Ethereum Lab
Solidity Development

Blockchain Technologies and Applications

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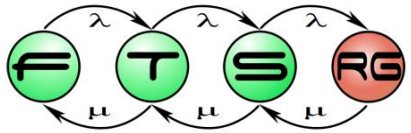
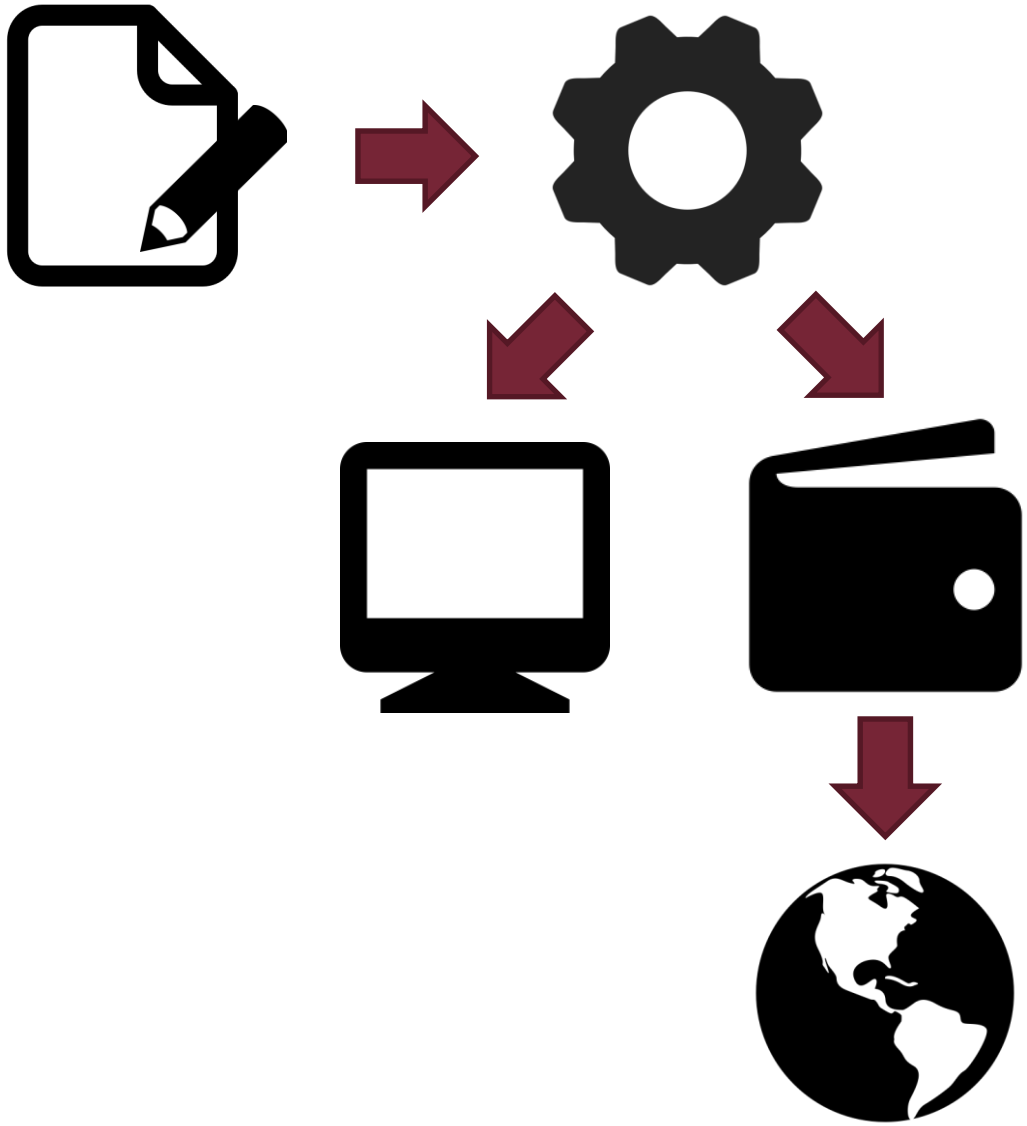


ETHEREUM DEVELOPMENT TOOLS

What do you need for development?

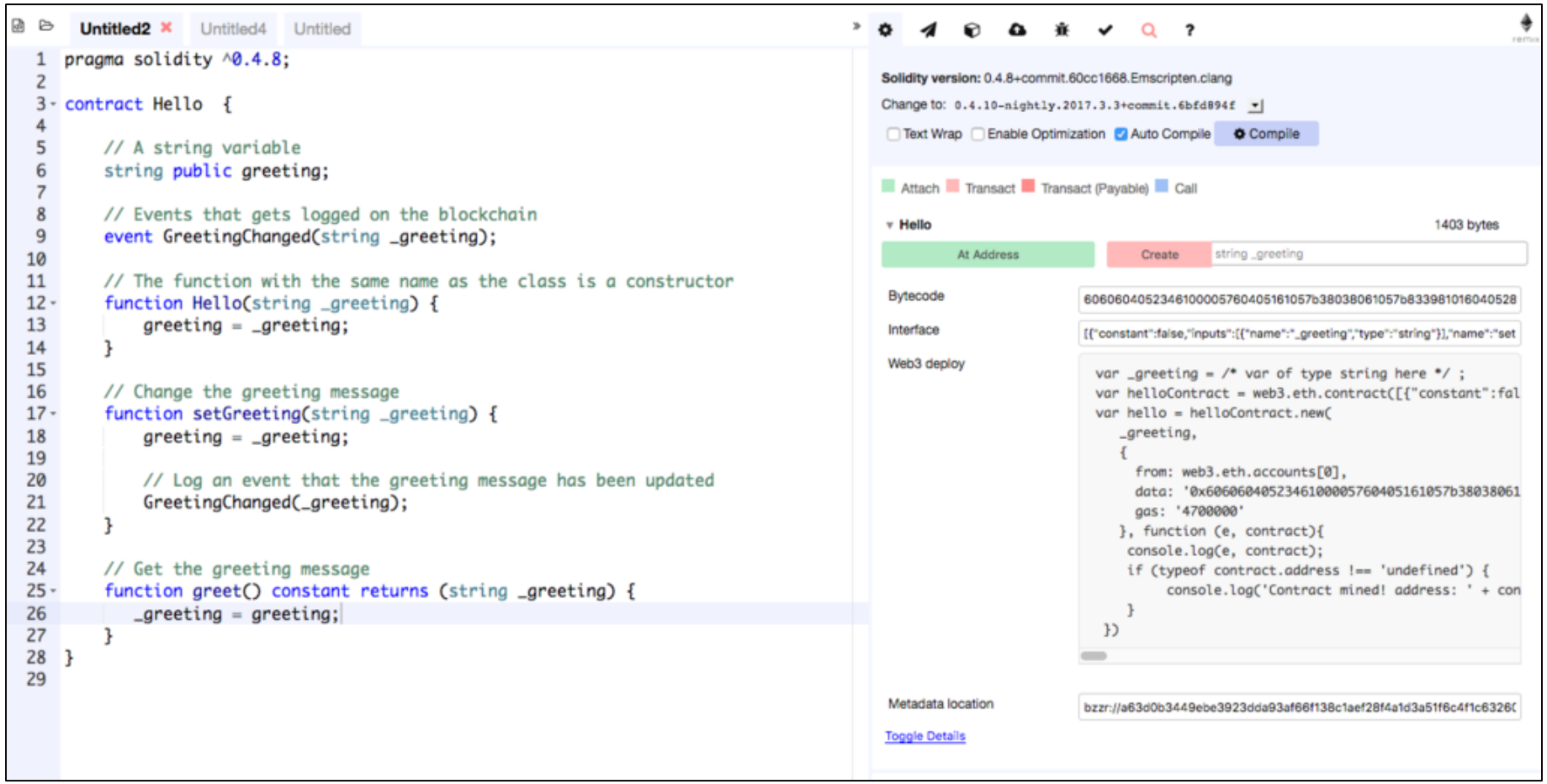
- Editor / IDE
  - Remix, Visual Studio Code
- Compiler
  - Solc, Remix
- Wallet
  - Metamask
- Other tools
  - Testing, verification, deployment, …



Remix

- Solidity/Ethereum IDE
  - Write, test, debug, deploy, ...

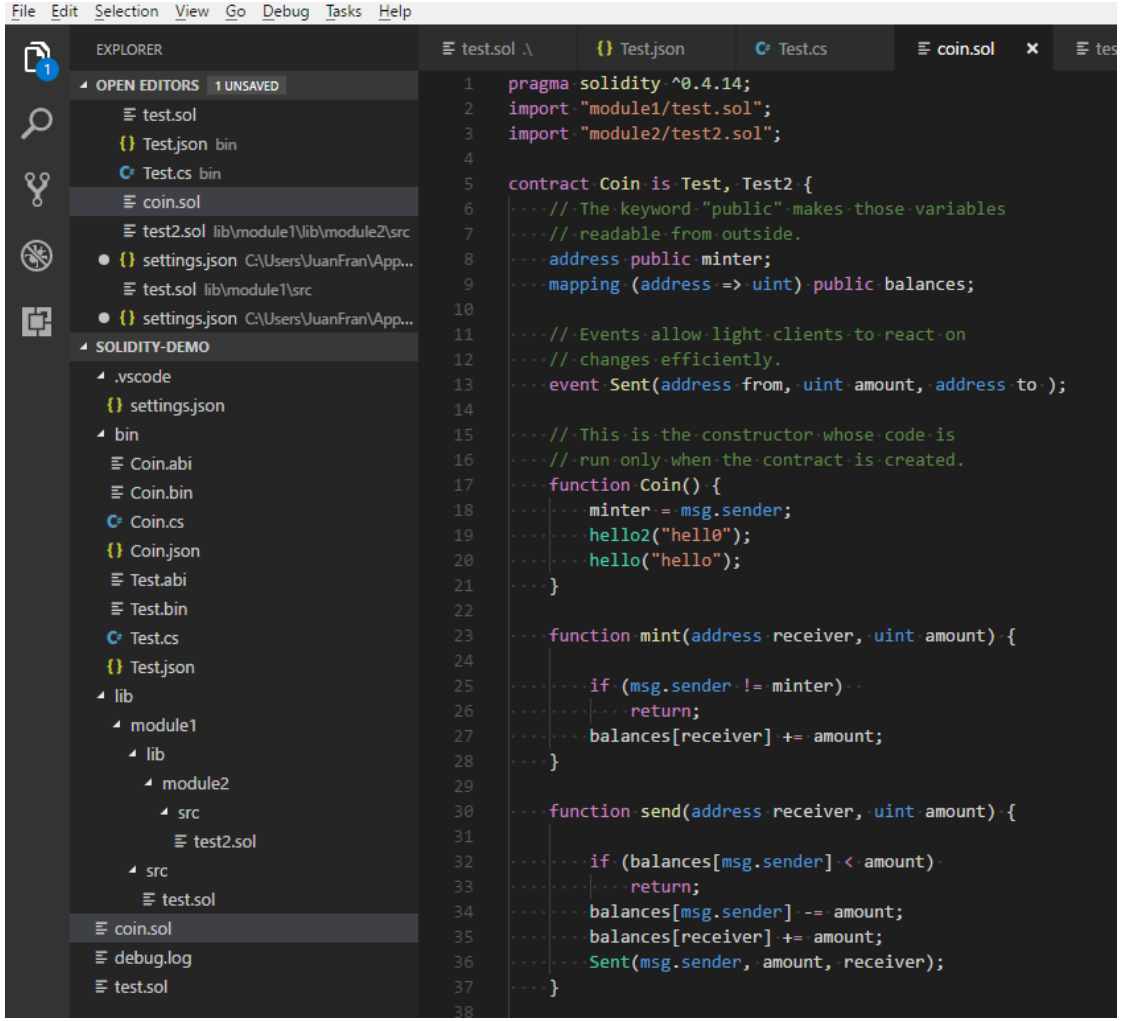
remix.ethereum.org
remix.readthedocs.io



Visual Studio Code

code.visualstudio.com

- General purpose editor with Solidity plug-in



solc: Solidity compiler

github.com/ethereum/solidity

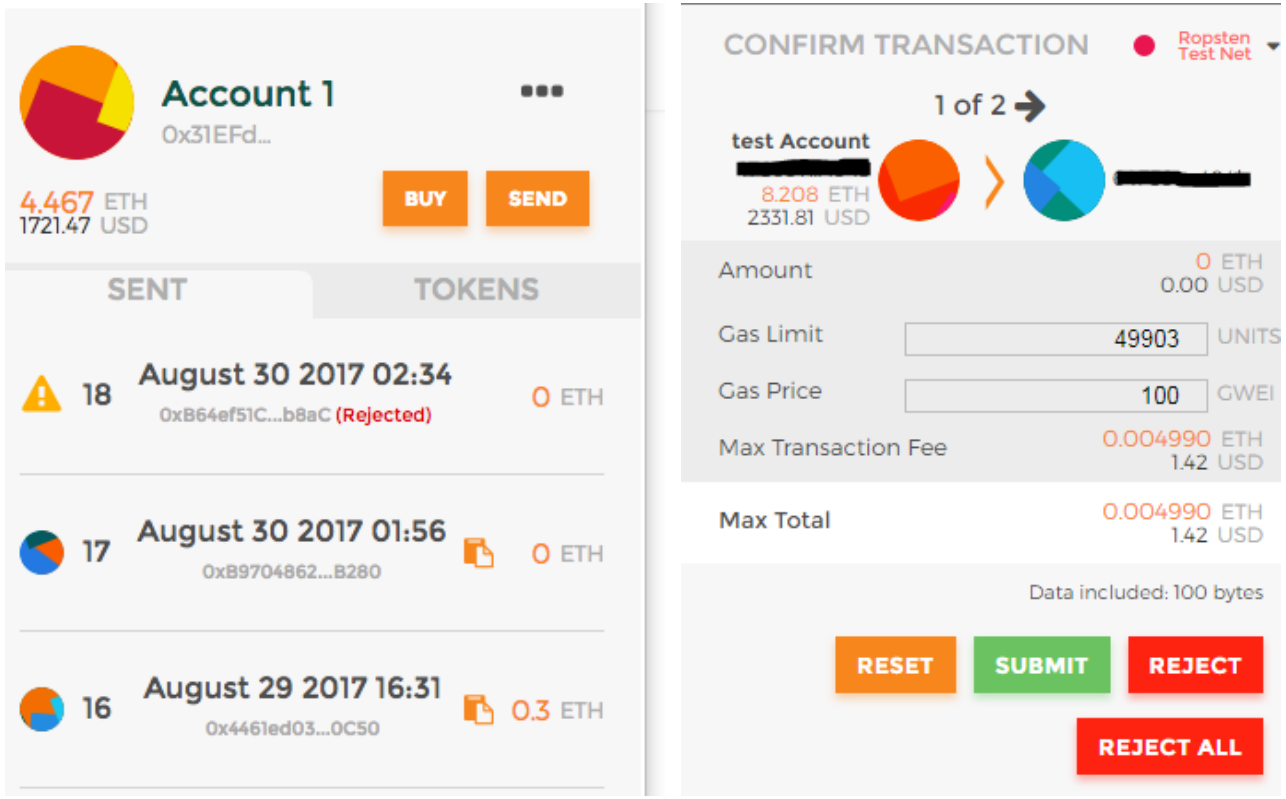
- npm, Docker, binary, building from source
  - Linux, OS X, Windows
- Command line tool
  - `solc MyContract.sol [flags]`

```
user@udesktop:~$ solc --help
solc, the Solidity commandline compiler.

This program comes with ABSOLUTELY NO WARRANTY. This is free software, and you
are welcome to redistribute it under certain conditions. See 'solc --license'
for details.

Usage: solc [options] [input_file...]
Compiles the given Solidity input files (or the standard input if none given or
"-" is used as a file name) and outputs the components specified in the options
at standard output or in files in the output directory, if specified.
Imports are automatically read from the filesystem, but it is also possible to
remap paths using the context:prefix=path syntax.
Example:
solc --bin -o /tmp/solcoutput dapp-bin=/usr/local/lib/dapp-bin contract.sol
```

Metamask

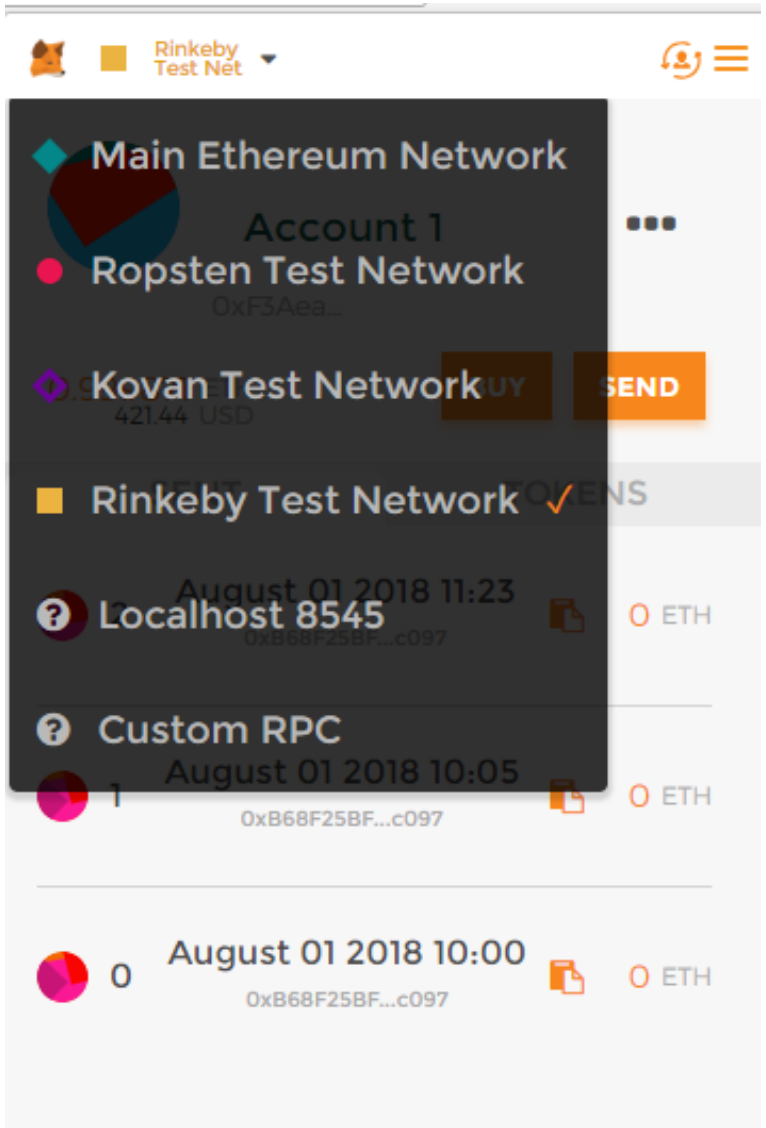
metamask.io

- Ethereum wallet and gateway
  - Browser add-on
  - Run dApps from browser without a full node



Ethereum test networks

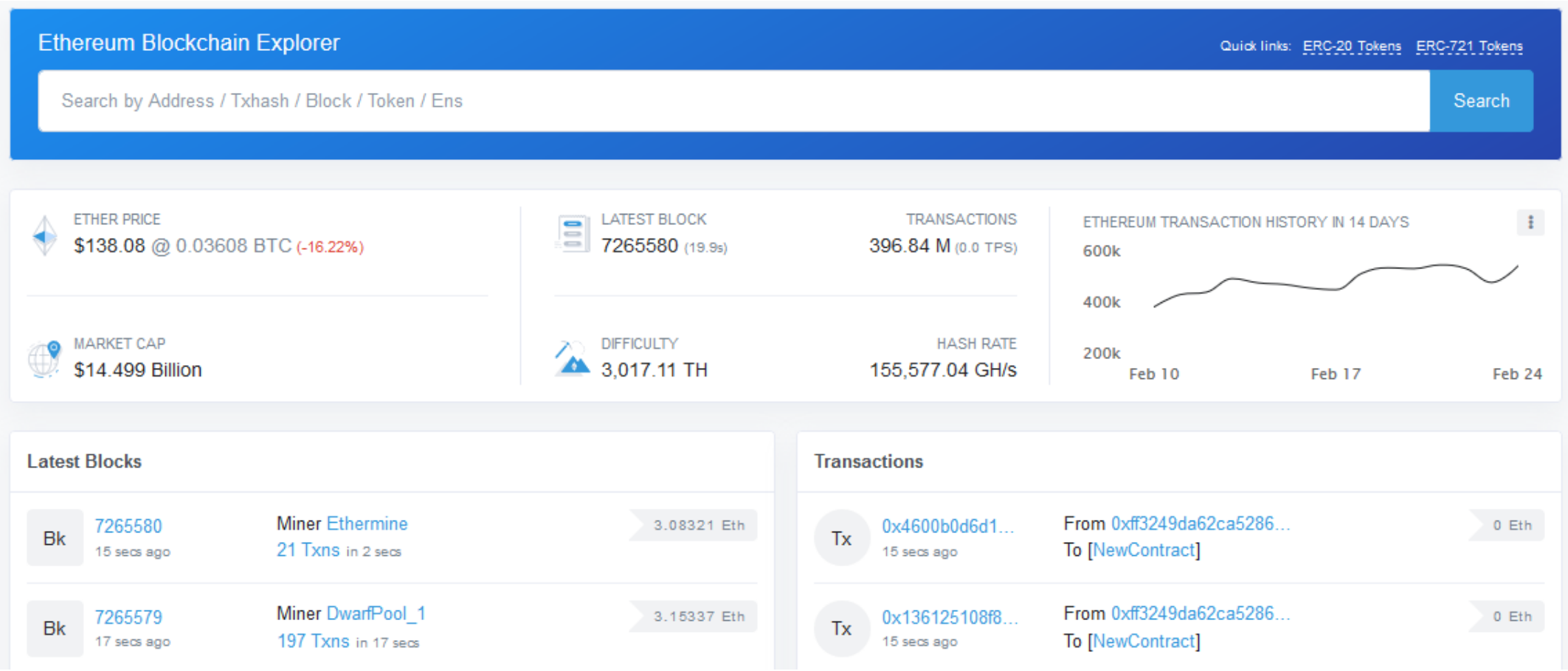
- Ropsten, RinkeBy, Kovan, …
  - More or less similar to real network
  - Can get free Ether to play with



Etherscan

- Blockchain explorer
  - Contracts, transactions, accounts

etherscan.io



Truffle

trufflefamework.com

- Ethereum development framework
  - Mostly command line tools
  - Compile, link, deploy contracts
  - Automated testing
  - Extensible deployment framework
  - Network management
  - Package management
  - Configurable build pipeline

TRUFFLE

web3.js

- JavaScript API
  - Interact with Ethereum nodes via JSON RPC

github.com/ethereum/web3.js
web3js.readthedocs.io/en/1.0

```
web3.eth.sendTransaction({from: '0x123...', data: '0x432...'})
.once('transactionHash', function(hash){ ... })
.once('receipt', function(receipt){ ... })
.on('confirmation', function(confNumber, receipt){ ... })
.on('error', function(error){ ... })
.then(function(receipt){
    // will be fired once the receipt is mined
});
```

SOLIDITY EXAMPLES

Solidity examples

- HelloWorld
- Counter
- SimpleBank
- BmeCoin
- DNS

FURTHER READING

Further reading

- Solidity documentation
  - https://solidity.readthedocs.io
  - Also: security considerations, style guide, common patterns, …
- Tutorials
  - https://ethereum.gitbooks.io/frontier-guide/contract_greeter.html
  - https://ethereum.gitbooks.io/frontier-guide/contract_coin.html
  - https://ethereum.gitbooks.io/frontier-guide/contract_crowdfunder.html
  - https://ethereum.gitbooks.io/frontier-guide/contract_democracy.html
- Ethernaut: Solidity security game/tutorial
  - https://ethernaut.zeppelin.solutions/

Further reading

- Cryptozombies: interactive Ethereum tutorial
  - https://cryptozombies.io/
- Ethereum blog
  - https://blog.ethereum.org/
- Vyper: pythonic programming language for EVM
  - https://vyper.readthedocs.io/
- How does Etherem work, anyway?
  - https://medium.com/@preethikasireddy/how-does-ethereum-work-anyway-22d1df506369
- The Hitchhiker's Guide to Smart Contracts in Ethereum
  - https://blog.zeppelin.solutions/the-hitchhikers-guide-to-smart-contracts-in-ethereum-848f08001f05