Ethereum DEVCON 2

Testing Ethereum Consensus

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HYATT ON THE BUND 199 Huangpu Road, Shanghai**, 2016**

The Blockchain Paradigm
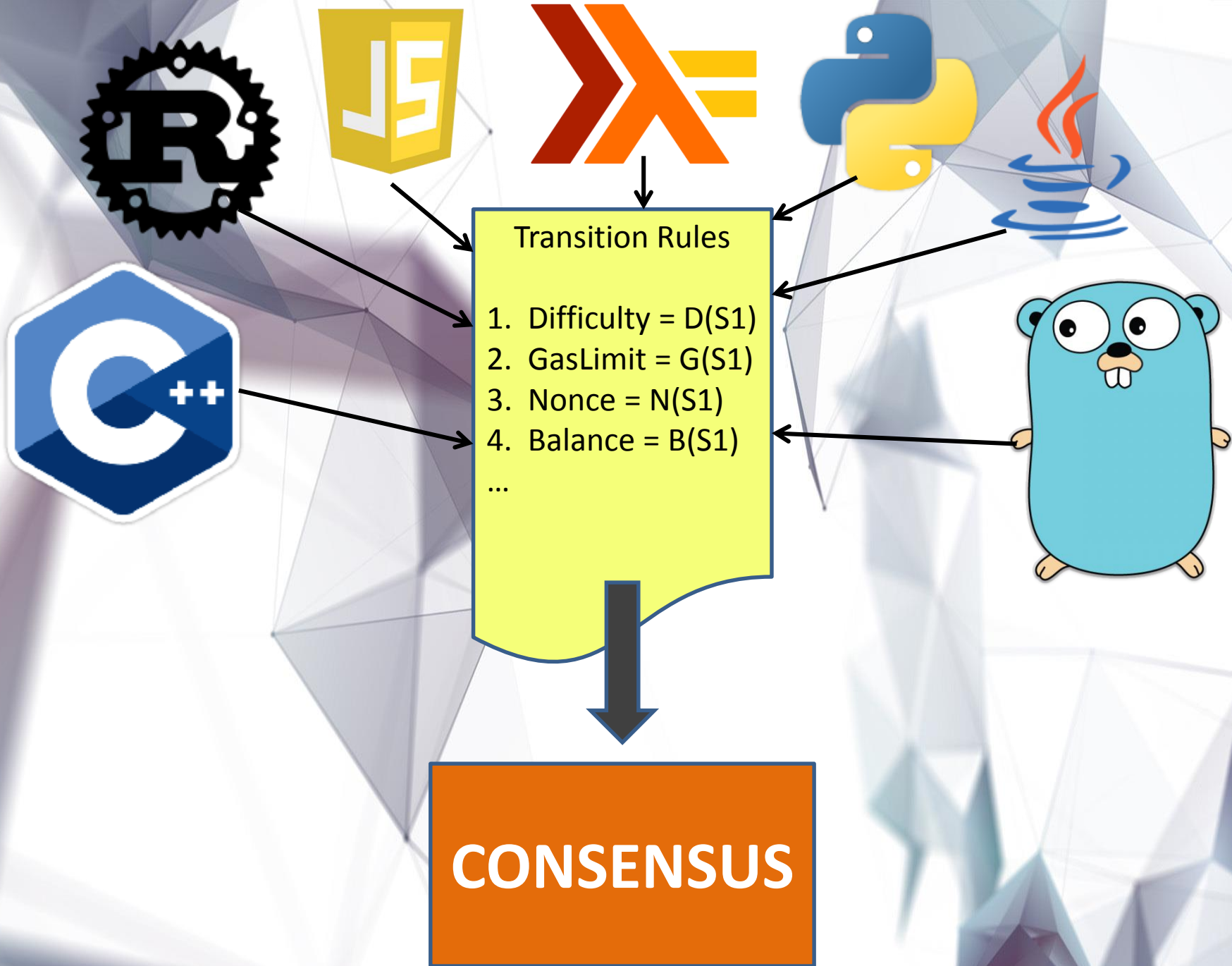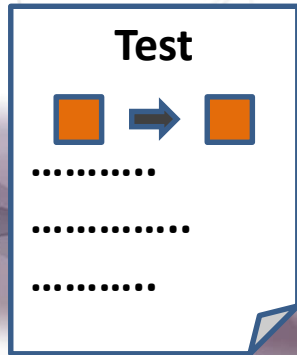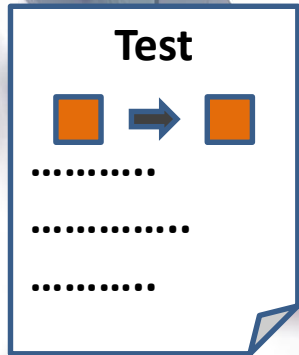
STATE 1 → **STATE 2**

Transition Rules

1. Difficulty = D(S1)
2. GasLimit = G(S1)
3. Nonce = N(S1)
4. Balance = B(S1)

...

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2. GasLimit = G(S1)
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...

CONSENSUS

Test suites

Blockchain   **Transaction**   **State**   **VMTests**

github.com/ethereum/tests

Test suites
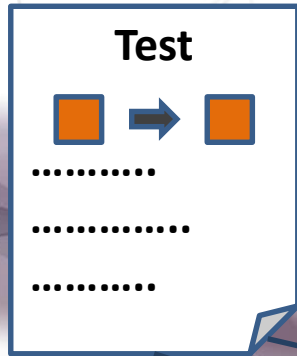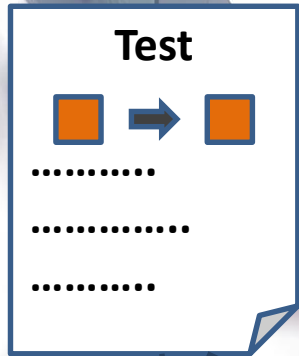
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Blockchain | Transaction | State | VMTests

github.com/ethereum/tests

State Tests

Basic Structure:
```
{

    "test name 1": {
        "env": { ... }, "logs": { ... },
        "out": { ... },
        "post": { ... },
         "pre": { ... },
        "transaction": { ... }}
}
```

Blockchain Tests

Basic Structure:
```
{
    "ValidBlocksTest":  {
        "genesisBlockHeader": { ... }, "pre": { ... },
          "post": { ... },
          "lastblockhash" :  "",
          "blocks" : [{
                "chainname" : "A",
                "blocknumber" : "1",
                "rlp": { ... },
                "blockHeader": { ... },
                "transactions": { ... },
                "uncleHeaders": { ... } } ]
}
```

Blockchain Tests

Basic Structure:

```
{
    "InvalidBlocksTest": {
        "genesisBlockHeader": { ... },
        "pre": { ... },
        "post": { ... },
        "lastblockhash" : "",
        "blocks" : [{
            "rlp": { ... },
        },
        {

            "rlp": { ... }
        }]
}
```

Blockchain Tests

BlockchainTests — All blocks Frontier Rules

Homestead — All blocks Homestead Rules

TestNetwork —
Frontier rules until block 5
Homestead rules from block 5
The DAO hardfork at block 8

ethdocs.org/en/latest/contracts-and-transactions/ethereum-tests

VMTests

Basic Structure:

```
{
    "test name 1": {
        "env": { ... },
        "pre": { ... },
        "exec": { ... },
        "gas": { ... },
        "logs": { ... },
        "out": { ... },
        "post": { ... },
        "callcreates": { ... }
    }
}
```

ethdocs.org/en/latest/contracts-and-transactions/ethereum-tests

Transaction Tests

Basic Structure:

```
{
    "transactionTest1": {
        "rlp" : "bytearray",
        "sender" : "address",
        "blocknumber" : "1000000",
        "transaction" :
        { "nonce" : "int", "gasPrice" : "int", "gasLimit" : "int", "to" :
"address", "value" : "int", "v" : "byte", "r" : "256 bit unsigned int",
"s" : "256 bit unsigned int", "data" : "byte array" } },

    "invalidTransactionTest": {  "rlp" : "bytearray",  }
}
```

Indicates network rules (frontier, homestead)

Creating Tests

Test Filler
■
....
....
....

Test
■ ➡ ■
....
....
....

Special credit to **Christoph Jentzsch**

github.com/ethereum/
cpp-ethereum/tree/develop/test/libethereum/BlockchainTestsFiller

github.com/ethereum/
cpp-ethereum/tree/develop/test/libethereum/StateTestsFiller

github.com/ethereum/tests is read only!

Conclusion

Documentation and Help:
ethdocs.org/en/latest/contracts-and-transactions/ethereum-tests

Test Repository:
github.com/ethereum/tests

Test Hive implementation:
github.com/karalabe/hive

Gitter chat channel:
gitter.im/ethereum/cpp-ethereum-development