

Hello Contract (Truffle + Remote Node)

How to deploy and interact your own smart contracts using a remote node.

tip As Celo is fully EVM compatible, we inherit the rich developer ecosystem and tooling of the Ethereum community. You will be deploying a typical hello world smart contract onto the Alfajores testnet with the common Ethereum tool, Truffle. note This page is similar to the Hello Contracts page, but this one will connect to a remote node (Forno) and do key management in the Truffle project.

Setup

This guide assumes that you have a basic Node[NPM](#) setup.

info [Learn more about the Truffle development framework here](#). As you may know, Truffle is built for Ethereum developers. Because Celo has a similar network architecture and runs the Ethereum Virtual Machine, Celo developers are able to leverage many Ethereum developer tools. But it is important to keep in mind the differences. If you haven't already, please review the Celo overview.

→ [Celo Overview /general](#) [Clone this Truffle project from GitHub to get started](#).

git clone https://github.com/critesjosh/hello_contract-truffle.git This is a basic truffle project, with some additional files to help us with account management and deploying to a remote Celo test net node. Run `npm install` to install of the project dependencies.

Hello World

Add a contract with the command

`truffle create contract HelloWorld` We will not go into the details of how to write Solidity in this exercise, but you can learn more at the [Solidity documentation page](#).

The contract will just store a name for now:

```
contracts/HelloWorld.sol pragma
```

```
solidity
```

```
    = 0.5.0
```

```
< 0.8.0 ;
```

```
contract
```

```
    HelloWorld
```

```
    { string name =
```

```
        'Celo' ;
```

```
function
```

```
    getName ( )
```

```
    public
```

```
    view
```

```
    returns
```

```
    ( string
```

```
        memory )
```

```
    { return name ; }
```

```
function
```

```
    setName ( string
```

```
        calldata newName )
```

external

```
{ name = newName ; } }
```

Prepare Deployment

Compile the contract

Before you deploy the contract, you need to compile the Solidity code into Ethereum bytecode. The following truffle command will look in the ./contracts directory and compile any new or updated Solidity (.sol) contracts.

truffle compile After compiling the contract, you need to create a migration to deploy the contract. For that, create a file in the ./migrations/ folder named 2_deploy_helloworld.js :

```
info Learn more about Truffle migrations here. migrations/2_deploy_helloworld.js var
```

```
HelloWorld
```

```
= artifacts . require ( "HelloWorld" ) ;
```

```
module . exports
```

```
=
```

```
function
```

```
( deployer )
```

```
{ deployer . deploy ( HelloWorld ) ; } ; info You can learn more about Truffle configuration options here.
```

Deploy to Alfajores (Remotely)

When you deploy contracts to the Celo network with a remote node, you have to sign the contract deployment transaction locally before sending it to the remote node to be broadcast to the network. This presents some unique challenges when using Ethereum development tools (like Truffle) because Celo transaction objects are slightly different than Ethereum transaction objects.

When you are ready to deploy your contract to Alfajores, you'll need a Celo client connected to the testnet. In this exercise you will connect to a remote node to read and write to the public testnet (Alfajores), but you could also run a testnet node locally to perform the same actions.

Here are the steps to go through to deploy the contract to the Alfajores testnet.

1. Connect to Forno (a remote Celo node service provider)
2. Get personal account information (generate a private key if required, stored in ./env)
3.)
4. Get your personal account address and fund it via the [faucet](#)
5. Get the compiled contract bytecode
6. Create and sign the contract deployment transaction
7. Send transaction to the network

Make sure the dependencies are installed with:

yarn install Run the createAccount.js script with:

```
node createAccount.js createAccount.js const
```

```
Web3
```

```
=
```

```
require ( "web3" ) ; const web3 =
```

```
new
```

```
Web3 ( "http://localhost:8545" ) ;
```

console . log (web3 . eth . accounts . create ()) ; The provided code will print a private key / account pair in the terminal. Copy and paste the printed private key into a PRIVATE_KEY variable in a file called .env , similar to what is shown in the .env.example file. The address that is printed with the private key is the account that we will fund with the faucet.

If you go to the [Alfajores Faucet Page](#) , you can faucet your account some CELO and see your balance increase.

Deploy the contract

Truffle Deployment

Before you can use truffle for the migration, you need to set up the proper configuration in ./truffle-config.js . At the top of ./truffle-config.js , set up the kit by connecting to the test network and adding the account you just funded.

```
truffle.config.js const
```

```
ContractKit
```

```
=
```

```
require ( "@celo/contractkit" ) ; const
```

```
Web3
```

```
=
```

```
require ( "web3" ) ; require ( "dotenv" ) . config ( ) ;
```

```
const web3 =
```

```
new
```

```
Web3 ( "https://alfajores-forno.celo-testnet.org" ) ; const kit =
```

```
ContractKit . newKitFromWeb3 ( web3 ) ;
```

kit . connection . addAccount (process . env . PRIVATE_KEY) ; Then, in the networks object, you can add the initialized kit provider to an alfajores property.

```
truffle.config.js networks :
```

```
{ test :
```

```
{ host :
```

```
"127.0.0.1" , port :
```

```
7545 , network_id :
```

```
"" } , alfajores :
```

```
{ provider : kit . connection . web3 . currentProvider ,
```

```
// CeloProvider network_id :
```

```
44787 ,
```

```
// Alfajores network id gas :
```

```
4000000 ,
```

// You need to include the gas limit } } info Truffle doesn't estimate the gas properly, so you need to specify a gas limit in truffle.config.js . Now, deploy the contracts to Alfajores with this command:

truffle migrate

```
network alfajores
```

Custom Node.js Deployment

In this section, you will deploy a contract using a simple Node.js script to show how you can do it without using Truffle.

You need to compile the HelloWorld.sol contract using (if it isn't already):

truffle compile This command will generate a HelloWorld.json file in the ./build/contracts/ directory. HelloWorld.json contains a lot of data about the contract, compiler and low level details. Import this file into the deployment script celo_deploy.js with:

```

const
HelloWorld

=

require ( "../build/contracts/HelloWorld.json" ) ; You are finally ready to deploy the contract. Use thekit to create a custom
transaction that includes the contract bytecode.

celo_deploy.js let tx =

await kit . connection . sendTransaction ( { from : address , data :

HelloWorld . bytecode ,

// from ../build/contracts/HelloWorld.json } ) ; info To deploy a contract on Celo, use thekit.connection.sendTransaction()
function with noto: field and the contract bytecode in thedata field. The account that you are sending the transaction from
must have enough CELO to pay the transaction fee, unless you specify another currency as thefeeCurrency , then you need
enough of that currency to pay the transaction fee. The entire deployment script is about 20 lines of code.

celo_deploy.js const

Web3

=

require ( "web3" ) ; const

ContractKit

=

require ( "@celo/contractkit" ) ; const web3 =

new

Web3 ( "https://alfajores-forno.celo-testnet.org" ) ; const privateKeyToAddress = require ( "@celo/utils/lib/address" ) .
privateKeyToAddress ; const kit =

ContractKit . newKitFromWeb3 ( web3 ) ; require ( "dotenv" ) . config ( ) ; const

HelloWorld

=

require ( "../build/contracts/HelloWorld.json" ) ;

async

function

awaitWrapper ( )

{ kit . connection . addAccount ( process . env . PRIVATE_KEY ) ;

// this account must have a CELO balance to pay transaction fees

// This account must have a CELO balance to pay tx fees // get some testnet funds at https://faucet.celo.org const address =

privateKeyToAddress ( process . env . PRIVATE_KEY ) ; console . log ( address ) ;

let tx =

await kit . connection . sendTransaction ( { from : address , data :

HelloWorld . bytecode , } ) ;

const receipt =

await tx . waitReceipt ( ) ; console . log ( receipt ) ; }

awaitWrapper ( ) ; Congratulations! You have deployed your first contract onto Celo! You can verify your contract
deployment on Blockscout . You can get the transaction hash from the receipt and look it up on the block explorer.

```

Interacting with Custom Contracts

Now HelloWorld.sol is deployed onto the Alfajores testnet. How can you interact with the deployed contract using ContractKit? helloWorld.js includes some example code that shows how you can do this.

There are 3 functions defined in helloWorld.js that accomplish this.

The first function, initContract(), reads the deployed contract information from the Truffle artifact at HelloWorld.json. With this information, you can create a new web3.js Contract instance:

```
helloWorld.js async
function
initContract ( )
{ // Check the Celo network ID const networkId =
await web3 . eth . net . getId ( ) ;
// Get the contract associated with the current network const deployedNetwork =
HelloWorld . networks [ networkId ] ;
// Create a new contract instance with the HelloWorld contract info let instance =
new
kit . web3 . eth . Contract ( HelloWorld . abi , deployedNetwork . address ) ;
getName ( instance ) ; setName ( instance ,
"hello world!" ) ; } After creating the contract instance, the initContract() function calls getName() and setName().
```

The getName() function will call, return and print the getName() function of the provided instance of the HelloWorld contract.

```
helloWorld.js async
function
getName ( instance )
{ let name =
await instance . methods . getName ( ) . call ( ) ; console . log ( name ) ; } The setName() function is a bit more involved.
First, it gets the account key from the provided ./secret file, just like in celo_deploy.js. Then it creates an atxObject that encodes
a smart contract transaction call to setName() with the provided newName to the provided instance of the HelloWorld
contract. Then the function sends the encoded transaction object to the network, waits for a receipt and prints it to the
console.
```

```
helloWorld.js async
function
setName ( instance , newName )
{ // Add your account to ContractKit to sign transactions // This account must have a CELO balance to pay tx fees, get some
https://faucet.celo.org kit . connection . addAccount ( process . env . PRIVATE_KEY ) ; const address =
privateKeyToAddress ( process . env . PRIVATE_KEY ) ;
// Encode the transaction to HelloWorld.sol according to the ABI let txObject =
await instance . methods . setName ( newName ) ;
// Send the transaction let tx =
await kit . sendTransactionObject ( txObject ,
{
from : address } ) ;
```

let receipt =

`await tx . waitReceipt () ; console . log (receipt) ; }` The above method shows a more detail about how to create custom deployment transactions and scripts than the previous method.

As you can see, all the goodies from Ethereum apply to Celo, so virtually all tutorials and other content should be easily translatable to Celo.

Check out <https://celo.org/developers> for more resources! [Edit this page](#) [Previous Celo Core Contracts \(Wrapper/Registry\)](#)
[Next Querying on-chain identifiers with ODIS](#)