A living programming environment for a living blockchain

by Santiago Bragagnolo - PharoDays - 2017
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Disclaimer!

This is not a blockchain mechanisms talk!
(Sorry disappoint you :))

General technology explanation

Starting by the fruit: Smart contracts

- Digital reification of contracts
  - Emulate the logic of contractual clauses
  - Self-executing
  - Self-enforcing
- Reduce transactional costs
- Minimise exceptions

Following by the branch: Ethereum

- Blockchain based technology
- Open source & public network
- Smart contracts
  - State stored in a blockchain
  - Byte-code executed in the turing complete EVM
  - Many development languages (solidity, serpent, etc)

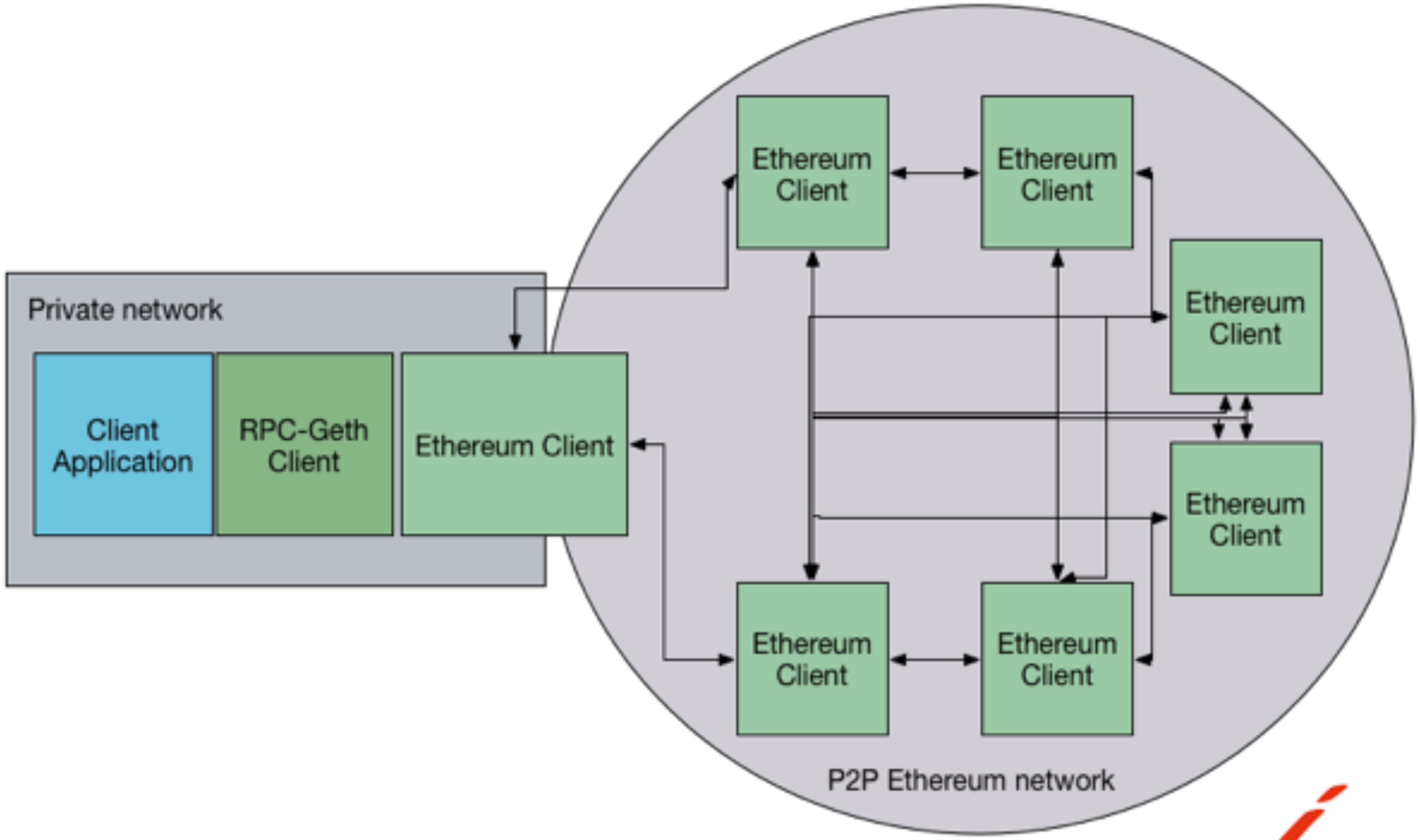
Arriving to the trunk: Blockchain

- Open and distributed ledger
- Records a constantly-growing list of transactions in between two parties. (blocks)
- Resistant to modification by design
- Cryptocurrency: Paying to reinforce the social engagement with the security

First-citizens in Blockchain

- Block: stamped batch of transactions
- Transaction: Representation of mutations of state
  - Movements of money
  - Method activation
- Account: Source and target of transactions (account in the accountancy meaning)
- Contracts (Specific in ethereum)

So what? Architecture of a proposed application



Pharo

Pharo: Why?

- Blockchain is a multiple actors always growing environment.
- Blockchain is a living environment
  - Transactions move money (ether - bitcoin) from one place to other
  - Transactions execute smart contracts
- Ethereum is a distributed runtime. Nothing better than a live environment for a living distributed runtime.
- A lot of code analysis and inspection state-of-the-art tools

Fog

- Pharo client for the Ethereum client (GEth)
- github.com/sbragagnolo/Fog

Fog - features

- Connection, communication, marshalling, etc.
- Block fetching
- Query and create transactions
- Query and create contracts
- Remote method invocation

Fog - features

- Development support
    - First-class citizen navigation (GT-Tools)
        - Accounts
        - Blocks
        - Transactions
        - Contracts
    - Automatic contract mirror generation
    - Automatic contract proxy building

Fog - features

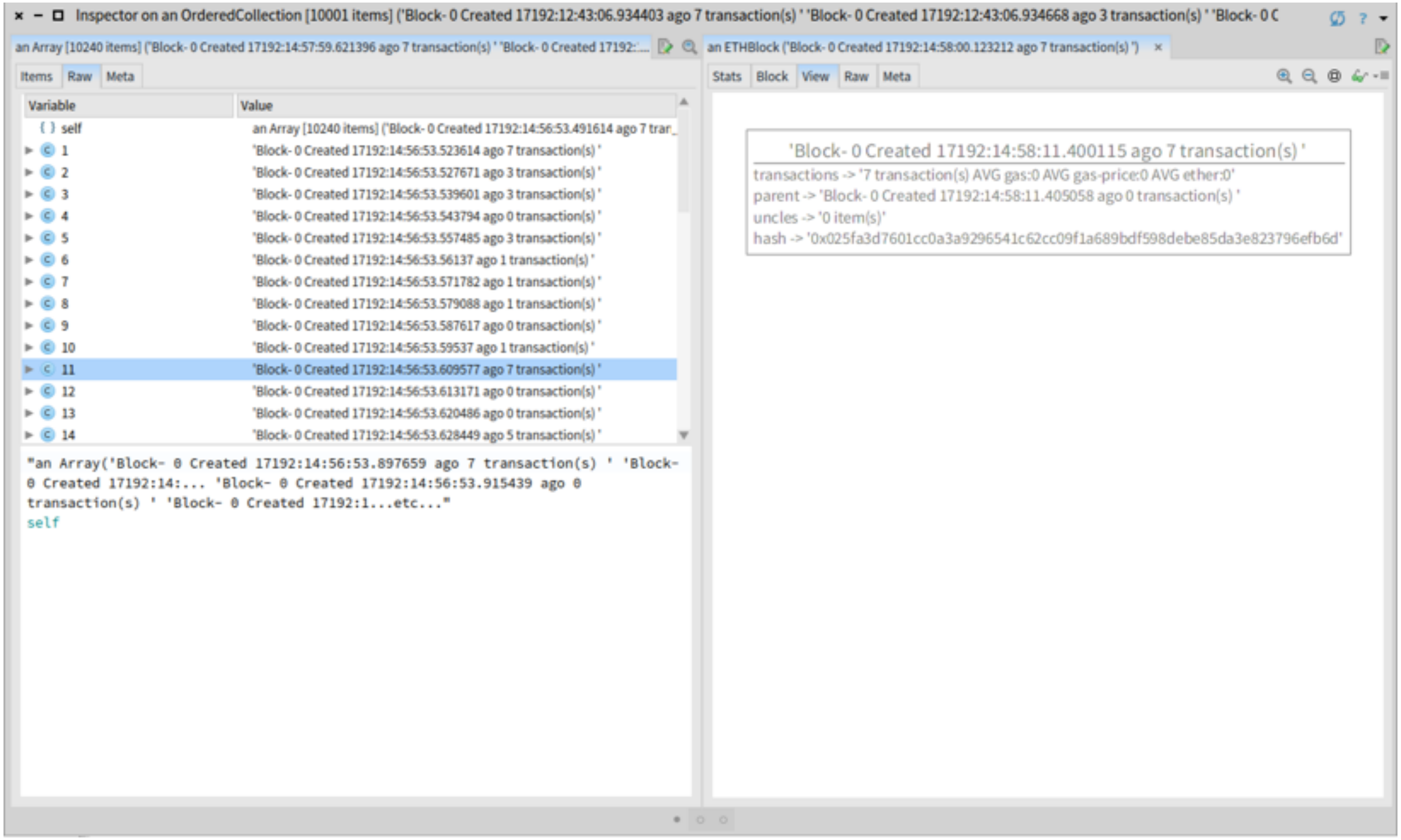
- Cache
  - General
  - Connection
  - Session

Some fancy slides :)

Block inspection

- Navigating blocks
- Inspecting blocks individually
- Overview of a collection of blocks through statistics
- Overview of the transactions of a collection of blocks

Navigating in blocks



Inspector on an OrderedCollection [10001 items] ('Block- 0 Created 17192:12:43:06.934403 ago 7 transaction(s) ' 'Block- 0 Created 17192:12:43:06.934668 ago 3 transaction(s) ' 'Block- 0 C

an Array [10240 items] ('Block- 0 Created 17192:14:57:59.621396 ago 7 transaction(s) ' 'Block- 0 Created 17192:...

Variable	Value
{ } self	an Array [10240 items] ('Block- 0 Created 17192:14:56:53.491614 ago 7 trar_
1	'Block- 0 Created 17192:14:56:53.523614 ago 7 transaction(s) '
2	'Block- 0 Created 17192:14:56:53.527671 ago 3 transaction(s) '
3	'Block- 0 Created 17192:14:56:53.539601 ago 3 transaction(s) '
4	'Block- 0 Created 17192:14:56:53.543794 ago 0 transaction(s) '
5	'Block- 0 Created 17192:14:56:53.557485 ago 3 transaction(s) '
6	'Block- 0 Created 17192:14:56:53.56137 ago 1 transaction(s) '
7	'Block- 0 Created 17192:14:56:53.571782 ago 1 transaction(s) '
8	'Block- 0 Created 17192:14:56:53.579088 ago 1 transaction(s) '
9	'Block- 0 Created 17192:14:56:53.587617 ago 0 transaction(s) '
10	'Block- 0 Created 17192:14:56:53.59537 ago 1 transaction(s) '
11	'Block- 0 Created 17192:14:56:53.609577 ago 7 transaction(s) '
12	'Block- 0 Created 17192:14:56:53.613171 ago 0 transaction(s) '
13	'Block- 0 Created 17192:14:56:53.620486 ago 0 transaction(s) '
14	'Block- 0 Created 17192:14:56:53.628449 ago 5 transaction(s) '

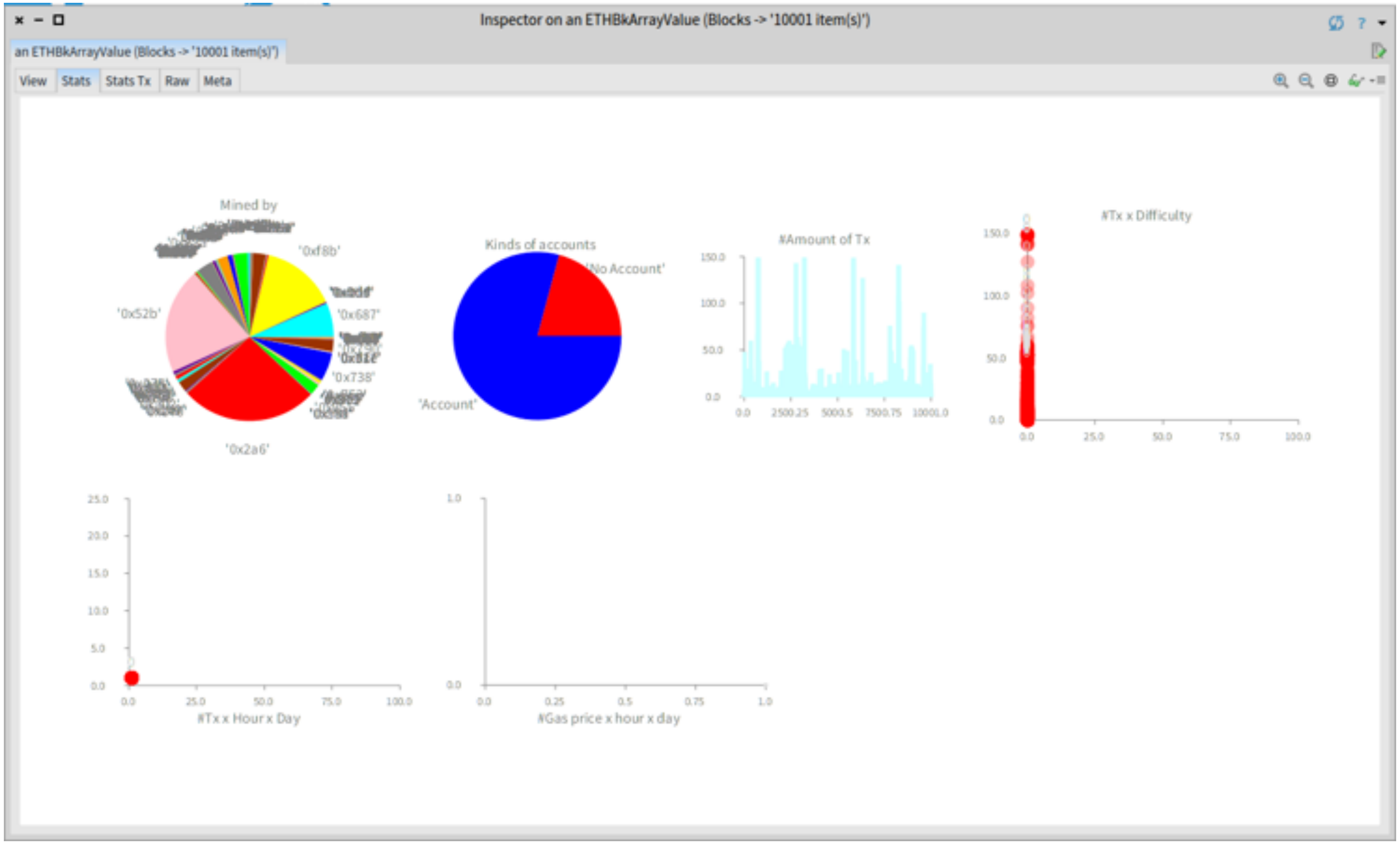
```
"an Array('Block- 0 Created 17192:14:56:53.897659 ago 7 transaction(s) ' 'Block-
0 Created 17192:14:... 'Block- 0 Created 17192:14:56:53.915439 ago 0
transaction(s) ' 'Block- 0 Created 17192:1...etc..."
self
```

an ETHBlock ('Block- 0 Created 17192:14:58:00.123212 ago 7 transaction(s) ')

'Block- 0 Created 17192:14:58:11.400115 ago 7 transaction(s) '

transactions -> '7 transaction(s) AVG gas:0 AVG gas-price:0 AVG ether:0'
parent -> 'Block- 0 Created 17192:14:58:11.405058 ago 0 transaction(s) '
uncles -> '0 item(s)'
hash -> '0x025fa3d7601cc0a3a9296541c62cc09f1a689bdf598debe85da3e823796efb6d'

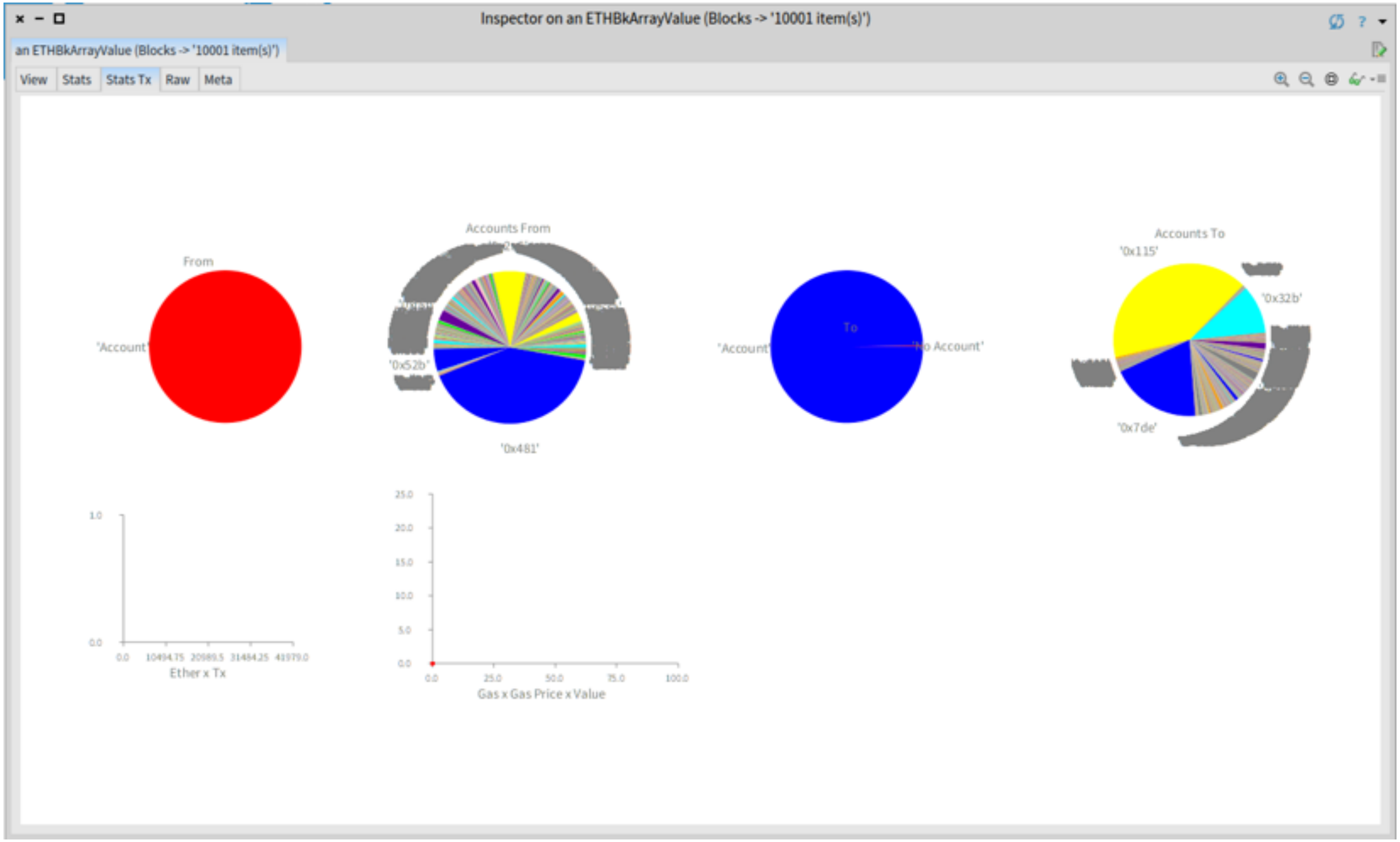
Blocks overview



Inspector on an ETHBkArrayValue (Blocks -> '10001 item(s)')

an ETHBkArrayValue (Blocks -> '10001 item(s)')

Transactions overview

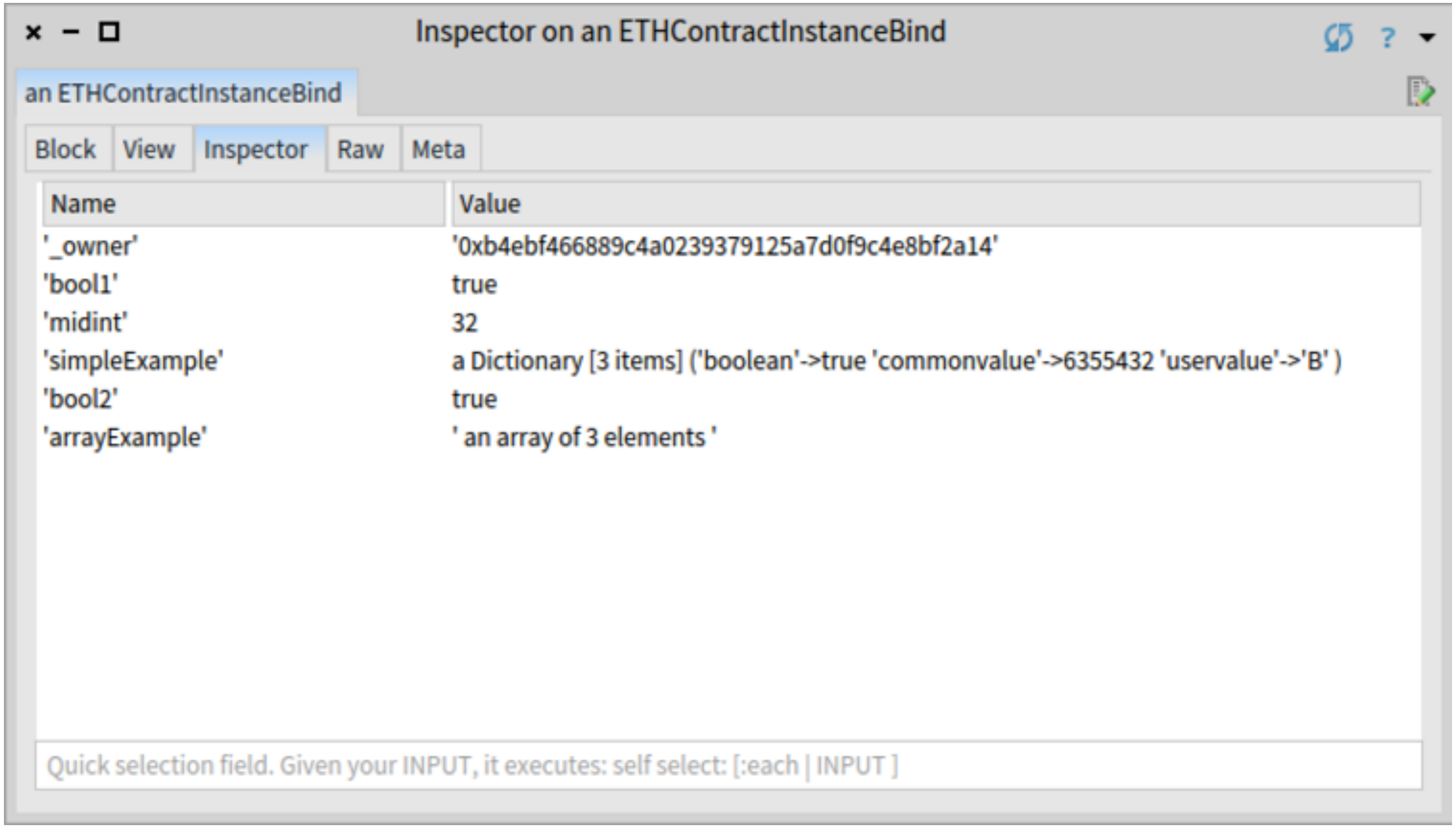


Contract source code

```
pragma solidity ^0.4.2;

contract StructTestContract {

    enum myenum { A, B, C }

    struct  mystruct {
        bool    boolean;
        myenum  uservalue;
        uint32  commonvalue;
    }
    address     _owner;
    bool bool1;
    int16 midint;
    mystruct simpleExample;
    bool bool2;
    mystruct[] arrayExample;

    function StructTestContract (){
        _owner = msg.sender;
             bool1 = true;
             bool2 = true;
             midint = 32;
             simpleExample.boolean = true;
             simpleExample.uservalue = myenum.B;
             simpleExample.commonvalue = 6355432;
             arrayExample.push(mystruct(true, myenum.A, 134));
             arrayExample.push(mystruct(false, myenum.B, 235));
             arrayExample.push(mystruct(true, myenum.C, 34));
    }
    function kill() {
        suicide(_owner);
    }
```

RMod

Inspecting contract

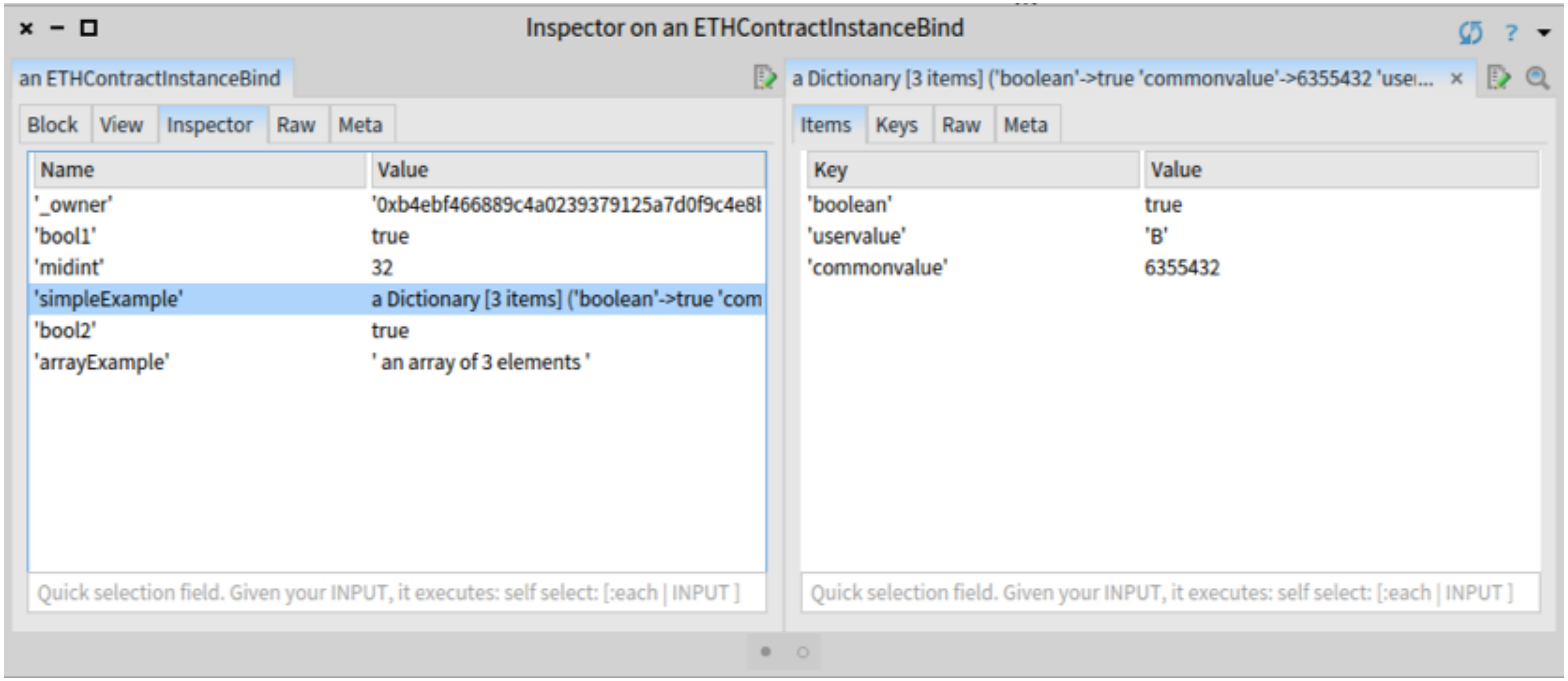

Inspector on an ETHContractInstanceBind
an ETHContractInstanceBind
Block
View
Inspector
Raw
Meta

Name	Value
'_owner'	'0xb4ebf466889c4a0239379125a7d0f9c4e8bf2a14'
'bool1'	true
'midint'	32
'simpleExample'	a Dictionary [3 items] ('boolean'->true 'commonvalue'->6355432 'uservalue'->'B')
'bool2'	true
'arrayExample'	' an array of 3 elements '

Quick selection field. Given your INPUT, it executes: self select: [:each \| INPUT]

inventeurs du monde numérique

Inspecting structs



Inspector on an ETHContractInstanceBind

an ETHContractInstanceBind

Name	Value
'_owner'	'0xb4ebf466889c4a0239379125a7d0f9c4e8l
'bool1'	true
'midint'	32
'simpleExample'	a Dictionary [3 items] ('boolean'->true 'com
'bool2'	true
'arrayExample'	' an array of 3 elements '

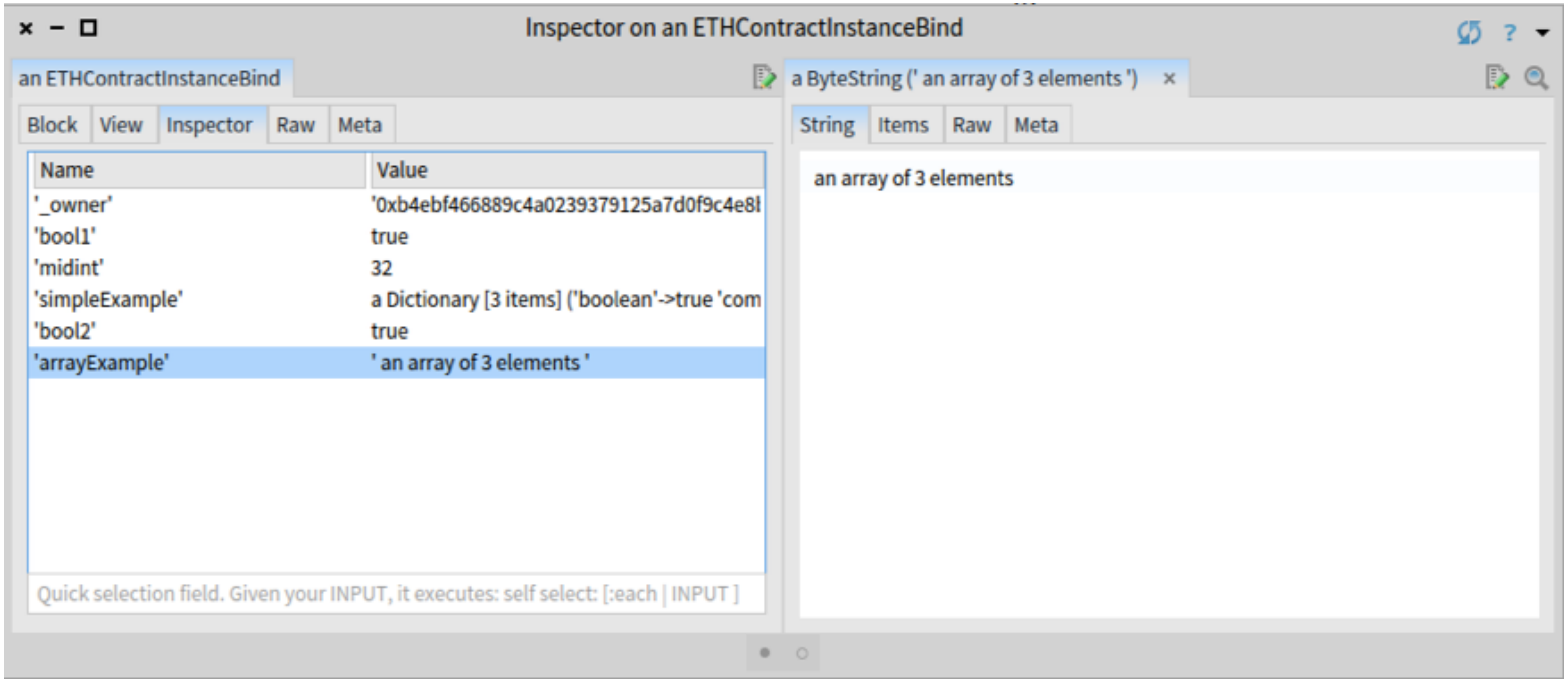
Quick selection field. Given your INPUT, it executes: self select: [:each \| INPUT]

a Dictionary [3 items] ('boolean'->true 'commonvalue'->6355432 'use...

Key	Value
'boolean'	true
'uservalue'	'B'
'commonvalue'	6355432

Quick selection field. Given your INPUT, it executes: self select: [:each \| INPUT]

Yet to implement



Inspector on an ETHContractInstanceBind
an ETHContractInstanceBind
Block
View
Inspector
Raw
Meta
a ByteString (' an array of 3 elements ')
String
Items
Raw
Meta

Name	Value
'_owner'	'0xb4ebf466889c4a0239379125a7d0f9c4e8l
'bool1'	true
'midint'	32
'simpleExample'	a Dictionary [3 items] ('boolean'->true 'com
'bool2'	true
'arrayExample'	' an array of 3 elements '

Quick selection field. Given your INPUT, it executes: self select: [:each \| INPUT]

an array of 3 elements

Fog - Demo

Fog - future

- Finishing session management
- Events support
- Transactional message send recognition
- New AST Definition (Henrique Rocha)

THANKS :)!

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