8Lab Solutions - Project "Soldino"

Developer manual

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Description

Developer manual made by *8Labs Solutions* for the making of the project *Soldino*.

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Changelog

Version	Date	Name	Role	Description
2.0.1	2019-03-20	Federico Bicciato	**RUOLO**	Structure of the document created.

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1 Introduction

1.1 Manual contents

This document is the developer manual of the project *Soldino*, developed by *8Lab Solutions* team for the proponent *Red Babel*.
Within the manual you can find:

- the technologies used for the development;
- the software tools used and suggested;
- the software architecture;
- the architectural and design pattern used;
- the functionalities provided by *Soldino*.

1.2 Purpose of the manual

The contents of the manual are intended to help the developers who decide to maintain or further develop *Soldino*. Everything described here can help the developer to fully and deeply understand the design, use and features of the application, so that it can be modified and improved with ease.
Many technologies, tools and languages are used to build the app: these are only briefly explained in their parts that cover the application domain. Additional references can be found in the "Reference" section.

1.3 Purpose of the product

Soldino platform is a DApp accessible on a web browser as a client interface and the plug-in Metamask is a virtual wallet used for transactions made through *Soldino*.
The main functionality of the product is trading goods and services online. Since the platform's backend is based on the Ethereum network, it provides more security and transparency than the traditional e-commerce websites.
The platform is built to be managed by the government and the currency used is called Cubit, it is a ERC20 compliant fork of Ether minted and managed by the government itself.

1.4 References

- **Ganache** `https://truffleframework.com/ganache`
- **Git** `https://it.atlassian.com/git`
- **Node.js** `https://nodejs.org/it/`
- **Node Package Manager** `https://www.npmjs.com/get-npm`
- **Surge.sh** `https://surge.sh/help/getting-started-with-surge`
- **Truffle** `https://truffleframework.com/truffle`
- **Solidity** `https://solidity.readthedocs.io/en/v0.5.0/`

2 Setup

2.1 Requirements

In this section all of the requirements needed are described.

2.1.1 Browser

Soldino is accessible through a web interface. The currently most recent versions of the following broswers are supported:

- **Mozilla Firefox**: version 64 or later;
- **Google Chrome** version 71 or later.

2.1.2 Tools

The following tools are needed:

- **Git**: a famous control version system: *Soldino* is hosted on GitHub;
- **Node.js**: a framework needed for installing dependencies;
- **Truffle**: needed to write and deploy contracts with ease;
- **Ganache**: needed to put up a local Ethereum network and check transactions in it;
- **Metamask**: a browser plugin used as a virtual wallet;
- **Surge.sh**: a web platform chosen for hosting the website interface of Soldino.

2.1.3 Dependencies

Soldino depends on many different packages, some for use and others for development.
All these packages are located in the file `package.json` which is in the root folder of the project.
The packages required to execute the software *Soldino* are listed below.

Table 2.1.1: Packages required for software usage

Software	Version
react-text-mask	≥5.4.4
commondir	≥1.0.1
history	≥4.7.2
prop-types	≥15.7.2
react	≥16.8.3
react-dom	≥16.8.3
react-number-format	≥4.0.6
react-redux	≥6.0.1

Table 2.1.1: Packages required for software usage

Software	Version
react-router	≥4.3.1
react-router-dom	≥4.3.1
react-router-redux	≥4.0.8
react-scripts	≥2.1.8
redux	≥4.0.1
redux-thunk	≥2.3.0
web3	1.0.0-beta.37

Other packages, listed below, are required for the development.

Table 2.1.2: Packages required for development

Software	Version
eslint	5.12.0
eslint-config-airbnb	≥17.1.0
eslint-loader	≥2.1.2
eslint-plugin-import	≥2.16.0
eslint-plugin-jsx-a11y	≥6.2.1
pre-commit	≥1.2.2
truffle-contract	≥4.0.6

2.2 Installing

2.2.1 Browser

The first thing is to have your browser installed. You can get the latest chrome version here.

2.2.2 Git

You should type this script in the shell for installing Git packet: `sudo apt install git`.

2.2.3 Node

For installing Node.js you have to digit in the shell the following commands:

1. `curl -sL https://deb.nodesource.com/setup_11.x | sudo -E bash -`
2. `sudo apt install -y nodejs`

3. check that `node` have been installed correctly with `node -v`.

There is no need to install npm separately, since it is automatically installed with Node.

2.2.4 Truffle

You should check you have the truffle requirements:

- an OS among Linux, Windows and MacOS (prefer Linux);
- NodeJS v8.9.4 or later (we picked version 11);
- Node Package Manager (npm).

then you can install Truffle by running the command: `npm install -g truffle`

2.2.5 Ganache

There are three step to install Ganache:

1. you can download the Ganache executable at this link, clicking on the download button;
2. if you have a Linux operating system, you have to give the permissions to make the Ganache file executable. This can be done with the command
`chmod +x path-of-the-appimage/name-of-downloaded-file.AppImage`;

2.2.6 MetaMask

You can add it to your browser in this way:

- Chrome: https://chrome.google.com/webstore/search/metamask?hl=it;
- Firefox: https://addons.mozilla.org/it/firefox/addon/ether-metamask/?src=search.

2.2.7 Surge

You have to install Surge by executing the shell command: `npm install -g surge`.

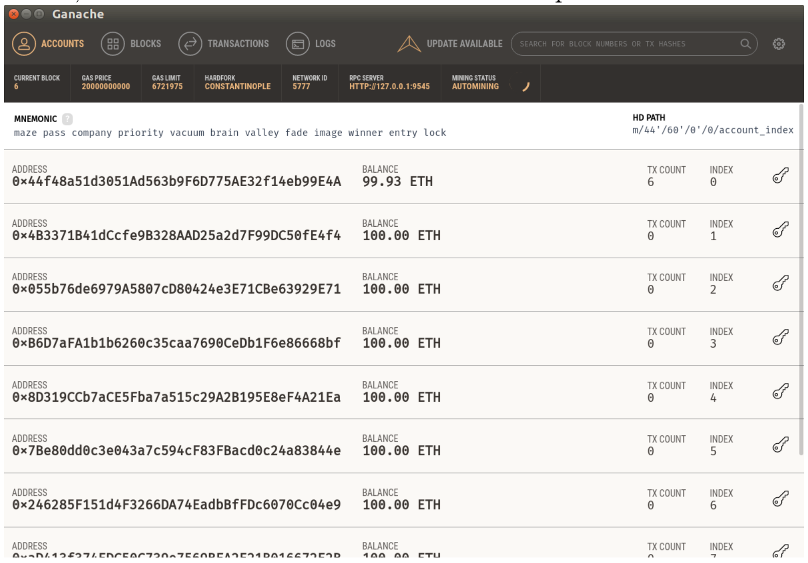
2.3 Configuration

This section shows how to configure your work environment, so that it's the same as ours, in order to minimize the number and entity of troubles you will occur in.
Make sure to configure the tools in order. In particular, Truffle requires that Ganache is opened and is configured to execute successfully.

2.3.1 Cloning the repo

You have to clone the *Soldino* repository on GitHub: open the shell, move to the directory where you want Soldino to be, then use `git clone https://github.com/8LabSolutions/Soldino-PoC`.
LINK DA MODIFICARE CON IL LINK ALLA REPOSITORY FINALE

Figure 2.3.1: Ganache UI: from top to bottom you can see the menu bar, the current configuration, the mnemonic, and the interface of the selected menu option



```
CURRENT BLOCK  GAS PRICE    GAS LIMIT  HARDFORK        NETWORK ID  RPC SERVER              MINING STATUS
6              20000000000  6721975    CONSTANTINOPLE  5777        HTTP://127.0.0.1:9545   AUTOMINING

MNEMONIC                                                                     HD PATH
maze pass company priority vacuum brain valley fade image winner entry lock  m/44'/60'/0'/0/account_index

ADDRESS                                       BALANCE      TX COUNT  INDEX
0×44f48a51d3051Ad563b9F6D775AE32f14eb99E4A    99.93 ETH    6         0

ADDRESS                                       BALANCE      TX COUNT  INDEX
0×4B3371B41dCcfe9B328AAD25a2d7F99DC50fE4f4    100.00 ETH   0         1

ADDRESS                                       BALANCE      TX COUNT  INDEX
0×055b76de6979A5807cD80424e3E71CBe63929E71    100.00 ETH   0         2

ADDRESS                                       BALANCE      TX COUNT  INDEX
0×B6D7aFA1b1b6260c35caa7690CeDb1F6e86668bf    100.00 ETH   0         3

ADDRESS                                       BALANCE      TX COUNT  INDEX
0×8D319CCb7aCE5Fba7a515c29A2B195E8eF4A21Ea    100.00 ETH   0         4

ADDRESS                                       BALANCE      TX COUNT  INDEX
0×7Be80dd0c3e043a7c594cF83FBacd0c24a83844e    100.00 ETH   0         5

ADDRESS                                       BALANCE      TX COUNT  INDEX
0×246285F151d4F3266DA74EadbBfFDc6070Cc04e9    100.00 ETH   0         6

ADDRESS                                       BALANCE      TX COUNT  INDEX
```

2.3.2 Ganache

You have to go to the folder where you've put Ganache, and open it with double click. Then you have to click on the cog at the top left corner to access Ganache settings and make sure you've matched the following settings (most of which are defined in `truffle-config.js`) on each respective window:

- Server:
  - hostname: `127.0.0.1`;
  - port number: `9545`;
  - network it: any (you can keep the default one).
- Account & keys:
  - nothing to configure here, but you should have a look at the **mnemonic**: it will help you later.

2.3.3 Truffle

The configuration of Truffle is defined in the file `truffle-config.js` in the root directory of *Soldino*. On your shell type the following shell commands:

- `truffle console`
  opens the truffle environment in the shell under the configuration defined in truffle-config.js. From now on, every command is executed in the truffle environment, from which you can exit double typing `ctrl + C`.

- `compile`
  to compile the contracts: these are compiled in in a .json format (which enables interaction with the frontend) and put into the folder defined in `truffle-config.js` at `contracts_build_directory` (in our case the location is `./src/contracts_build`)
- `migrate --network development`
  puts the contracts runnning on the blockchain.

2.3.4 MetaMask

It's necessary to create an account.

- open MetaMask on your browser
- select get started
- select import wallet
- use the seed frase (AKA the mnemonic) copy pasting the one
- from ganache and put your password

Now your account is up and synchronized with Ganache. Now you have to connect the wallet to Ganache network. Ganache settings are exposed in the Ganache UI just above the mnemonic. Let's synchronize MetaMask to the same network. On the top right corner there is a drop-down menu to select the network. Select `Custom RPC` to set your own local network.
You are now in the MetaMask advanced settings screen. In the field `Net Network` click on `Show Advanced Options` to open the form, then insert these data:

1. **New RPC URL**: http://127.0.0.1:9545 (the port number matches the one in truffle-config.js);
2. **Nickname**: the name you wanna give to your network;
3. **save** when you're done.

MetaMask is now connected to Ganache.

To enable transactions on your local test network, you can find free ether for testing networks on this site: https://faucet.metamask.io/.

2.4 Running

Now that you have all the required software installed and configured, it's time to get it up running.
All you have to do is moving to the root directory of Soldino and prompt

```
npm run start
```

This will open the website on your browser at the address `http://127.0.0.1:3000` and allow you to explore it.

2.5 Deploying

This part shows you how to deploy contracts with Truffle and have them up running on Soldino.

3 React

3.1 Overview

React is a JavaScript library, based on npm and made by Facebook, for building user intrerfaces by assembling user-defined components.

3.2 Components

Components are the key of this npm module, *Soldino* is made by two types of component:

- Presentational components;
- Container components.

3.2.1 Presentational

Each presentational component implements *Component* interface provided by the library. According to this interface, some methods are inherited to the presentational components, in particular our components uses *Render()* method for rendering themselves. Most components can be customized when they are created, with different parameters. These creation parameters are called *props*. Each presentational component returns a single HTML tag, here we can customize the returned tag with some Bootstrap classes. The props are accessible, by components which own them, referencing to them with *this.props.propsName*.

3.2.2 Containers

This type of component is like a wrapper of presentational components. A function called *Connect(arg1, arg2)* is needed for connecting a container component to a presentational component, in this way we are able to map inside the presentational component some actions and some application state variables passing them through props. The *arg1* is a function called *mapStateToProps()* and the *arg2* is another function called *mapDispatchToProps()*.

3.3 React-Router

React-router-dom is a npm module used for rendering different pages without reloading the entire website, this module works with *Render()* method provided by each presentational component. *Soldino* is a single page application, so the router, implemented into a JavaScript file called *App.js*, is responsible to manage which components should be rendered.

4 Redux

4.1 Overview

Redux is a npm module which manage the entire state of the website from client-side. It consists of:

- Store;
- Reducers;
- Actions.

When the website is built, a default state for the store is set (it is defined into the reducer JavaScript file).

4.2 Unidirectional pattern

Basically some actions are mapped by *container components* into specific *presentational components* through them props with *Connect(arg1, arg2)* method. When a presentational component request a *dispatch()* of a specific action, a reducer will complete the request by changing the store and returning a new instance of the application state. Each time the store is changed, the *Render()* method of displayed components is called. *Redux* is the name of the pattern implemented by React and Redux, it is an evolution of *Flux* pattern.

4.3 Redux-Persist

It is a npm module used for maintaining the current store even if the user leaves the website. It is browser-locally saved, so if a user will enter into the website from another device or from another browser, the store will be set with default values. It has a blacklist for bypassing some values, in this way reloading the website, these values will not be saved (the blacklist is defined into reducer JavaScript file).

5 Web3

5.1 Overview

5.2 Collaborations

6 Solidity

6.1 Architecture overview

As you know the main feature of the blockchain is its immutability. It means that once a contract is deployed, it's not possible to modify or update it. In order to update a contract you need to deploy a new contract on the blockchain.
In view of this fact and the proponent's request to develop upgradeable smart contracts, the architecture ideated and developed reflects these two aspects. In fact the smarts contracts in Soldino are essentially of three types:

- **Storage contract**: this type of contract isn't upgreadable because it's used to save all the critical data like products, orders, vat movements.
- **Logic contract**: this type of contract implements the business logic. In addition a logic contract as a reference to its storage contract (e.g. UserLogic has a reference to User-Storage). This choice has been made to improve the security of the storage contract (it will be explained in section [DA INSERIRE]).
- **Generic contract**: this type defines the contracts that aren't logic nor storage. These are:
  - **TokenCubit**: contract to implement a custom token ERC20 complaint.
  - **ContractManager**: contract used to achieve simple upgradeablilty of the system.
  - **Purchase**: contract to allows the user to buy several products with minimum number of transaction.
  - **Owned** and **Authorizable**: contracts used for the system's security.

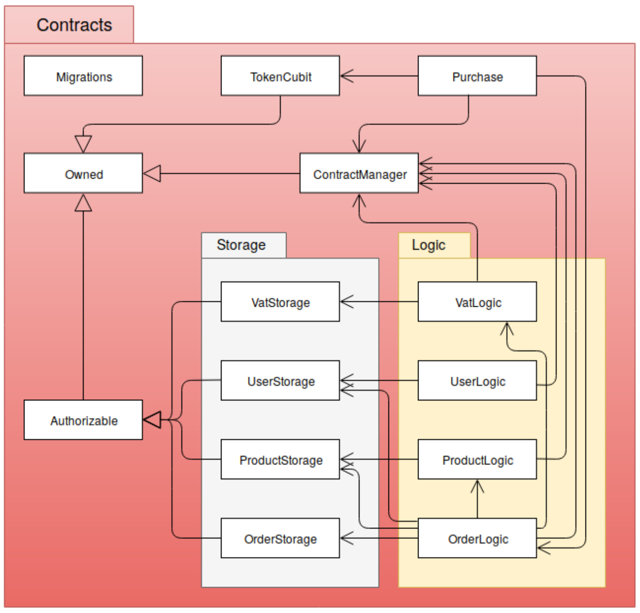


Figure 6.1.1: Simplified class diagram of the contracts (state variables and methods are omitted)

6.2 Contracts

6.2.1 Storage contracts

In this section we will illustrate the storage contracts. As mentioned before the storage contracts are immutable becaouse they store all the critical data. In fact if a contract is upgraded, which means that a new version(using inheritance) is deployed, then all its state variable are new and the data of the previous version should be copied into the new contract, which translate in high cost transaction.
To avoid that, storage contracts implements none business logic of any kind. Their purpose is to store data and allow specific contract to modify their state. For data retrival, on the other hand, the are no limitation because getter methods don't modify the storage contract's state.

6.3 Collaborations

6.4 How to extend

7 Testing

This chapter shows how to

- test the javascript and solidity code automatically;
- check if the code syntax is complied to the rules given.

A Glossary

A

B

C