







**Bingen Eguzkitza** 🏳️‍🌈🛡️ @bingentxu · 6h

After so long I finally got my hands dirty with [@BrownieEth](#) ... and my first impression is that I love it! Everything feels so natural and clean, and the documentation is so good!

All I had read about it seems to be true, so far it's even surpassing my expectations.



1



4



6



**Sam Werner**

@samwern

Replying to [@bingentxu](#) and [@BrownieEth](#)

Having gotten used to Brownie and everything about it, reading this makes me appreciate everything once more



Best thing about it: you don't have to go back to something else.

12:25 PM · Mar 3, 2021 · Twitter Web App

1 Retweet

4 Likes



# Smart Contracts

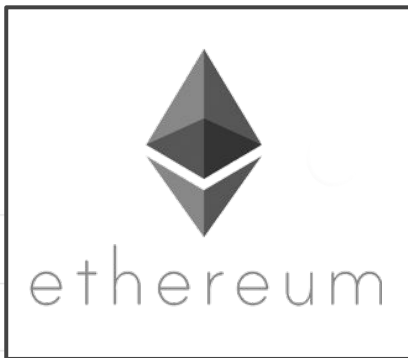
Decentralized programmatic  
value transfer and storage





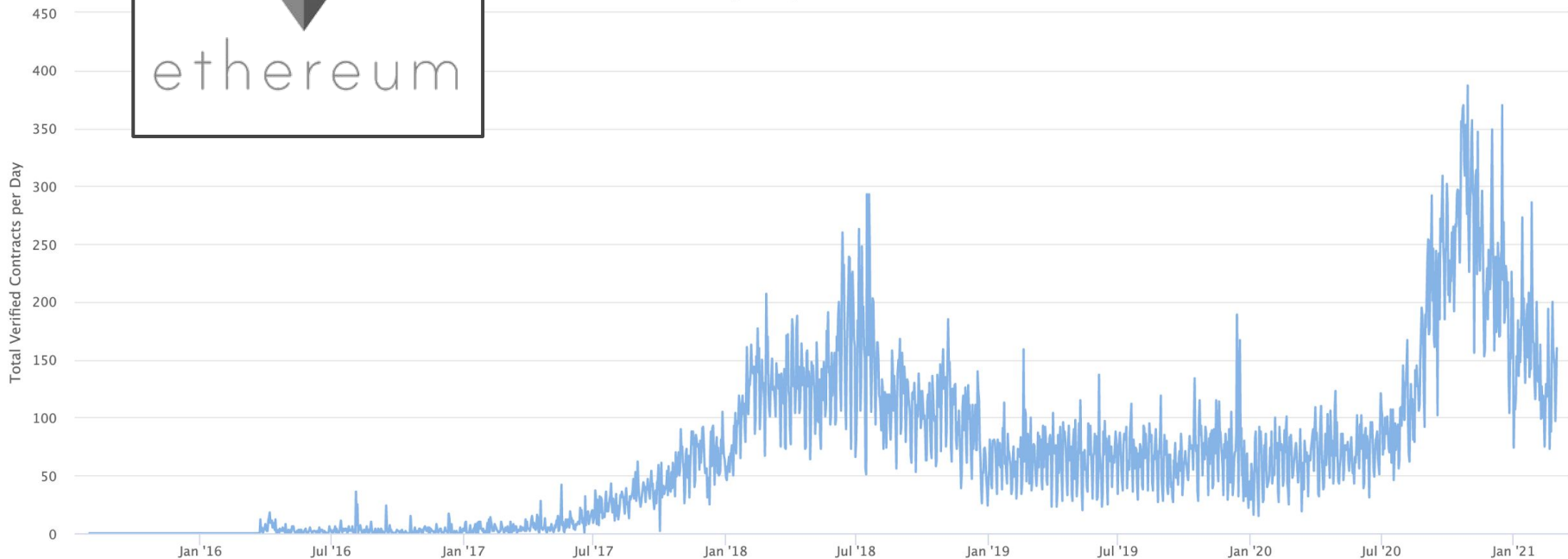


History



## Ethereum Daily Verified Contracts Chart

Source: Etherscan.io  
Click and drag in the plot area to zoom in





Solidity

*Launched*

2014

*Inspiration*

Java

*Turing-Complete*

Yes



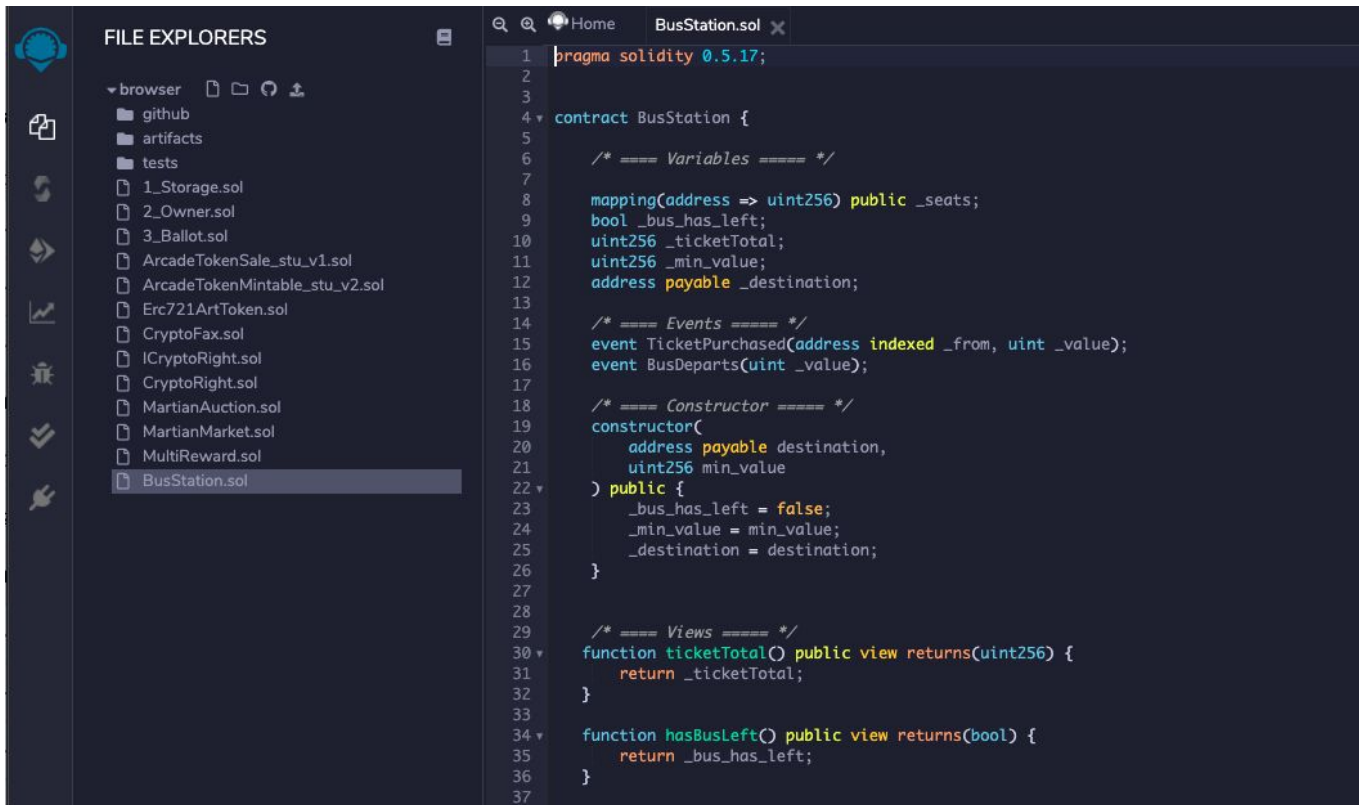
Vyper

2018

Python

No

# Remix







# Brownie

*Smart Contract Development Framework*

- Deployment
- Interaction
- Debugging
- Testing







# Deployment

*Local, live, or forked*

```
> brownie networks list
Brownie v1.13.0 - Python development framework for Ethereum

The following networks are declared:

Ethereum
├─ Mainnet (Infura): mainnet
├─ Ropsten (Infura): ropsten
├─ Rinkeby (Infura): rinkeby
├─ Goerli (Infura): goerli
└─ Kovan (Infura): kovan

Ethereum Classic
├─ Mainnet: etc
└─ Kotti: kotti

Development
├─ Ganache-CLI: development
├─ Ganache-CLI (Mainnet Fork): mainnet-fork
└─ forkedmain: forkedmain
```

🍏 ~ /life/poolparty/git/bus-station 🐙 master ??



# Interaction

*Built in console*

```
> brownie console
Brownie v1.13.0 - Python development framework for Ethereum

Compiling contracts...
  Solc version: 0.5.17
  Optimizer: Enabled Runs: 200
  EVM Version: Istanbul
Generating build data...
- Address
- IERC20
- Math
- MultiRewards
- Owned
- Pausable
- ReentrancyGuard
- SafeERC20
- SafeMath

MultiRewardsProject is the active project.

Launching 'ganache-cli --accounts 10 --hardfork istanbul --gasLimit 12000000 --mnemonic brownie --port 8545'..
Brownie environment is ready.
>>> tx = chain.mine(timedelta=60)
>>> chain.revert
  redo
  reset
  revert
  sleep
  snapshot
  time
```



# Debugging

```
> brownie test
Brownie v1.13.0 - Python development framework for Ethereum

Compiling contracts...
  Solc version: 0.8.0
  Optimizer: Enabled Runs: 200
  EVM Version: Istanbul
Generating build data...
  - BusStation

===== test session starts =====
platform darwin -- Python 3.7.7, pytest-6.0.1, py-1.9.0, pluggy-0.13.1
rootdir: /Users/gerrithall/life/poolparty/git/bus-station
plugins: eth-brownie-1.13.0, hypothesis-5.41.3, xdist-1.34.0, web3-5.11.1,
forked-1.3.0
collected 15 items

Launching 'ganache-cli --accounts 10 --hardfork istanbul --gasLimit 1200000
0 --mnemonic brownie --port 8545'...

tests/test_BusStation_buyBusTicket.py ..... [ 40%]
tests/test_BusStation_triggerBusRide.py .... [ 66%]
tests/test_BusStation_withdraw.py ..... [100%]

===== 15 passed in 29.92s =====
Terminating local RPC client...
```





# Testing

## *Results coverage GUI*

opcode Viewer

NFTaggable.sol    NFToken.sol

```
154 Data storage data = t.map[_pointer];
155 require(data.start <= _start && data.owner == 0x00);
156 _remove[0] = data;
157 if (data.start < _start) {
158     /* new range does not touch start of old range */
159     _addTagPointers(_tag, data.start, _start, 0);
160 } else if (_start > data.start) {
161     /* new range touches , same owner */
162     _remove[1] = t.map[t.range[_start-1]];
163     _start = _remove[1].start;
164 }
165 if (data.stop > _stop) {
166     _addTagPointers(_tag, _stop, data.stop, 0);
167 } else if (_stop + 1 != 0) {
168     _remove[2] = t.map[t.range[_stop]];
169     _stop = _remove[2].stop;
170 }
171 _addTagPointers(_tag, _start, _stop, 1);
172 if (_start < t.start) {
173     t.start = _start;
174 }
175 if (_stop > t.stop) {
176     t.stop = _stop;
177 }
178 for (uint256 i = 0; i < 3; i++) {
179     if (_remove[i].start == 0) continue;
180     _pointer = _generatePointer(_remove[i].start, _remove[i].stop);
181     if (t.map[_pointer].owner != _remove[i].owner) continue;
182     delete t.map[_pointer];
183     _removeRangePointers(
184         t.range,
185         _remove[i].start,
186         _remove[i].stop,
187         _pointer
188     );
189 }
```

NFTaggable

| pc  | opcode       |
|-----|--------------|
| 480 | AND          |
| 481 | PUSH1        |
| 483 | CALLDATALOAD |
| 484 | PUSH2        |
| 487 | JUMP         |
| 488 | JUMPDEST     |
| 489 | CALLVALUE    |
| 490 | DUP1         |
| 491 | ISZERO       |
| 492 | PUSH2        |
| 495 | JUMPI        |
| 496 | PUSH1        |
| 498 | DUP1         |
| 499 | REVERT       |
| 500 | JUMPDEST     |
| 501 | POP          |
| 502 | PUSH2        |
| 505 | PUSH2        |
| 508 | JUMP         |
| 509 | JUMPDEST     |
| 510 | PUSH1        |
| 512 | DUP1         |
| 513 | MLOAD        |
| 514 | SWAP2        |
| 515 | DUP3         |
| 516 | MSTORE       |
| 517 | MLOAD        |
| 518 | SWAP1        |
| 519 | DUP2         |
| 520 | SWAP1        |

## Resources

- <https://eth-brownie.readthedocs.io/>
- <https://github.com/eth-brownie/brownie>
- <https://gitter.im/eth-brownie/community>
- <https://twitter.com/BrownieEth>
- <https://medium.com/@iamdefinitelyahuman/getting-started-with-brownie-part-1-9b2181f4cb99>

