

Desafio de Projeto - Bootcamp Blockchain Developer

Criando a sua primeira criptomoeda na rede Ethereum

Projeto destina-se a desenvolver competências para criar contratos inteligentes. Mais especificamente para este desafio, criar um contrato no padrão ERC20.

Consiste basicamente das seguintes atividades:

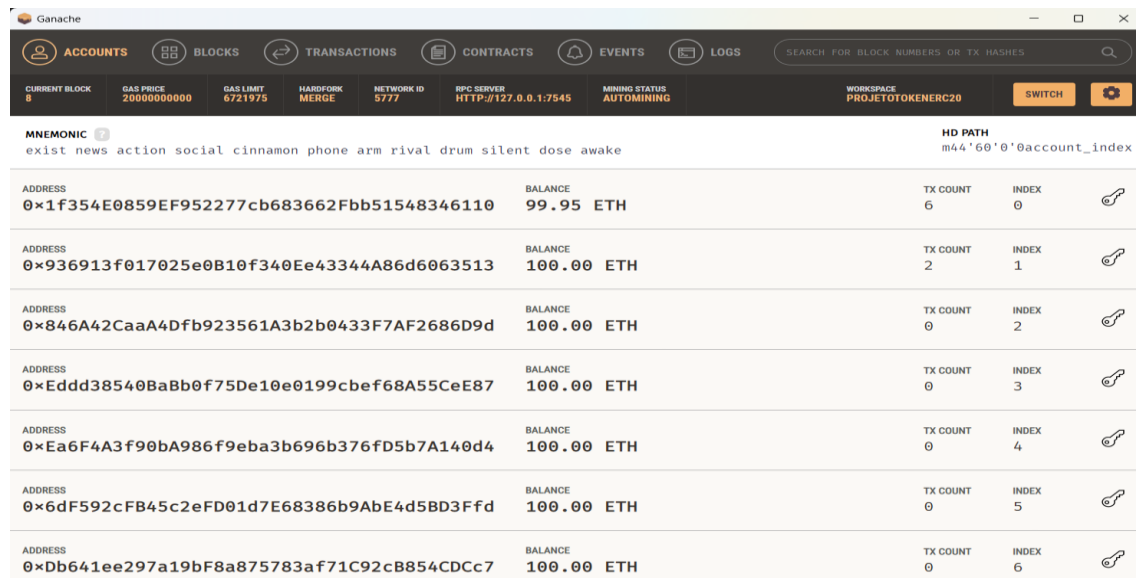
- Instalar o Ganache - ambiente de blockchain local para deploy e execução do contrato;
- Instalar o plugin Metamask no google chrome e criar algumas contas associadas ao ambiente(rede) local Ganache para controlar a execução do contrato;
- Programar, compilar, fazer o deploy do contrato empregando a Remix IDE;
- interagir com o contrato empregando a Remix IDE;
- Consultar os blocos e as transações empregando a interface do Ganache.

Tecnologias envolvidas

- Ganache-CLI (<https://archive.trufflesuite.com/ganache/>)
- MetaMask (<https://metamask.io/download/>)
- Remix IDE (<https://remix.ethereum.org/>)
- Solidity – Linguagem de programação (<https://soliditylang.org/>)

O passo a passo para concluir o desafio

1º - Instalação do ambiente Ganache

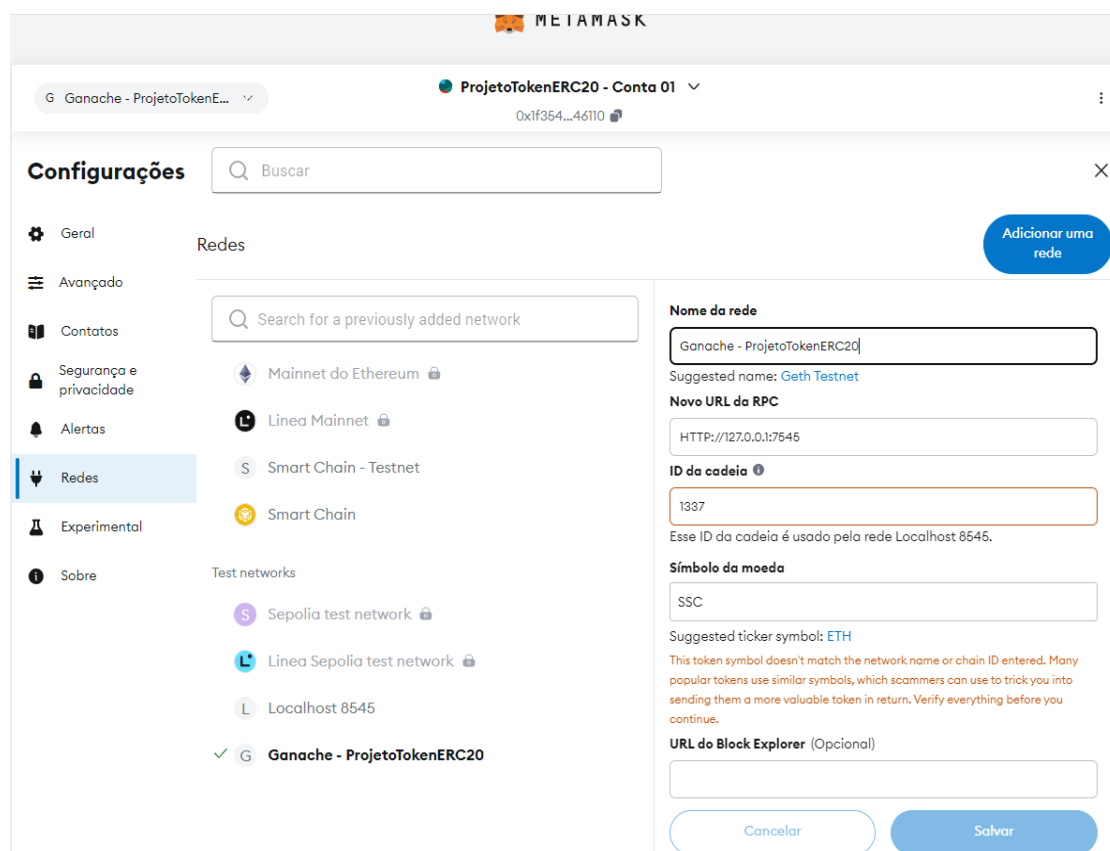


The screenshot shows the Ganache application window. At the top, there's a navigation bar with tabs for ACCOUNTS, BLOCKS, TRANSACTIONS, CONTRACTS, EVENTS, and LOGS. Below this, a status bar displays various metrics like CURRENT BLOCK, GAS PRICE, GAS LIMIT, HARDFORK, NETWORK ID, RPC SERVER, and MINING STATUS. The main area shows a list of accounts with columns for ADDRESS, BALANCE, TX COUNT, and INDEX. The mnemonic phrase is visible at the top left, and the HD PATH is shown at the top right.

ADDRESS	BALANCE	TX COUNT	INDEX
0x1f354E0859EF952277cb683662Fbb51548346110	99.95 ETH	6	0
0x936913f017025e0B10f340Ee43344A86d6063513	100.00 ETH	2	1
0x846A42CaaA4Dfb923561A3b2b04337AF2686D9d	100.00 ETH	0	2
0xEdd385408aBb0f75De10e0199cbef68A55CeE87	100.00 ETH	0	3
0xEa6F4A3f90bA986f9eba3b696b376fD5b7A140d4	100.00 ETH	0	4
0x6dF592cFB45c2eFD01d7E68386b9AbE4d5BD3Ffd	100.00 ETH	0	5
0xDB641ee297a19bF8a875783af71C92cB854CDCc7	100.00 ETH	0	6

A cada workspace criado, são adicionados automaticamente 10 endereços de carteiras para a operação na rede blockchain.

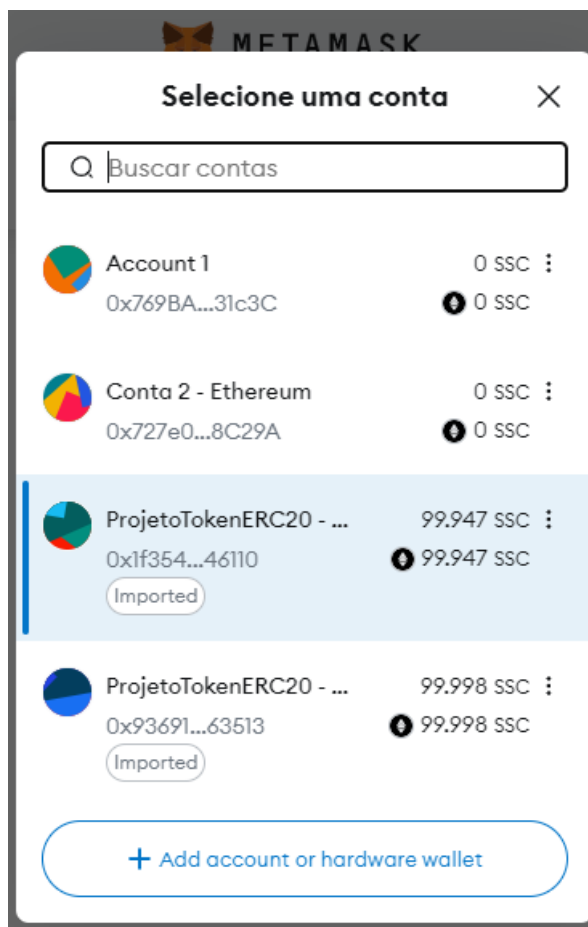
2º - Instalar o MetaMask no google chrome e criar algumas contas



The screenshot shows the MetaMask configuration window for adding a new network. The window is titled 'Configurações' and has a search bar. The 'Redes' (Networks) tab is selected. On the left, there's a sidebar with options like Geral, Avançado, Contatos, Segurança e privacidade, Alertas, Redes, Experimental, and Sobre. The main area shows a list of networks with columns for Nome da rede, Suggested name, Novo URL da RPC, ID da cadeia, Símbolo da moeda, and URL do Block Explorer. The 'Ganache - ProjetoTokenERC20' network is highlighted.

Nome da rede	Suggested name	Novo URL da RPC	ID da cadeia	Símbolo da moeda	URL do Block Explorer (Opcional)
Ganache - ProjetoTokenERC20	Geth Testnet	HTTP://127.0.0.1:7545	1337	SSC	

Plugin instalado. Adicionada a rede Ganache – ProjetoTokenERC20, vinculada ao servidor ganache HTTP://127.0.0.1:7545



Criadas as contas ProjetoTokenERC20 – Conta 01 e ProjetoTokenERC20 – Conta 02.

Ambas as contas criadas por importação dos dois primeiros endereços gerados pelo Ganache, copiando a chave privada de cada endereço lá no Ganache e colando na tela de importação da conta.

Essas contas serão utilizadas para as operações do contrato e foram vinculadas à Remix IDE para tanto.

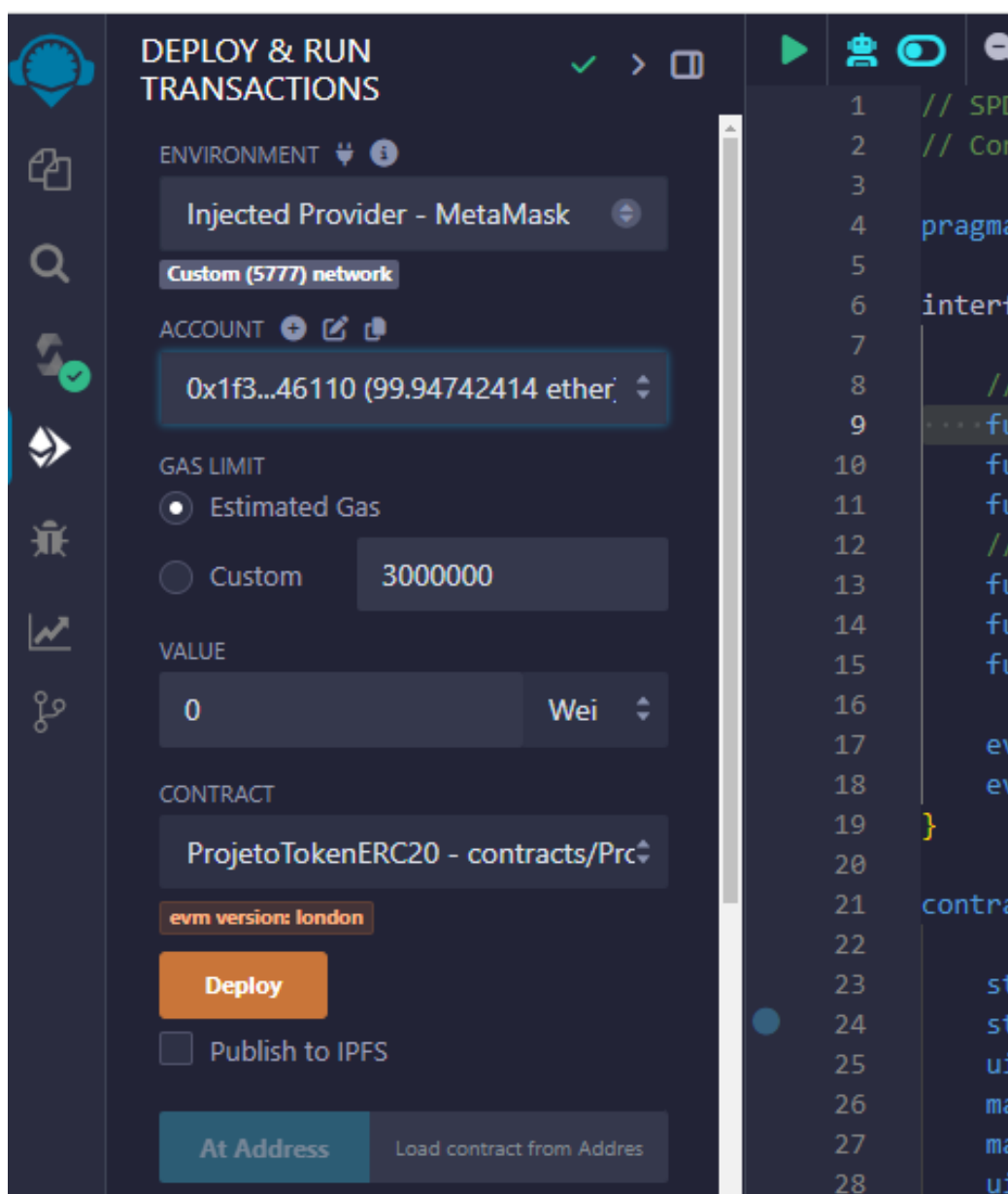
3º - Programar, compilar e fazer o deploy do contrato com a Remix IDE

The screenshot displays the Remix IDE interface. The top bar shows the URL: `remix.ethereum.org/#lang=en&optimize=false&runs=200&evmVersion=london&version=soljson-v0.8.26+commit.8a97fa7a.js`. Below the browser bar, there are several utility icons and a search bar. The main interface is divided into three panels:

- FILE EXPLORER:** Located on the left, it shows a file tree with folders like `.states`, `contracts`, `artifacts`, and files like `1_Storage.sol`, `2_Owner.sol`, `3_Ballot.sol`, `HelloContract001.sol`, and the selected `ProjetoTokenERC20.sol`. It also includes `scripts`, `tests`, `.prettierrc.json`, and `README.txt`.
- EDITOR:** The central panel displays the Solidity code for `ProjetoTokenERC20.sol`. The code defines an `IERC20` interface and implements the `ProjetoTokenERC20` contract. Key features include:
 - `IERC20` interface with functions: `totalSupply()`, `balanceOf()`, `allowance()`, `transfer()`, `approve()`, and `transferFrom()`.
 - Contract constants: `nome` ("SSC Coin"), `simbolo` ("SSC"), `decimais` (18), and `suprimentoTotal` (10 ether).
 - Constructor: Initializes `saldo[msg.sender]` to `suprimentoTotal`.
 - Functions: `totalSupply()`, `balanceOf()`, `allowance()`, `transfer()`, `approve()`, and `transferFrom()` with their respective logic and gas costs.
- TERMINAL:** The bottom panel is currently empty, showing the status "Initialize as git repo".

At the bottom of the screen, there is a system tray with a weather widget showing 28°C in Limpo, a search bar, and various application icons.

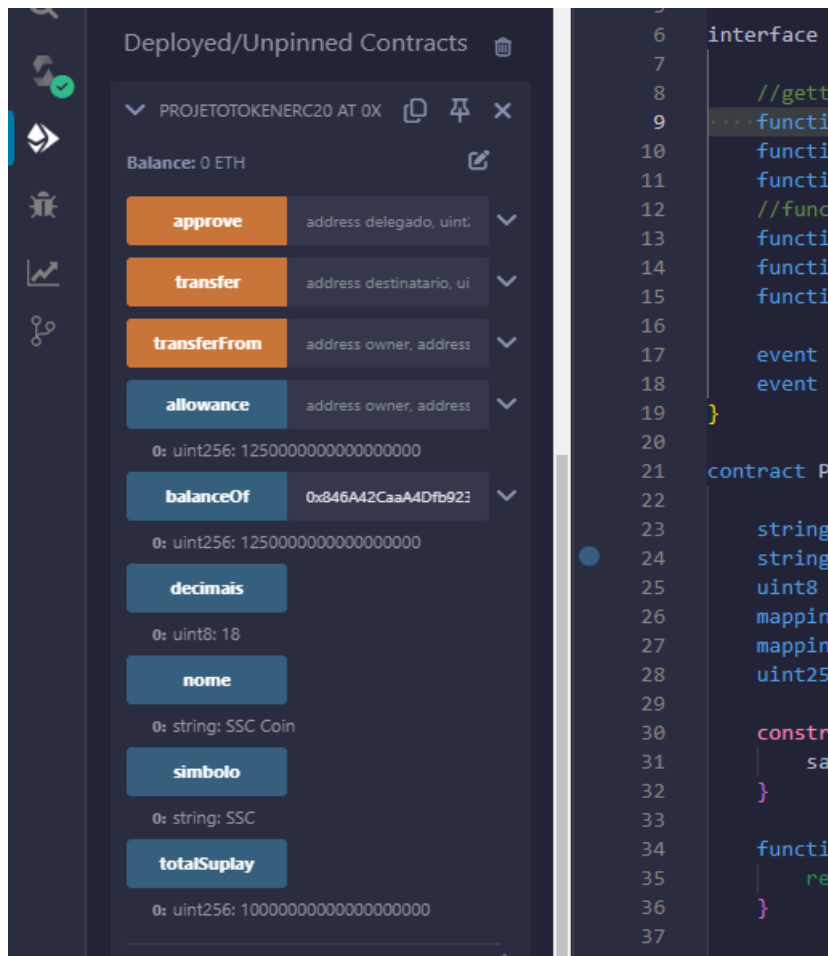
Contrato programado adaptando o exemplo desenvolvido pelo professor Cassiano. Feitas apenas adaptações de nome de variáveis, funções e eventos, além do nome do contrato.



O deploy do contrato foi feito com sucesso para a blockchain local do Ganache por intermédio da carteira MetaMask (Injected Provider – MetaMask).

As duas contas (correspondentes aos dois primeiro endereços, finais 46110 e 63513, da blockchain Ganache) foram vinculados ao contrato em ACCOUNT para serem usados nas interações com o contrato.

Consultando as variáveis do contrato



Variáveis do contrato conforme esperado, isto é:

Nome do Token → SSC Coin;

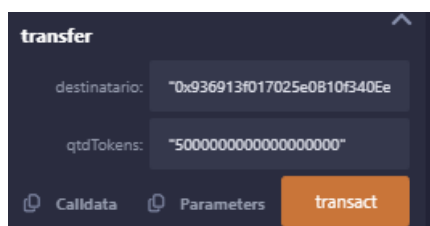
Simbolo do Token → SSC;

Casas decimais → 18;

Total Suplay → 100000000000000000000

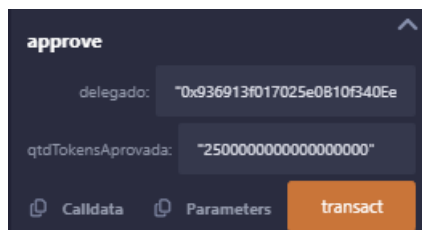
OBS.: Para fins deste contrato, adotou-se o endereço da primeira conta, final 46110 como Owner e o segundo endereço/conta, final 63513, como delegado

Chamada da função transfer



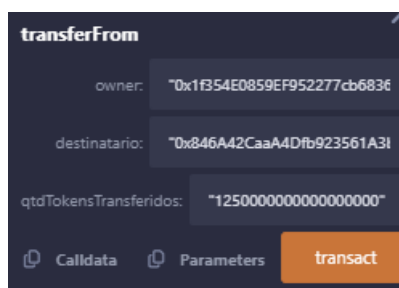
Transferiu metade do suprimento total, da primeira carteira (owner) para a segunda (delegado)

Chamada da função approve



O owner autoriza/delega para o delegado a permissão para gastar $\frac{1}{4}$ do saldo do owner.

Chamada da função transferFrom



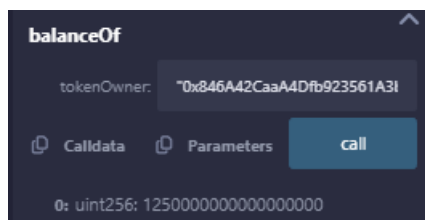
O delegado transfere (paga para) um terceiro endereço, o terceiro gerado pelo ganache, a quantia correspondente à metade do que lhes foi autorizado pelo owner. Esta quantia sai da conta do owner e não do saldo do delegado.

Obs: Para cada transação executada, a carteira da metamask é acionada na conta correspondente para autorizar a transação.

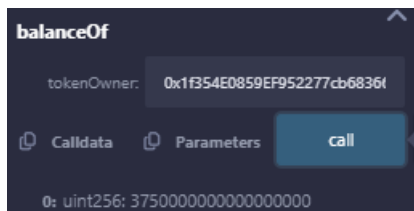
Obs.: O terceiro endereço do Ganache utilizado como destinatário na função transferFrom não precisa ter conta na MetaMask, pois apenas recebe, não necessitando, portanto autorizar nenhuma transação.

Consultando saldos

Consultando saldo do terceiro endereço, destinatário do transferFrom

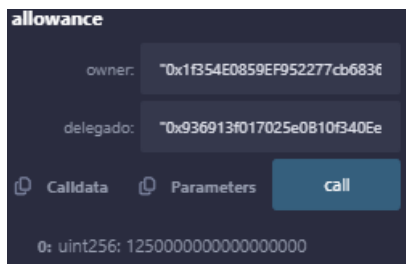


Consultando saldo final do owner, após todas as operações realizadas



Saldo OK, restante do total suply (10) menos 50%(5) transferidos para o segundo endereço, menos 12,5%(1,25) gastos pelo delegado do saldo do owner.

Consultando saldo aprovado restante – autorizado pelo owner ao delegado



Saldo OK, corresponde à metade do que foi autorizado.

Log das transações no terminal do Remix IDE

Welcome to Remix 0.53.1

Your files are stored in indexedDB, 5.14 MB / 558.16 GB used

You can use this terminal to:

- Check transactions details and start debugging.
- Execute JavaScript scripts:
 - Input a script directly in the command line interface
 - Select a Javascript file in the file explorer and then run ``remix.execute()`` or ``remix.exeCurrent()`` in the command line interface
 - Right click on a JavaScript file in the file explorer and then click ``Run``

The following libraries are accessible:

- [web3.js](#)
- [ethers.js](#)
- sol-gpt <your Solidity question here>

Type the library name to see available commands.

Solidity copilot not activated!

creation of ProjetoTokenERC20 pending...

[block:5 txIndex:-]

from: 0x1f3...46110 // owner do contrato

to: ProjetoTokenERC20.(constructor)

value: 0 wei

data: 0x608...a0033

logs: 0

hash: 0x92c...4c53c

call to ProjetoTokenERC20.balanceOf

call[call]

from: 0x936913f017025e0B10f340Ee43344A86d6063513

to: ProjetoTokenERC20.balanceOf(address) // Consulta saldo do segundo endereço

data: 0x70a...63513

call to ProjetoTokenERC20.balanceOf

call[call]

from: 0x1f354E0859EF952277cb683662Fbb51548346110

to: ProjetoTokenERC20.balanceOf(address) // Consulta saldo do owner

data: 0x70a...46110

transact to ProjetoTokenERC20.transfer pending ...

[block:6 txIndex:-]

from: 0x1f3...46110

to: ProjetoTokenERC20.transfer(address,uint256) 0x443...c0e67 // owner transfere para endereço 2.

value: 0 wei

data: 0xa90...40000

logs: 1

hash: 0xcf9...a5c64

call to ProjetoTokenERC20.balanceOf

call[call]

from: 0x1f354E0859EF952277cb683662Fbb51548346110

to: ProjetoTokenERC20.balanceOf(address)

data: 0x70a...46110

Debug

call to ProjetoTokenERC20.balanceOf

call[call]

from: 0x936913f017025e0B10f340Ee43344A86d6063513

to: ProjetoTokenERC20.balanceOf(address)

data: 0x70a...63513

Debug

call to ProjetoTokenERC20.balanceOf

call[call]

from: 0x936913f017025e0B10f340Ee43344A86d6063513

to: ProjetoTokenERC20.balanceOf(address)

data: 0x70a...63513

Debug

call to ProjetoTokenERC20.allowance

call[call]

from: 0x1f354E0859EF952277cb683662Fbb51548346110

to: ProjetoTokenERC20.allowance(address,address)

data: 0xdd6...63513

Debug

transact to ProjetoTokenERC20.approve pending ...

[block:7 txIndex:-]

from: 0x1f3...46110

to: ProjetoTokenERC20.approve(address,uint256) 0x443...c0e67

value: 0 wei

data: 0x095...a0000

logs: 1

hash: 0xe27...5be39

Debug

call to ProjetoTokenERC20.allowance

call[call]

from: 0x1f354E0859EF952277cb683662Fbb51548346110

to: ProjetoTokenERC20.allowance(address,address)
data: 0xdd6...63513
Debug
call to ProjetoTokenERC20.balanceOf
call[call]
from: 0x1f354E0859EF952277cb683662Fbb51548346110
to: ProjetoTokenERC20.balanceOf(address)
data: 0x70a...63513
Debug
call to ProjetoTokenERC20.balanceOf
call[call]
from: 0x1f354E0859EF952277cb683662Fbb51548346110
to: ProjetoTokenERC20.balanceOf(address)
data: 0x70a...46110
Debug
transact to ProjetoTokenERC20.transferFrom pending ...
[block:8 txIndex:-]
from: 0x936...63513
to: ProjetoTokenERC20.transferFrom(address,address,uint256) 0x443...c0e67
value: 0 wei
data: 0x23b...d0000
logs: 1
hash: 0x9db...a49f9
Debug
call to ProjetoTokenERC20.allowance
call[call]
from: 0x936913f017025e0B10f340Ee43344A86d6063513
to: ProjetoTokenERC20.allowance(address,address)
data: 0xdd6...63513
Debug
call to ProjetoTokenERC20.balanceOf
call[call]
from: 0x936913f017025e0B10f340Ee43344A86d6063513
to: ProjetoTokenERC20.balanceOf(address)
data: 0x70a...46110
Debug
call to ProjetoTokenERC20.balanceOf
call[call]
from: 0x936913f017025e0B10f340Ee43344A86d6063513
to: ProjetoTokenERC20.balanceOf(address)
data: 0x70a...63513
Debug
call to ProjetoTokenERC20.balanceOf
call[call]
from: 0x936913f017025e0B10f340Ee43344A86d6063513
to: ProjetoTokenERC20.balanceOf(address)
data: 0x70a...86d9d
Debug
call to ProjetoTokenERC20.balanceOf
call[call]
from: 0x936913f017025e0B10f340Ee43344A86d6063513
to: ProjetoTokenERC20.balanceOf(address)
data: 0x70a...86d9d
Debug
call to ProjetoTokenERC20.balanceOf
call[call]
from: 0x936913f017025e0B10f340Ee43344A86d6063513
to: ProjetoTokenERC20.balanceOf(address)
data: 0x70a...86d9d
Debug
call to ProjetoTokenERC20.totalSupply
call[call]
from: 0x1f354E0859EF952277cb683662Fbb51548346110
to: ProjetoTokenERC20.totalSupply()
data: 0x16f...a99be
Debug
call to ProjetoTokenERC20.simbolo
call[call]
from: 0x1f354E0859EF952277cb683662Fbb51548346110
to: ProjetoTokenERC20.simbolo()
data: 0x0de...82bae
Debug

```
call to ProjetoTokenERC20.nome
call[call]
from: 0x1f354E0859EF952277cb683662Fbb51548346110
to: ProjetoTokenERC20.nome()
data: 0x2de...b124b
Debug
call to ProjetoTokenERC20.decimais
call[call]
from: 0x1f354E0859EF952277cb683662Fbb51548346110
to: ProjetoTokenERC20.decimais()
data: 0x45b...0a611
Debug
call to ProjetoTokenERC20.balanceOf
call[call]
from: 0x1f354E0859EF952277cb683662Fbb51548346110
to: ProjetoTokenERC20.balanceOf(address)
data: 0x70a...46110
Debug
>
```

5º - Consultando blocos e transações no Ganache

ACCOUNTS

BLOCKS

TRANSACTIONS

CONTRACTS

EVENTS

LOGS

SEARCH FOR BLOCK NUMBERS OR TX HASHES

CURRENT BLOCK8

GAS PRICE20000000000

GAS LIMIT6721975

HARDFORKMERGE

NETWORK ID5777

RPC SERVERHTTP://127.0.0.1:7545

MINING STATUSAUTOMINING

WORKSPACEPROJETOTOKENERC20

SWITCH

MNEMONIC?
exist news action social cinnamon phone arm rival drum silent dose awake

HD PATH
m44'60'0'0account_index

ADDRESS	BALANCE	TX COUNT	INDEX	
0x1f354E0859EF952277cb683662Fbb51548346110	99.95 ETH	6	0	
0x936913f017025e0B10f340Ee43344A86d6063513	100.00 ETH	2	1	
0x846A42CaaA4Dfb923561A3b2b0433F7AF2686D9d	100.00 ETH	0	2	

Transações executadas por cada um dos três primeiros endereços.

ACCOUNTS

BLOCKS

TRANSACTIONS

CONTRACTS

EVENTS

LOGS

SEARCH FOR BLOCK NUMBERS OR TX HASHES

CURRENT BLOCK8

GAS PRICE20000000000

GAS LIMIT6721975

HARDFORKMERGE

NETWORK ID5777

RPC SERVERHTTP://127.0.0.1:7545

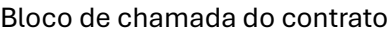
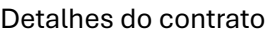
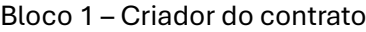
MINING STATUSAUTOMINING

WORKSPACEPROJETOTOKENERC20

SWITCH

BLOCK	MINED ON	GAS USED	
8	2024-09-11 11:16:28	59014	1 TRANSACTION
7	2024-09-11 11:04:22	46708	1 TRANSACTION
6	2024-09-11 10:57:44	52557	1 TRANSACTION
5	2024-09-11 10:47:29	825657	1 TRANSACTION
4	2024-09-10 23:07:08	46708	1 TRANSACTION
3	2024-09-10 22:47:34	52557	1 TRANSACTION
2	2024-09-10 22:17:36	825657	1 TRANSACTION
1	2024-09-10 22:04:18	825657	1 TRANSACTION
0	2024-09-10 17:12:08	0	NO TRANSACTIONS

Total de blocos gerados



Ganache

ACCOUNTS

BLOCKS

TRANSACTIONS

CONTRACTS

EVENTS

LOGS

SEARCH FOR BLOCK NUMBERS OR TX HASHES

CURRENT BLOCK
8

GAS PRICE
20000000000

GAS LIMIT
6721975

HARDFORK
MERGE

NETWORK ID
5777

RPC SERVER
HTTP://127.0.0.1:7545

MINING STATUS
AUTOMINING

WORKSPACE
PROJETOTOKENERC20

SWITCH

TX HASH

0xf360c2086a80dd1994b12f9c0c5dab6e619fe51e8110a088a7a7f556ebdbbde4

CONTRACT CALL

FROM ADDRESS

0x936913f017025e0810f340Ee43344A86d6063513

TO CONTRACT ADDRESS

0x44315195b7A9df98B65F2FF08FEe7b6C1dCc0e67

GAS USED

59014

VALUE

0

TX HASH

0xc9267f9e891ab1419550875055d3c3e1d1fdce85512006bb903686331c6b7f4

CONTRACT CALL

FROM ADDRESS

0x1f354E0859EF952277cb683662Fbb51548346110

TO CONTRACT ADDRESS

0x44315195b7A9df98B65F2FF08FEe7b6C1dCc0e67

GAS USED

46708

VALUE

0

TX HASH

0xfc129802992f454c6864cb60774a32150e096c5ef4ce8e88f06f12193320da93

CONTRACT CALL

FROM ADDRESS

0x1f354E0859EF952277cb683662Fbb51548346110

TO CONTRACT ADDRESS

0x44315195b7A9df98B65F2FF08FEe7b6C1dCc0e67

GAS USED

52557

VALUE

0

TX HASH

0xb75696dce473fe3b83e5f66bb600fbae0323018d1ca3cce780b9d17aabb04f20

CONTRACT CREATION

FROM ADDRESS

0x1f354E0859EF952277cb683662Fbb51548346110

CREATED CONTRACT ADDRESS

0x44315195b7A9df98B65F2FF08FEe7b6C1dCc0e67

GAS USED

825657

VALUE

0

TX HASH

0xa32910e3094af788e293b79854e0dbb0945c7c4bb4377c804b2e751729761dec

CONTRACT CALL

Algumas das transações

Sobre mim

Eu sou Sérgio Santa Catarina, servidor público aposentado após longa carreira em TI, começando como programador em ambientes mainframe IBM, linguagem COBOL/CICS, e passando por diversas outras tecnologias e funções/cargos, como analista de suporte, administrador de banco de dados, analista de negócios e, por fim, gerente de projetos. Antes de me aposentar ainda trabalhei 6 anos com gestão de processos e planejamento estratégico. Se tem uma linguagem que ainda me atrevo a codificar algo é SQL.

Hoje busco me atualizar nas tecnologias atuais com ênfase em blockchain e demais que dão suporte às criptomoedas. Não faço ideia se vou trabalhar com isso. No momento busco aprender.

Conecte-se comigo

Perfil DIO; https://www.dio.me/users/sergio_santacatarina)

E-mail: (<mailto:sergio.santacatarina@gmail.com>)

LinkedIn: (www.linkedin.com/in/sérgio-santa-catarina-95b58273/)

[Instagram (<https://www.instagram.com/sergiosantacatarina/>)

Apêndice

Apenas lembrando que sou iniciante nestas tecnologias.

Autores

- [[@SergioSantaCatarina](https://www.github.com/SergioSantaCatarina)](<https://www.github.com/SergioSantaCatarina>)