

ETHECOLE 2021

VERIFYING SMART CONTRACT SOURCE CODE ON ETHERSCAN

By Rosco Kalis



ABOUT ME

- Software Engineer @ General Protocols
- revoke.cash, CashScript
- truffle-assertions
- truffle-plugin-verify



CONTENTS

- Why verifying source code is important
- Traditional method for source code verification
- Setting up and using truffle-plugin-verify
- Technical details of truffle-plugin-verify

WHY VERIFYING IS IMPORTANT





WHY VERIFYING IS IMPORTANT

Code | Read Contract | Write Contract

Contract Source Code Verified (Exact Match)

Contract Name:	**SimpleToken**	Optimization Enabled:	**No** with **200** runs
Compiler Version	**v0.6.11+commit.5ef660b1**	Other Settings:	**default** evmVersion

Contract Source Code (Solidity Standard Json-Input format)

More Options

File 1 of 6 : SimpleToken.sol

```
// SPDX-License-Identifier: MIT
pragma solidity ^0.6.0;

import "@openzeppelin/contracts/token/ERC20/ERC20.sol";

/**
 * @title SimpleToken
 * @dev Very simple ERC20 Token example, where all tokens are pre-assigned to the creator.
 * Note they can later distribute these tokens as they wish using `transfer` and other
 * `ERC20` functions.
 */
contract SimpleToken is ERC20 {

    /**
     * @dev Constructor that gives msg.sender all of existing tokens.
     */
    constructor () public ERC20("Simple Token", "SIM") {
        _mint(msg.sender, 1000000 * (10 ** uint256(decimals())));
    }
}
```

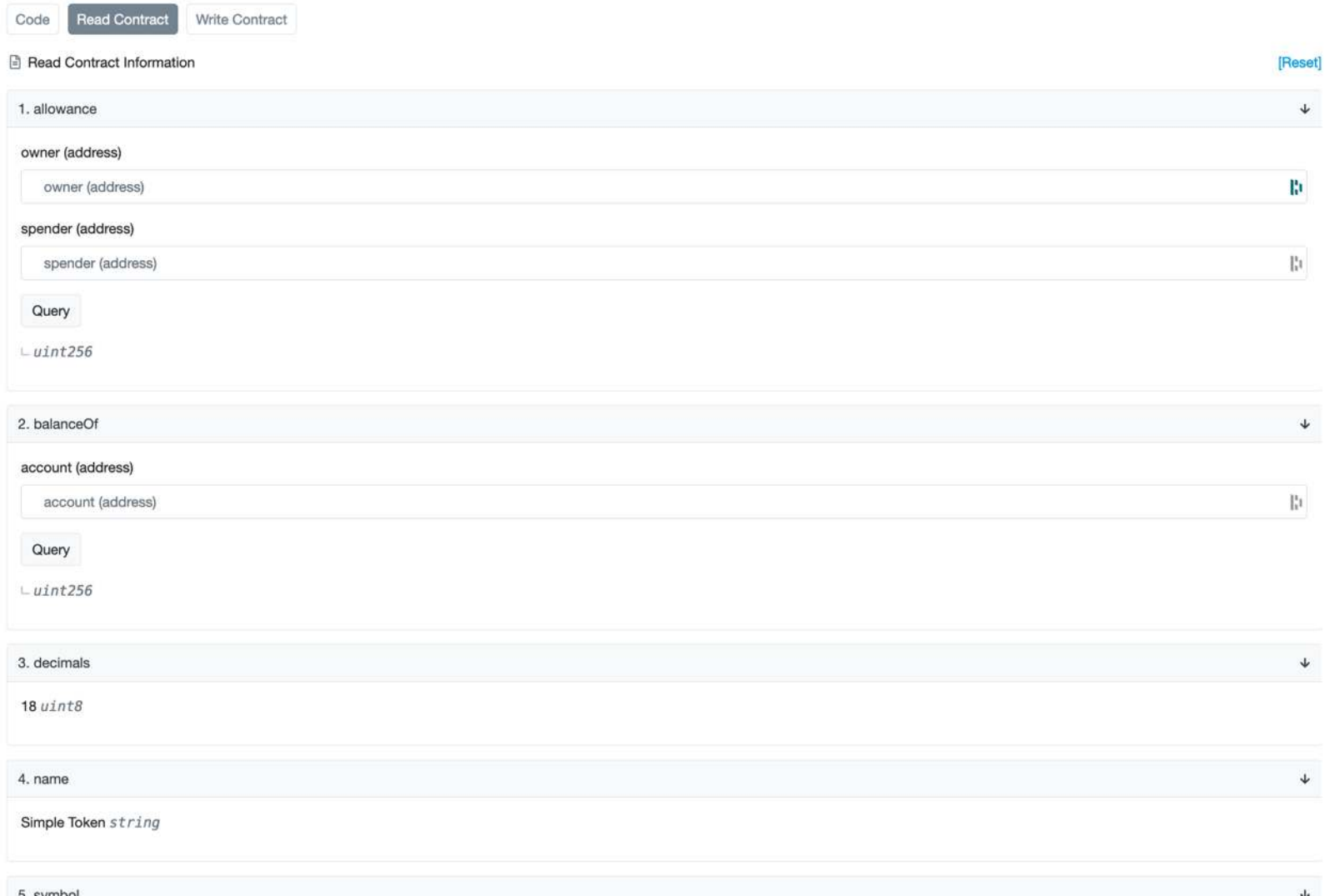
File 2 of 6 : Context.sol

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

pragma solidity ^0.6.0;

/*
 * @dev Provides information about the current execution context, including the
 * sender of the transaction and its data. While these are generally available
 * via msg.sender and msg.data, they should not be accessed in such a direct
 * manner, since when dealing with GSN meta-transactions the account sending and
 * paying for execution may not be the actual sender (as far as an application
 * is concerned).
```

WHY VERIFYING IS IMPORTANT





WHY VERIFYING IS IMPORTANT

Contract Overview

Balance: 0 Ether

More Info

My Name Tag: Not Available

Contract Creator: 0x16c1a94c8c027c011... at txn 0x497f2ff57621e03d32...

Token Tracker: Simple Token (SIM)

Transactions | Contract | Events

Latest 1 Contract Event

Tip: Logs are used by developers/external UI providers for keeping track of contract actions and for auditing

Txn Hash	Method	Logs
0x497f2ff57621e03d32... # 7453811 16 mins ago	0x60806040	> Transfer (index_topic_1 address from, index_topic_2 address to, uint256 value) [topic0] 0xddf252ad1be2c89b69c2b068fc378daa952ba7f163c4a11628f55a4df523b3ef [topic1] 0x0000000000000000000000000000000000000000000000000000000000000000 [topic2] 0x000000000000000000000016c1a94c8c027c011a4097d24df55893cfb5d268 Hex → 0000000000000000000000000000000000000000d3c21bcecceda1000000



WHY VERIFYING IS IMPORTANT

Contract ABI

Export ABI


```
[{"inputs":[],"stateMutability":"nonpayable","type":"constructor"},{"anonymous":false,"inputs":[{"indexed":true,"internalType":"address","name":"owner","type":"address"},
{"indexed":true,"internalType":"address","name":"spender","type":"address"},
{"indexed":false,"internalType":"uint256","name":"value","type":"uint256"}],"name":"Approval","type":"event"},{"anonymous":false,"inputs":
[{"indexed":true,"internalType":"address","name":"from","type":"address"},{"indexed":true,"internalType":"address","name":"to","type":"address"},
{"indexed":false,"internalType":"uint256","name":"value","type":"uint256"}],"name":"Transfer","type":"event"},{"inputs":
[{"internalType":"address","name":"owner","type":"address"},{"internalType":"address","name":"spender","type":"address"}],"name":"allowance","outputs":
[{"internalType":"uint256","name":"","type":"uint256"}],"stateMutability":"view","type":"function"},{"inputs":[{"internalType":"address","name":"spender","type":"address"},
{"internalType":"uint256","name":"amount","type":"uint256"}],"name":"approve","outputs":
[{"internalType":"bool","name":"","type":"bool"}],"stateMutability":"nonpayable","type":"function"},{"inputs":
[{"internalType":"address","name":"account","type":"address"}],"name":"balanceOf","outputs":
[{"internalType":"uint256","name":"","type":"uint256"}],"stateMutability":"view","type":"function"},{"inputs":[],"name":"decimals","outputs":
[{"internalType":"uint8","name":"","type":"uint8"}],"stateMutability":"view","type":"function"},{"inputs":[{"internalType":"address","name":"spender","type":"address"},
{"internalType":"uint256","name":"subtractedValue","type":"uint256"}],"name":"decreaseAllowance","outputs":
[{"internalType":"bool","name":"","type":"bool"}],"stateMutability":"nonpayable","type":"function"},{"inputs":[{"internalType":"address","name":"spender","type":"address"},
{"internalType":"uint256","name":"addedValue","type":"uint256"}],"name":"increaseAllowance","outputs":
[{"internalType":"bool","name":"","type":"bool"}],"stateMutability":"nonpayable","type":"function"},{"inputs":[],"name":"name","outputs":
[{"internalType":"string","name":"","type":"string"}],"stateMutability":"view","type":"function"},{"inputs":[],"name":"symbol","outputs":
[{"internalType":"string","name":"","type":"string"}],"stateMutability":"view","type":"function"},{"inputs":[],"name":"totalSupply","outputs":
[{"internalType":"uint256","name":"","type":"uint256"}],"stateMutability":"view","type":"function"},{"inputs":
[{"internalType":"address","name":"recipient","type":"address"},{"internalType":"uint256","name":"amount","type":"uint256"}],"name":"transfer","outputs":
[{"internalType":"bool","name":"","type":"bool"}],"stateMutability":"nonpayable","type":"function"},{"inputs":[{"internalType":"address","name":"sender","type":"address"},
{"internalType":"address","name":"recipient","type":"address"},{"internalType":"uint256","name":"amount","type":"uint256"}],"name":"transferFrom","outputs":
[{"internalType":"bool","name":"","type":"bool"}],"stateMutability":"nonpayable","type":"function"}]
```


Contract Creation Code

Decompile ByteCode | Switch to Opcodes View


```
6080604052348015620000115760008 0fd5b5060405180604001604052806 00c81526020017f53696d706c6520546f6b656e0000000000000000000000000000000000000000815250604051806040016040528060038
1526020017f53494d0000000000000000000000000000000000000000000000000000000000000000815250816003908051906020019062000969291906200038 3565b5080600490805190602001906200009af929190620003
83565b5060126005600061010 00a81548160ff021916908360ff160217905550505062000 0fa33620000e36200010060201b60201c565b60ff16600a0a620f4240026200011760201b60201c565b62000432565b60006
0056000905490610100 0a900460ff16905090565b600073ffffffffffffffffffffffffffffffffffffffff168273ffffffffffffffffffffffffffffffffffffffff161415620001bb576040517f08c379a000000000
0000000000000000000000000000000000000000000000000000000815260040180806020018281038252601f815260200180 7f45524332303a206d696e7420746f20746865207a65726f206164647265737300815250602001 9
150506040518091039 0fd5b620001cf60008383620002f560201b60201c565b620001eb81600254620002fa60201b620009ad1790919060201c565b60028190555062000249816000808573ffffffffffffffffffffffff
ffffffffffffffff1673ffffffffffffffffffffffffffffffffffffffff168152602001908152602001600020548190555062 0fa60201b620009ad1790919060201c565b6000808473ffffffffffffffffffffffffffffffff
ffffffffff1673ffffffffffffffffffffffffffffffffffffffff16815260200190815260200160002081905550817 3ffffffffffffffffffffffffffffffffffffffff16600073ffffffffffffffffffffffffffffffff
ffffffffff167fddf252ad1be2c89b69c2b068fc378daa952ba7f163c4a11628f55a4df523b3ef836040518082815260200191505060405180910390a35050565b505050565b600080828401905083811015620003 7
9576040517f08c379a000000000000000000000000000000000000000000000000000000000000000815260040180806020018281038252601b815260200180 7f536166654d6174683a206164646974696f6e206f766572666c
6f77000000000081525060200191505060405180910390fd5b809150509291505056 5b828054600181600116156101000203166002900490600052602060002090601f016020900481019282601f10620003c65780516
```



THE TRADITIONAL METHOD FOR VERIFICATION

DEPLOY & RUN TRANSACTIONS

ENVIRONMENT

Injected Web3

Main (1) network

ACCOUNT

0xe12...3652a (4.53716489928719

GAS LIMIT

3000000

VALUE

0

wei

CONTRACT

SimpleToken - browser/SimpleToken.s

Deploy

Publish to IPFS

OR

At Address | Load contract from Address

Transactions recorded 0

Deployed Contracts

Currently you have no contract instances to interact with.

Home | SimpleToken.sol | 2 tabs

```
pragma solidity ^0.6.0;


// SPDX-License-Identifier: MIT
/*
 * @dev Provides information about the current execution context, including the
 * sender of the transaction and its data. While these are generally available
 * via msg.sender and msg.data, they should not be accessed in such a direct
 * manner, since when dealing with GSN meta-transactions the account sending and
 * paying for execution may not be the actual sender (as far as an application
 * is concerned).
 *
 * This contract is only required for intermediate, library-like contracts.
 */
abstract contract Context {
    function _msgSender() internal view virtual returns (address payable) {
        return msg.sender;
    }

    function _msgData() internal view virtual returns (bytes memory) {
        this; // silence state mutability warning without generating bytecode - see https://github.com/ethereum/solidity/issues/2691
        return msg.data;
    }
}

/**
 * @dev Interface of the ERC20 standard as defined in the EIP.
 */
interface IERC20 {
    /**
     * @dev Returns the amount of tokens in existence.
     */
    function totalSupply() external view returns (uint256);

    /**
     * @dev Returns the amount of tokens owned by `account`.
     */
    function balanceOf(address account) external view returns (uint256);

    /**
     * @dev Moves `amount` tokens from the caller's account to `recipient`.
     *
     * Returns a boolean value indicating whether the operation succeeded.
     *
     * Emits a {Transfer} event.
     */
```



THE TRADITIONAL METHOD FOR VERIFICATION

1. If the contract compiles correctly at REMIX, it should also compile correctly here.
2. We have limited support for verifying contracts created by another contract and there is a timeout of up to 45 seconds for each contract compiled.
3. For programatic contract verification, check out the Contract API Endpoint

Contract Address

0x2fed370C5E3b5a9Cb14859e81d6213C187DFD8ff

Compiler

v0.6.11+commit.5ef660b1

Optimization

No

Enter the Solidity Contract Code below *

Fetch from Gist

```
 */
contract SimpleToken is ERC20 {

    /**
     * @dev Constructor that gives msg.sender all of existing tokens.
     */
    constructor () public ERC20("Simple Token", "SIM") {
        _mint(msg.sender, 1000000 * (10 ** uint256(decimals())));
    }
}
```

Constructor Arguments ABI-encoded (for contracts that were created with constructor parameters)

Contract Library Address (for contracts that use libraries, supports up to 10 libraries)

Misc Settings (Runs, EvmVersion & License Type settings)

Runs (Optimizer)

200

EVM Version to target

default (compiler defaults)

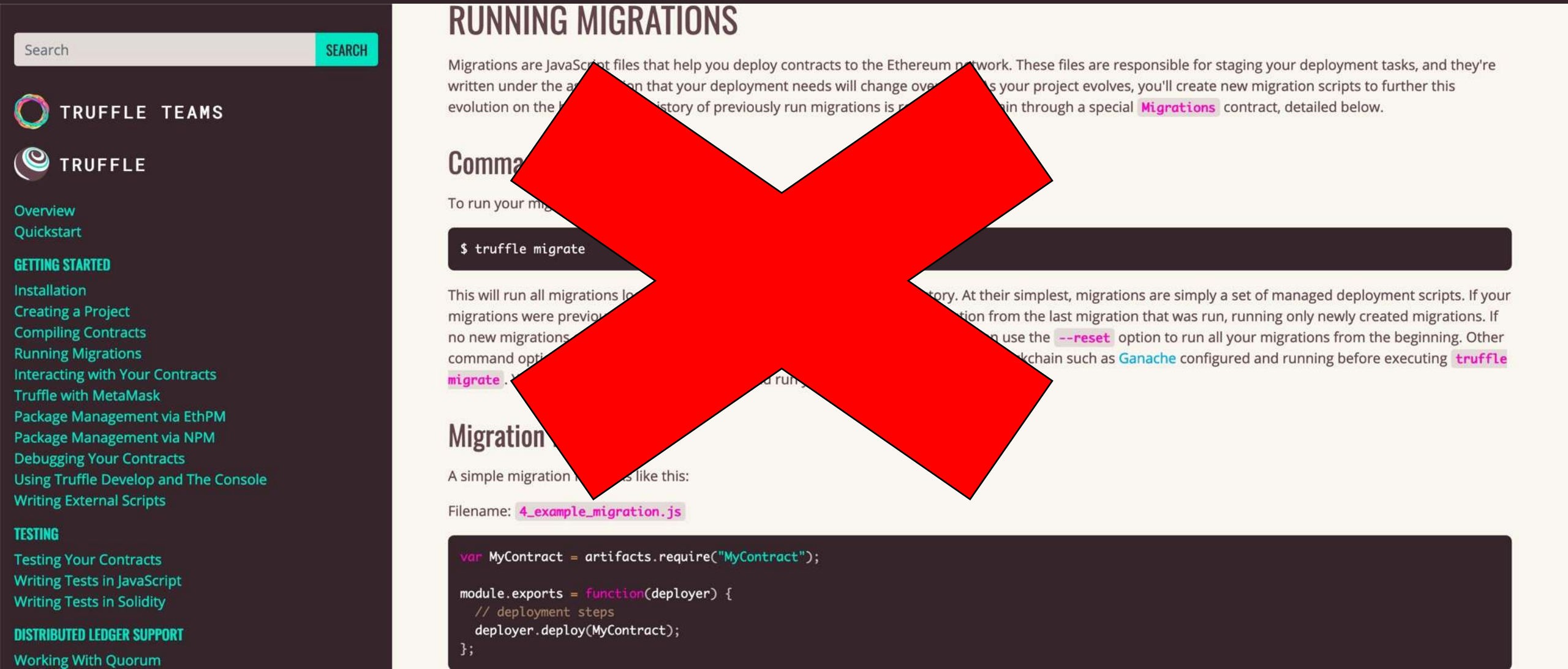
LicenseType

3) MIT License (MIT)

THE TRADITIONAL METHOD FOR VERIFICATION



THE TRADITIONAL METHOD FOR VERIFICATION



Search SEARCH

TRUFFLE TEAMS

TRUFFLE

Overview
Quickstart

GETTING STARTED

Installation
Creating a Project
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Package Management via EthPM
Package Management via NPM
Debugging Your Contracts
Using Truffle Develop and The Console
Writing External Scripts

TESTING

Testing Your Contracts
Writing Tests in JavaScript
Writing Tests in Solidity

DISTRIBUTED LEDGER SUPPORT

Working With Quorum

RUNNING MIGRATIONS

Migrations are JavaScript files that help you deploy contracts to the Ethereum network. These files are responsible for staging your deployment tasks, and they're written under the assumption that your deployment needs will change over time. As your project evolves, you'll create new migration scripts to further this evolution on the blockchain. A history of previously run migrations is recorded on-chain through a special `Migrations` contract, detailed below.

Command

To run your migrations,

```
$ truffle migrate
```

This will run all migrations located in the migrations directory. At their simplest, migrations are simply a set of managed deployment scripts. If your migrations were previously run successfully, running `truffle migrate` will start execution from the last migration that was run, running only newly created migrations. If no new migrations exist, no migrations will be run. To force migrations to run from the beginning, you can use the `--reset` option to run all your migrations from the beginning. Other command options are available as well. Please ensure your blockchain such as Ganache configured and running before executing `truffle migrate`.

Migration

A simple migration file looks like this:

Filename: `4_example_migration.js`

```
var MyContract = artifacts.require("MyContract");

module.exports = function(deployer) {
  // deployment steps
  deployer.deploy(MyContract);
};
```



TRUFFLE-PLUGIN-VERIFY

rkalis / truffle-plugin-verify

Sponsor | Watch 2 | Star 92 | Fork 14

Code | Issues 7 | Pull requests | Actions | Security | Insights

master | v0.5.0 | 2 branches | 24 tags

rkalis Bump version to 0.5.0 — 9471050 3 days ago — 77 commits

truffle-plugin-verify

npm v0.5.0 | downloads 6.8k/month | license MIT

This truffle plugin allows you to automatically verify your smart contracts' source code on Etherscan, straight from the Truffle CLI.

I wrote a tutorial on my website that goes through the entire process of installing and using this plugin: Automatically verify Truffle smart contracts on Etherscan.

Note: This version of the plugin uses **multi-file verification**. If you want to use source code flattening instead for any reason, please use the legacy version (v0.4.x) of the plugin.

Installation / preparation

1. Install the plugin with npm or yarn

```
npm install -D truffle-plugin-verify
yarn add -D truffle-plugin-verify
```

About

✅ Verify your deployed smart contracts on Etherscan from the Truffle CLI

kalis.me/verify-truffle-smart-contra...

truffle | etherscan | ethereum | web3 | solidity

MIT License

1 year old

Releases 24

v0.5.0 Latest
3 days ago

+ 23 releases

Sponsor this project

rkalis Rosco Kalis

gitcoin.co/grants/259/rosco-kalis



INSTALLATION & SETUP

1. Install the plugin with npm or yarn

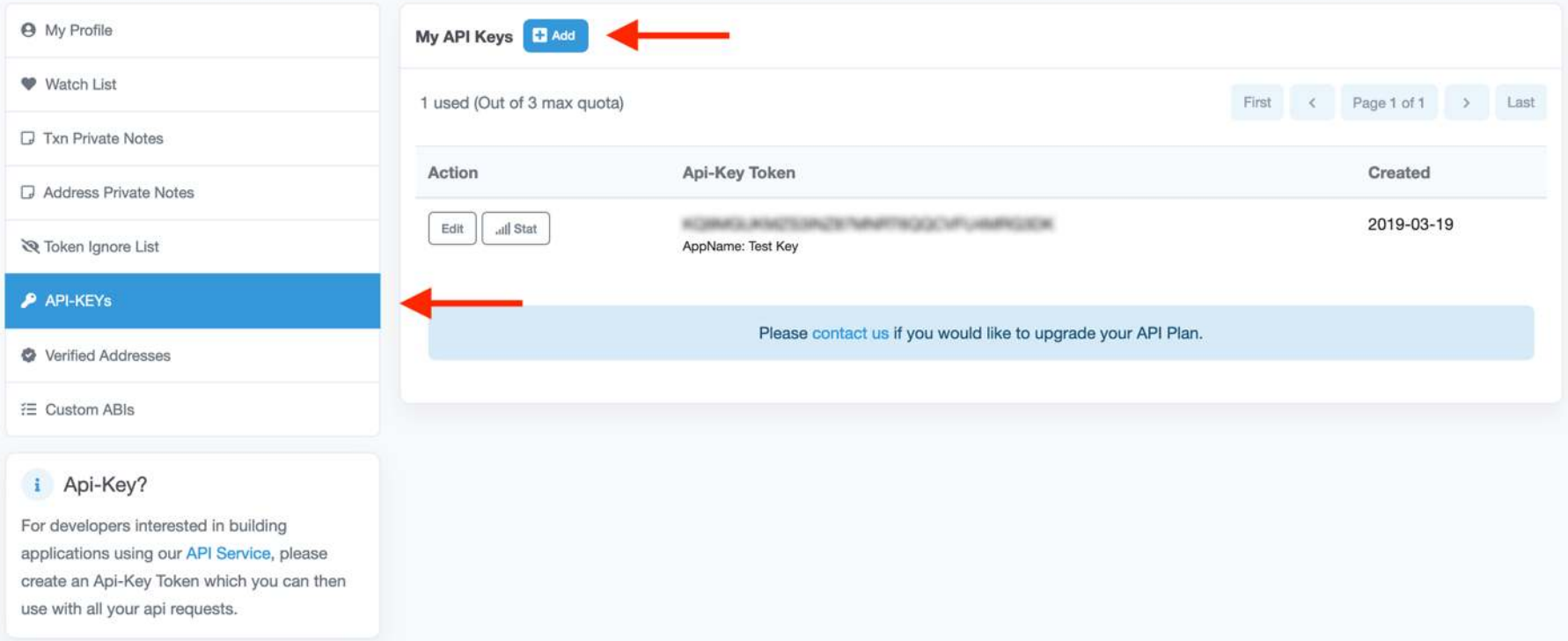
```
npm install -D truffle-plugin-verify
yarn add -D truffle-plugin-verify
```

2. Add the plugin to your `truffle-config.js` file

```
module.exports = {
  /* ... rest of truffle-config */

  plugins: [
    'truffle-plugin-verify'
  ]
}
```

INSTALLATION & SETUP





INSTALLATION & SETUP

3. Add your Etherscan API key to your truffle config (make sure to use something like dotenv so you don't commit the api key)

```
module.exports = {
  /* ... rest of truffle-config */

  api_keys: {
    etherscan: 'MY_API_KEY'
  }
}
```



RUNNING VERIFICATION

1. Compile & deploy contracts

```
truffle compile
truffle migrate --network rinkeby
```

2. Verify deployed contract

```
truffle run verify SimpleToken --network rinkeby
```

2. (Alternatively) Verify deployed contract with custom address

```
truffle run verify SimpleToken@0x2fed370C5E3b5a9Cb14859e81d6213C187DFD8ff --network rinkeby
```

3. Enjoy your verified contract

```
> Pass - Verified: https://rinkeby.etherscan.io/address/0x2fed370C5E3b5a9Cb14859e81d6213C187DFD8ff#contracts
```



RUNNING VERIFICATION

Code | Read Contract | Write Contract

Contract Source Code Verified (Exact Match)

Contract Name:	**SimpleToken**	Optimization Enabled:	**No** with **200** runs
Compiler Version	**v0.6.11+commit.5ef660b1**	Other Settings:	**default** evmVersion

Contract Source Code (Solidity Standard Json-Input format)

More Options

File 1 of 6 : SimpleToken.sol

```
// SPDX-License-Identifier: MIT
pragma solidity ^0.6.0;

import "@openzeppelin/contracts/token/ERC20/ERC20.sol";

/**
 * @title SimpleToken
 * @dev Very simple ERC20 Token example, where all tokens are pre-assigned to the creator.
 * Note they can later distribute these tokens as they wish using `transfer` and other
 * `ERC20` functions.
 */
contract SimpleToken is ERC20 {

    /**
     * @dev Constructor that gives msg.sender all of existing tokens.
     */
    constructor () public ERC20("Simple Token", "SIM") {
        _mint(msg.sender, 1000000 * (10 ** uint256(decimals())));
    }
}
```

File 2 of 6 : Context.sol

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

pragma solidity ^0.6.0;

/*
 * @dev Provides information about the current execution context, including the
 * sender of the transaction and its data. While these are generally available
 * via msg.sender and msg.data, they should not be accessed in such a direct
 * manner, since when dealing with GSN meta-transactions the account sending and
 * paying for execution may not be the actual sender (as far as an application
 * is concerned).
```



TECHNICAL DETAILS

- Extract config information

```
// Truffle handles network stuff, just need to get network_id
const networkId = config.network_id
const apiUrl = API_URLS[networkId]
enforce(apiUrl, `Etherscan has no support for network ${config.network} with id ${networkId}`, logger)

const apiKey = config.api_keys && config.api_keys.etherscan
enforce(apiKey, 'No Etherscan API key specified', logger)

const workingDir = config.working_directory
const contractsBuildDir = config.contracts_build_directory

enforce(config._.length > 1, 'No contract name(s) specified', logger)
const contractNames = config._.slice(1)
```



TECHNICAL DETAILS

- Extract & format data from artifact
- Retrieve constructor data from Etherscan

```
const artifactPath = path.resolve(options.contractsBuildDir, `${contractName}.json`)
const artifact = require(artifactPath)
const inputJSON = await fetchInputJSON(artifact, options)
const constructorArgs = await fetchConstructorArgs(artifact, options)
```



TECHNICAL DETAILS

- Build & send Etherscan verification request

```
const postQueries = {
  apikey: options.apiKey,
  module: 'contract',
  action: 'verifysourcecode',
  contractaddress: artifact.networks[`${options.networkId}`].address,
  sourceCode: JSON.stringify(inputJSON),
  codeformat: 'solidity-standard-json-input',
  contractname: `${artifact.sourcePath}:${artifact.contractName}`,
  compilerversion: `v${artifact.compiler.version.replace('.Emscripten.clang', '')}`,
  constructorArguements: encodedConstructorArgs
}

const guid = await axios.post(options.apiUrl, querystring.stringify(postQueries))
```



TECHNICAL DETAILS

- Retrieve verification result

```
while (true) {
  await delay(1000)

  const qs = querystring.stringify({
    apiKey: options.apiKey,
    module: 'contract',
    action: 'checkverifystatus',
    guid
  })

  const verificationResult = await axios.get(`${options.apiUrl}?${qs}`)
  if (verificationResult.data.result !== VerificationStatus.PENDING) {
    return verificationResult.data.result
  }
}
```



HAPPY VERIFYING

```
$ truffle run verify SimpleToken --network rinkeby
Verifying SimpleToken
Pass - Verified: https://rinkeby.etherscan.io/address/0x7Eaf86d770FAd2d495E7923555a1553DEdC6B172#contracts
Successfully verified 1 contract(s).
```



FURTHER READING

- https://kalis.me/verify-truffle-smart-contracts-etherscan/
- https://github.com/rkalis/truffle-plugin-verify
- https://kalis.me/uploads/trufflecon2020.pdf