https://main.d3oz5l3o8ahlw9.amplifyapp.com/

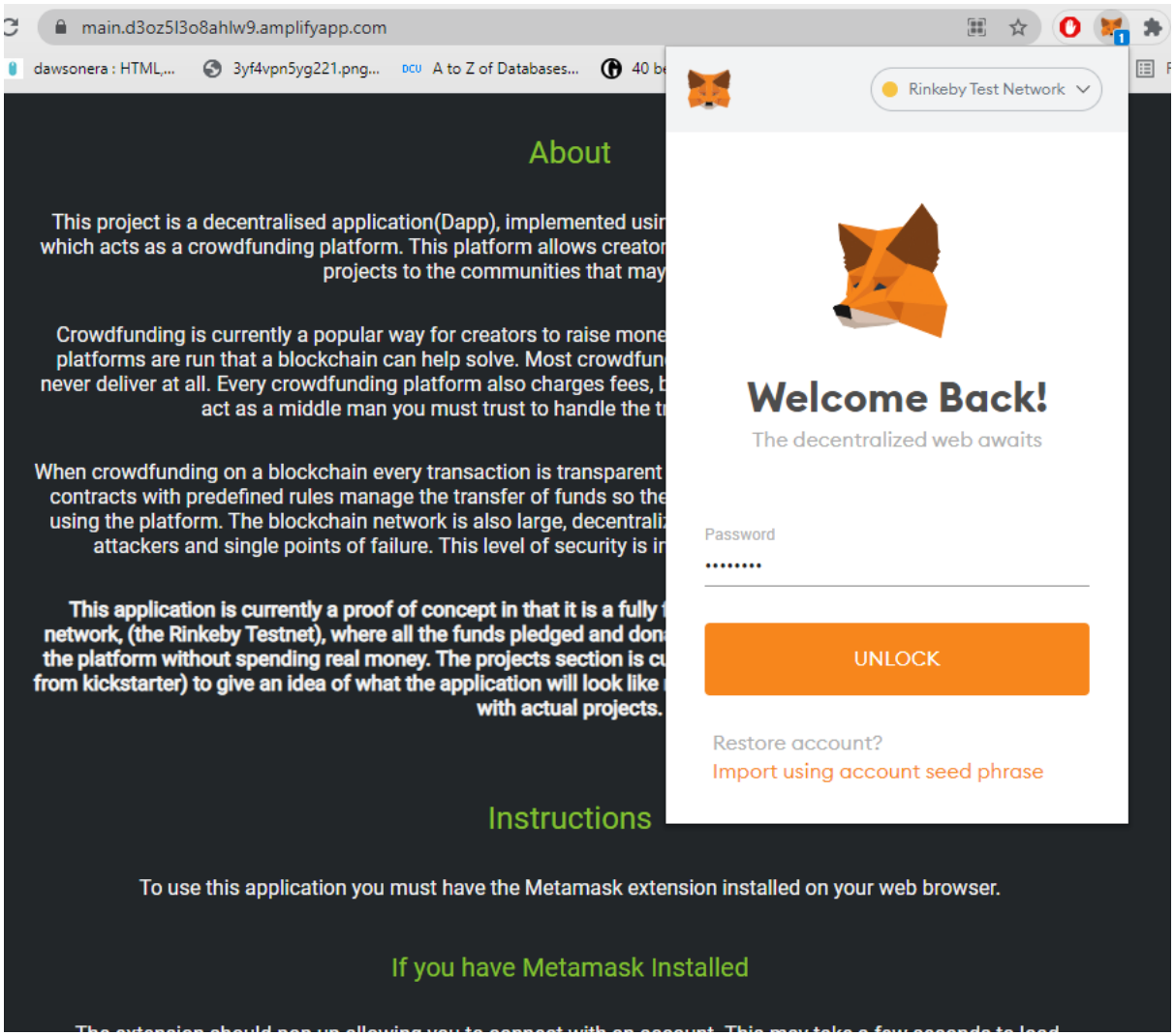
4.1. App layout

4.1.1. Landing page

When you open the Application, you will be brought to the landing page which displays information about the App and gives detailed instructions on how to install Metamask if you have not already.

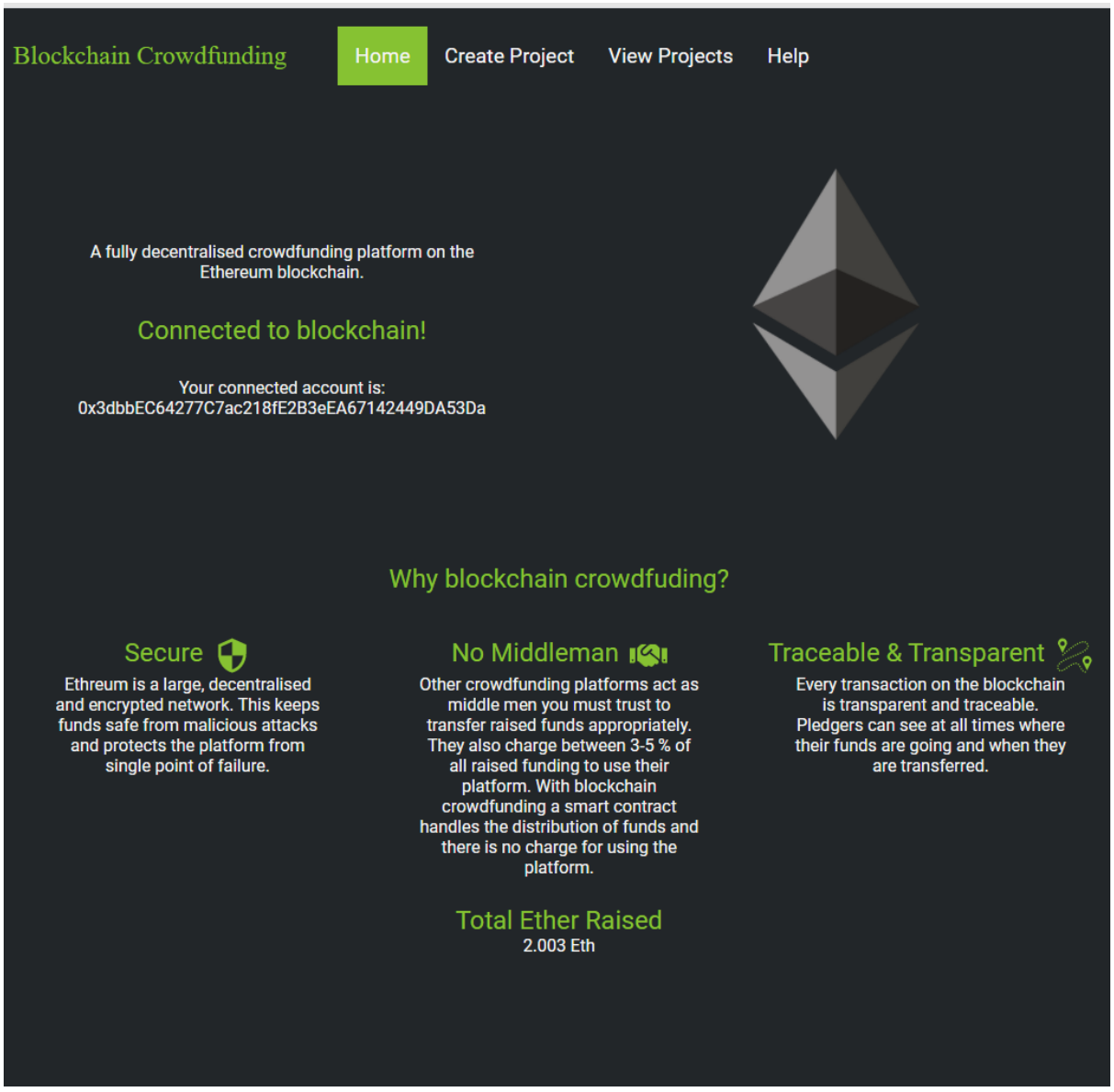


If you do have Metamask installed it should pop up now allowing you to sign in, choose your account and to connect to the blockchain.


main.d3oz5l3o8ahlw9.amplifyapp.com
dawsonera : HTML,...
3yf4vpn5yg221.png...
A to Z of Databases...
Rinkeby Test Network
About
This project is a decentralised application(Dapp), implemented usir
which acts as a crowdfunding platform. This platform allows creator
projects to the communities that may
Crowdfunding is currently a popular way for creators to raise mone
platforms are run that a blockchain can help solve. Most crowdfun
never deliver at all. Every crowdfunding platform also charges fees, b
act as a middle man you must trust to handle the t
When crowdfunding on a blockchain every transaction is transparent
contracts with predefined rules manage the transfer of funds so the
using the platform. The blockchain network is also large, decentrali
attackers and single points of failure. This level of security is ir
This application is currently a proof of concept in that it is a fully
network, (the Rinkeby Testnet), where all the funds pledged and don
the platform without spending real money. The projects section is cu
from kickstarter) to give an idea of what the application will look like
with actual projects.
Welcome Back!
The decentralized web awaits
Password
UNLOCK
Restore account?
Import using account seed phrase
Instructions
To use this application you must have the Metamask extension installed on your web browser.
If you have Metamask Installed

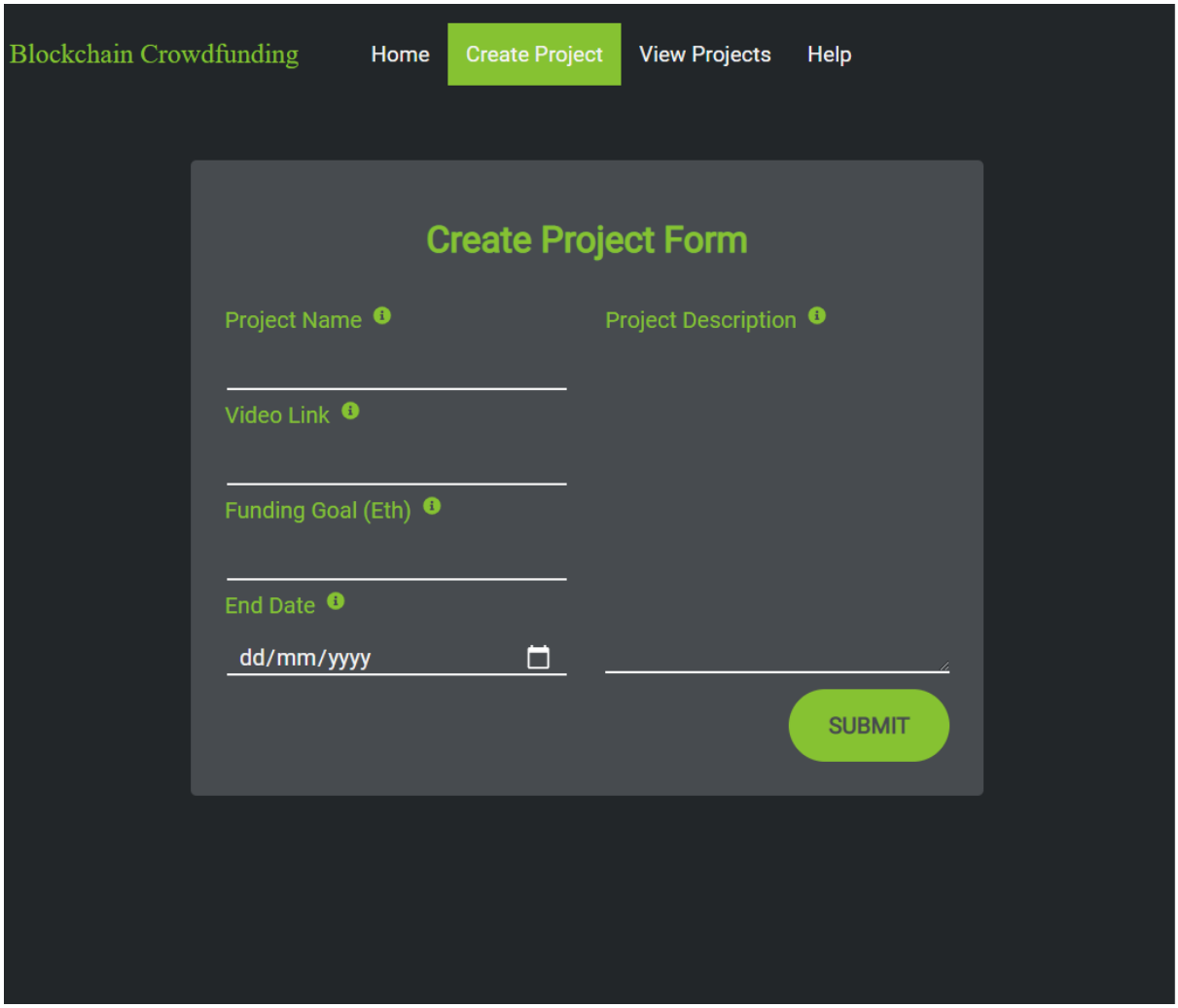
4.1.2. Home page

Once signed in you will be redirected to the homepage which contains some more information about the app including what account you are connected with and the total amount of Eth raised so far for active projects on the platform. You can now use the Navbar to navigate between pages.



4.1.3. Create project page

The create project page contains a submittable form that allows users to create a project. Tooltip icons give more detailed descriptions of the forms fields if the user needs them.

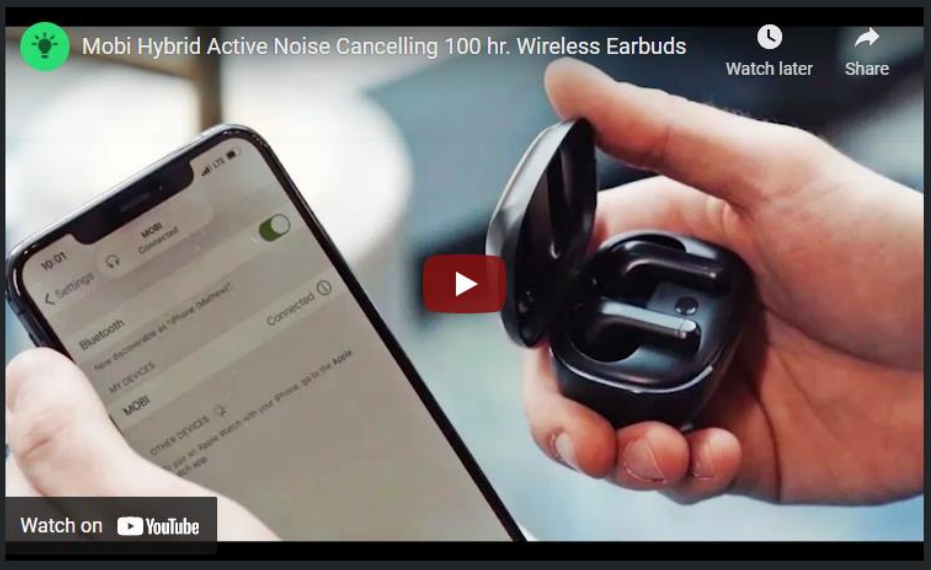


4.1.4. View projects page

The view projects page contains information about all active projects on the platform. The information on each project includes the project name, description, project video, funding goal, amount raised so far and the end date of the project. There is also a section at the bottom of each project allowing you to donate to that project should you wish. You can scroll through the projects by clicking the green arrows or by dragging across the screen with your mouse or finger if on mobile.

Mobi Hybrid Active Noise Cancelling 100 hr. Wireless Earbuds

Project Video



Project Description

Mobi is the first true wireless headphones to deliver full-frequency noise cancellation for a full-immersion audio experience. Mobi's hybrid ANC technology features 3 separate feedback and feedforward microphones on each earbud to capture and cancel noise at any frequency. Mobi actually hears what you hear and uses AI to create the ideal listening experience based on your music, your environment, and your movements.

The result? Full immersion into your music, videos, calls, and more. No distraction. No distortion. No disruption.

Combined with oversized speakers, an ultra-long battery, and IPX4 weatherproofing, Mobi can transform anywhere and everywhere into your own world of crystal-clear audio.

A revolutionary pair of earphones, MOBI is an enhancement to all your deep listening experiences. No more 'so-called' noise cancellation, MOBI is a guaranteed set of earbuds that will transform your view of noise cancellation with these unique features: AI powered Hybrid Active Nise Cancellation, 12mm Oversized Drivers for stronger bass, 100-Hour Battery Life and Multi Touch controls.

Mobi's AI Powered Hybrid Active Noise Cancellation is the newest and most advanced noise cancelling technology on the market.

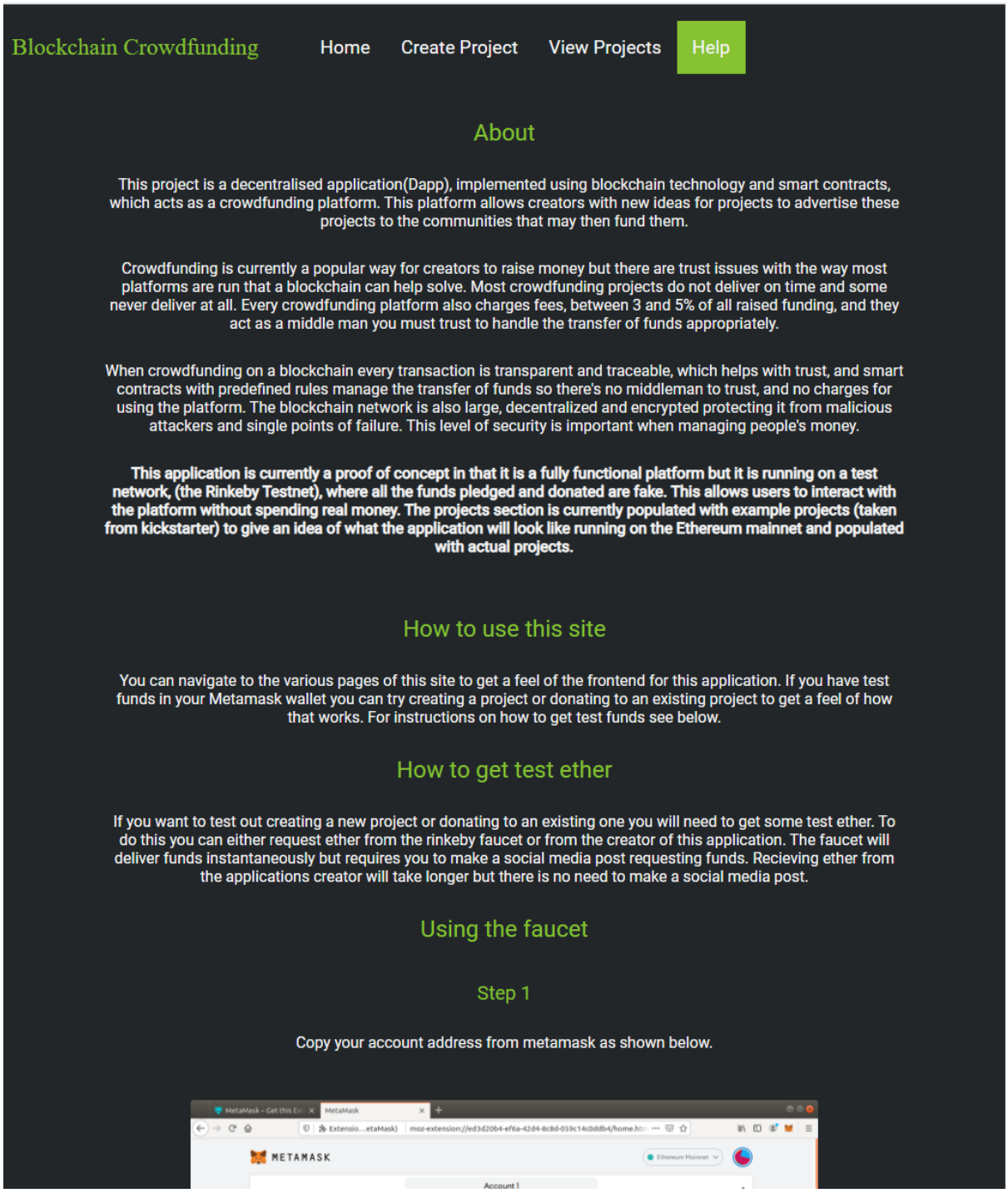
Hybrid active noise cancellation combines feedforward and feedback microphones to capture a wider audio frequency, therefore cancelling more noise.

Funding Goal	Amount Pledged	End Date
5 Eth	1.003 Eth	6/6/2021

Donation Amount

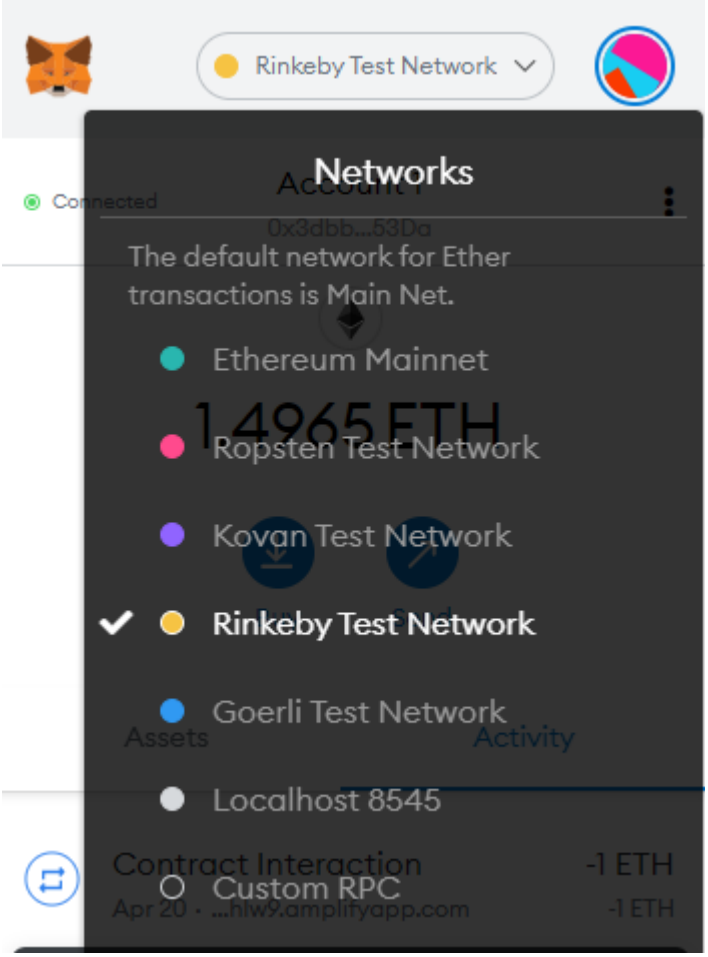
4.1.5. Help Page

The help page contains information about the App, information on how to use the site and information about how to get test ether from the Rinkeby faucet.



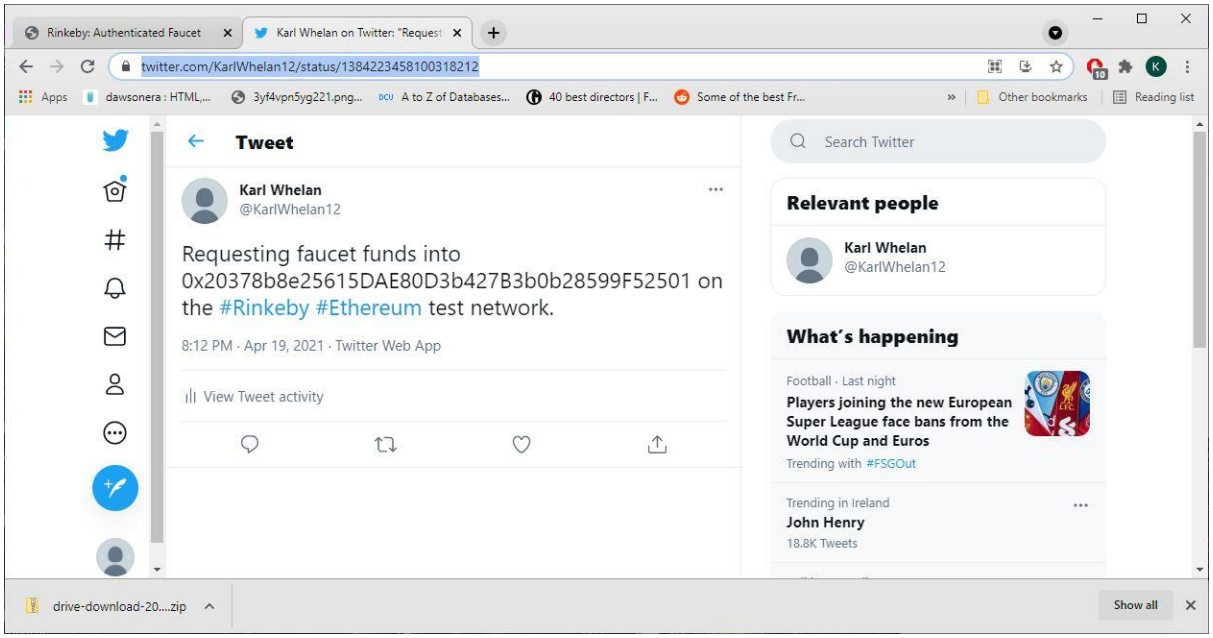
4.2. Using the App

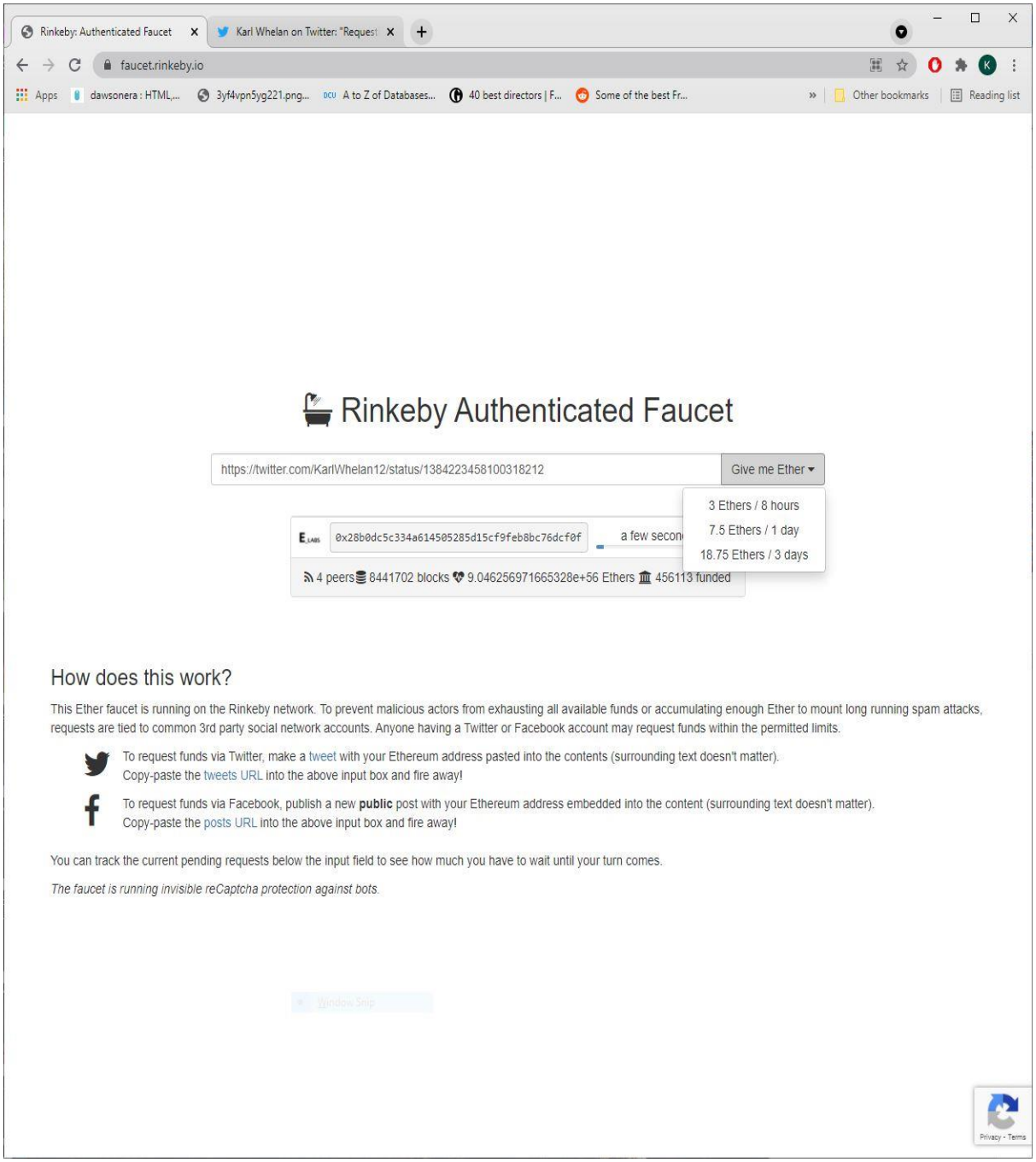
Before using the App, please make sure you are connected to the correct blockchain on Metamask otherwise the functions will not work. If you are using the live UI from earlier in this section, you should be on the Rinkeby testnet as shown below.



4.2.1. Getting test ether

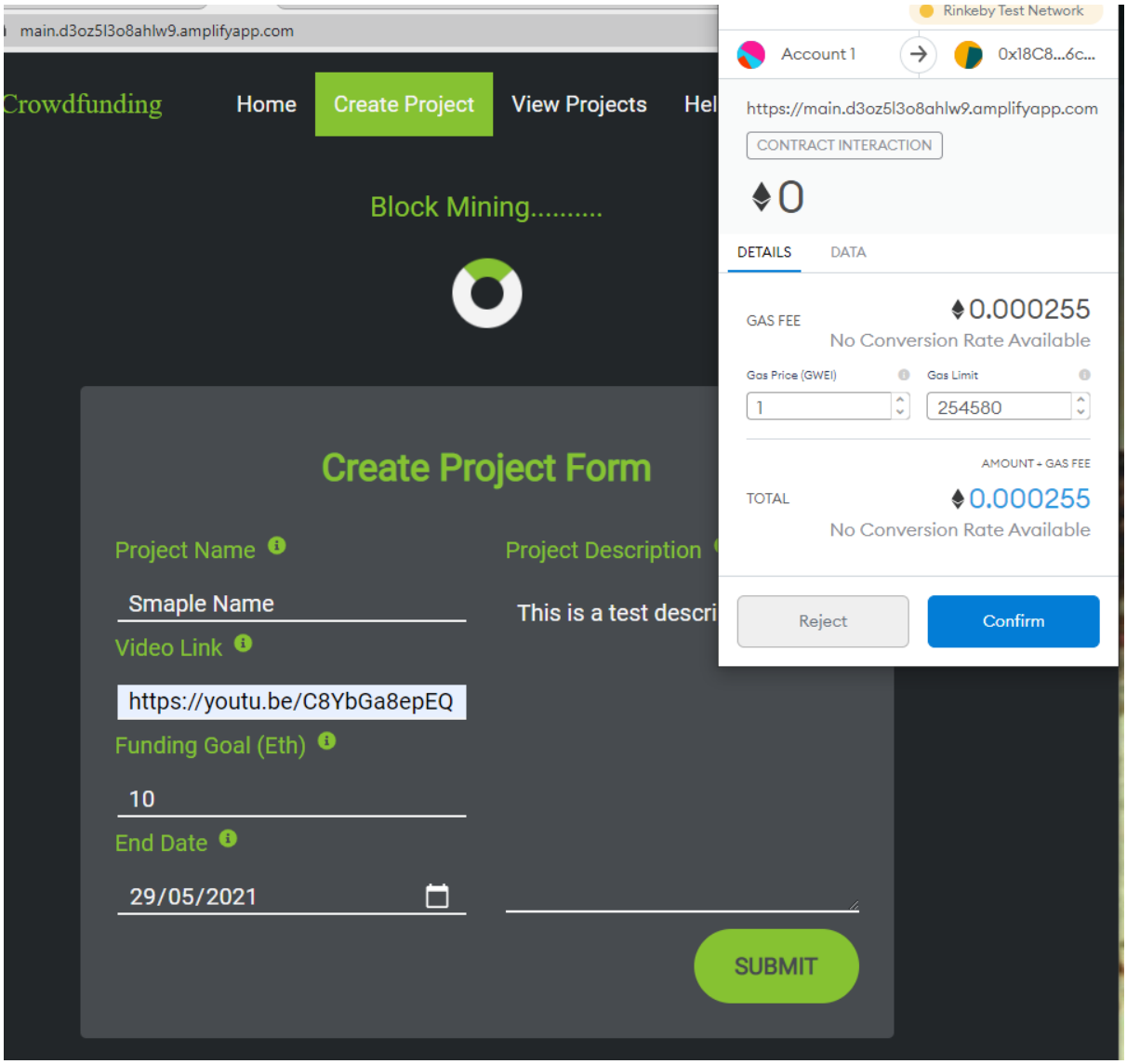
You will need Ether to create projects or to donate to existing projects. If you are using the live UI from earlier in this section, you will need Rinkeby test ether. To get some you can use the Rinkeby faucet. First make a public social media post, on twitter or Facebook, containing your public account address. Then go to the Rinkeby faucet here and paste the URL of you post into the faucet selecting the amount of ether you wish to receive. You should receive the funds in a matter of seconds. And example is shown below.




Rinkeby: Authenticated Faucet
Karl Whelan on Twitter: "Request
faucet.rinkeby.io
Apps
dawsonera : HTML,...
3yf4vpn5yg221.png...
A to Z of Databases...
40 best directors | F...
Some of the best Fr...
Other bookmarks
Reading list
Rinkeby Authenticated Faucet
https://twitter.com/KarlWhelan12/status/1384223458100318212
Give me Ether
3 Ethers / 8 hours
7.5 Ethers / 1 day
18.75 Ethers / 3 days
0x28b0dc5c334a614505285d15cf9feb8bc76dcf0f
4 peers 8441702 blocks 9.046256971665328e+56 Ethers 456113 funded
How does this work?
This Ether faucet is running on the Rinkeby network. To prevent malicious actors from exhausting all available funds or accumulating enough Ether to mount long running spam attacks, requests are tied to common 3rd party social network accounts. Anyone having a Twitter or Facebook account may request funds within the permitted limits.
To request funds via Twitter, make a tweet with your Ethereum address pasted into the contents (surrounding text doesn't matter).
Copy-paste the tweets URL into the above input box and fire away!
To request funds via Facebook, publish a new public post with your Ethereum address embedded into the content (surrounding text doesn't matter).
Copy-paste the posts URL into the above input box and fire away!
You can track the current pending requests below the input field to see how much you have to wait until your turn comes.
The faucet is running invisible reCaptcha protection against bots.

4.2.2. Creating a project

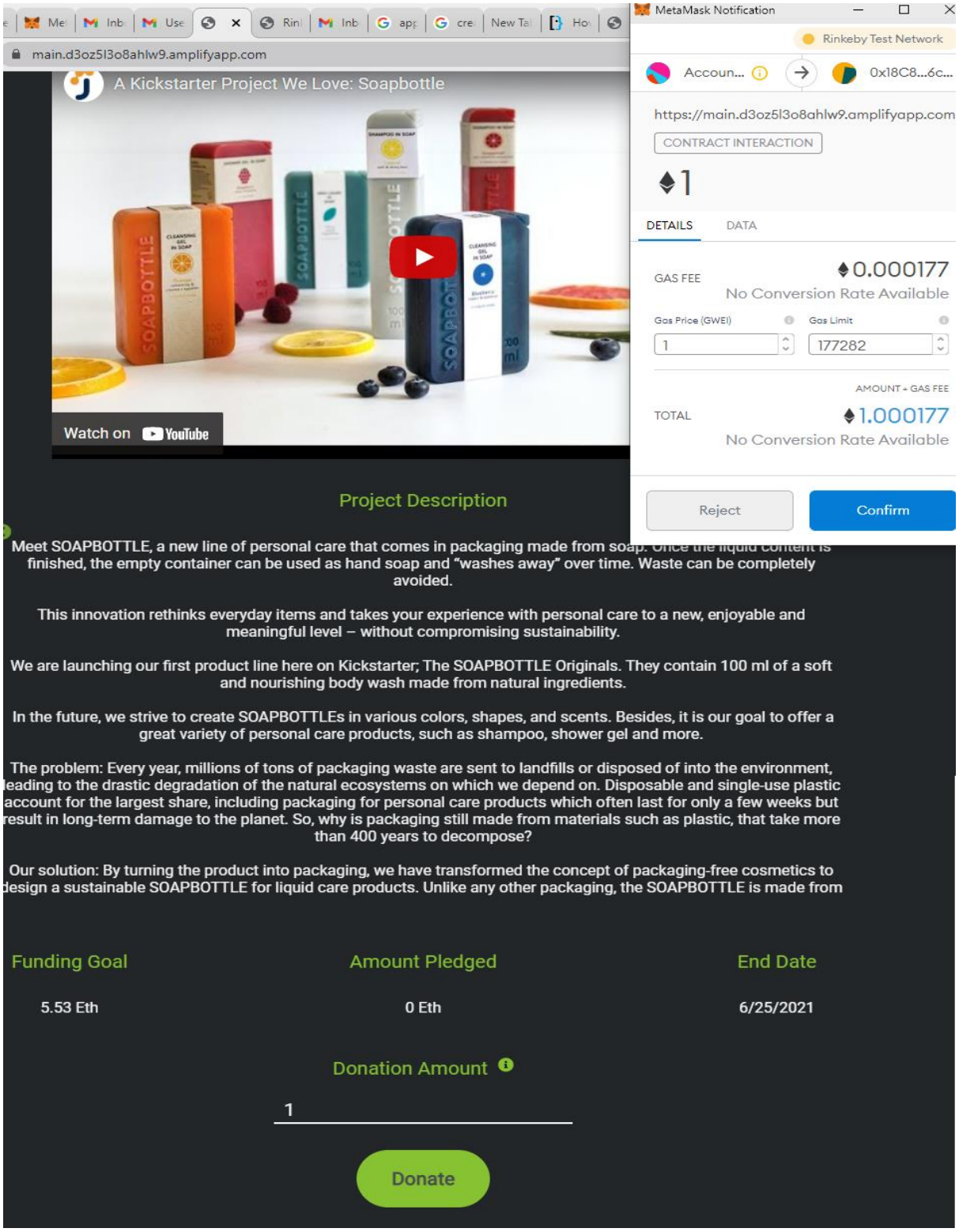
To create a project, fill in the create project form and press submit. You will not be able to submit the form if one or more of the fields are not valid. The tool tip icons can help you understand the various fields. When you have submitted valid values Metamask should pop up and allow you to accept or reject the transaction.



On the public testnet blocks take around 15 seconds to mine, after this you will receive a confirmation and your project will be added to the list of active projects.

4.2.3. Donating to a project

To donate to a project simply enter the amount of Eth you wish to donate in the donation field and click the button. Metamask will pop up with information about the proposed transaction and you can accept or reject it.



On the public testnet blocks take around 15 seconds to mine, after this you will receive a confirmation and the values will have updated.