

WEB3

**HOW THE BROWSER SPEAKS TO THE
BLOCKCHAIN**

GETH/TESTRPC – RPC NODES

- Json RPC Interfaces
- Talk via HTTP(S)
- Like any RESTful interface
- Open a specific port (usually port 8545)
- Available on localhost

EXAMPLE VIA TESTRPC IN PRACTICE

```
$ testrpc
EthereumJS TestRPC v3.9.2

Available Accounts
=====
(0) 0x1b7505858c7a06a2a142e973de3e6edbc4b17731
(1) 0xf29fe36eef1f6226a54199f1200523d3672ee767
(2) 0x1f1da8991fc2c4721c219913adda4a6a11c16965
(3) 0xa5ba27f82b131484cc4f0697fe7327f13ab78401
(4) 0x1815fa1d9e3b5cd0c445fc0cadbc9b8690ddc82a
(5) 0x2c12db388ada1bb8d2ecdfe302697632af1a9202
(6) 0x837124f320ecdec3ff00961973414a351e47b7a4
(7) 0x0fd1f52ba995e3caace83ba9051d16f09bca7eea
(8) 0x43a8465aa939c79dadeab5c64e5bddabb3eeb9af
(9) 0x248158358db89ddad628d95c494b368fcd419543

Private Keys
=====
(0) 74cd9985da131fbc5d4c507b4af0178f0f2247601bafb306190fefcea386e8e
(1) 9996e36fbbac7e6c0afe5aa4df497115f99a0694d7608629e809edf874ca46ba
(2) 99f2ee9eed9fbb3e3f25eb15ac3aa3a990dd42b7f10badd335b4bac7b9527501
(3) 1aaa76fc2f6724bddf48542b734ca0828934ffac7b218726ff0c43ab068551d2
(4) 29b2db186b52b4909a39ab5d7637a75a1b3cf1ac1e10c465154b3a557578b8c6
(5) 6dd4c9762beaaafb513e36f09f2f832fa6a9eb7a6e3948e53f3c1b8dcb97fc62
(6) df9ddb2e3789c284ffe5ae413820e7b3431df8c640507cc5b475efd45fc0217c
(7) e7cfd6ced0b6ffa295c3d8faca45a0c8b615c6288434123e771449729033f3f3
(8) bbd4c42ddf428dfec0b0e6caabae11e8cc46d6dc49827156d3d7b8d1c4403ff0
(9) dellb8468f1317b32a07a830134c4af5593d636e42454a042ceaf992e905ded8

HD wallet
=====
Mnemonic:      swift cactus cradle merry improve layer this calm raven tobacco gap two
Base HD Path:  m/44'/60'/0'/0/{account_index}

Listening on localhost:8545
```

JSON-RPC INTERFACE WITH GETH

- „geth console“
 - Or „geth attach“ when geth is running in the background

```
$ geth --datadir=./chaindata/ console
WARN [07-09|12:04:32] No etherbase set and no accounts found as default
INFO [07-09|12:04:32] Starting peer-to-peer node           instance=Geth/v1.6.6-stable-10a45cb5/windows-amd64/go1.8.3
INFO [07-09|12:04:32] Allocated cache and file handles     database=C:\\Users\\thoma\\Dropbox\\Projects\\ethereum3-exchange\\empty\\chaindata\\geth\\chaindata cache=128 handles=1024
INFO [07-09|12:04:32] Initialised chain configuration      config="{chainID: 15 Homestead: 0 DAO: <nil> DAOSupport: false EIP150: <nil> EIP155: 0 EIP158: 0 Metropolis: <nil> Engine: unknown}"
INFO [07-09|12:04:32] Disk storage enabled for ethash caches dir=C:\\Users\\thoma\\Dropbox\\Projects\\ethereum3-exchange\\empty\\chaindata\\geth\\ethash count=3
INFO [07-09|12:04:32] Disk storage enabled for ethash DAGs dir=C:\\Users\\thoma\\AppData\\Ethash count=2
INFO [07-09|12:04:32] Initialising Ethereum protocol      versions="[63 62]" network=1
INFO [07-09|12:04:32] Loaded most recent local header      number=0 hash=9b8d4a...9021ba td=131072
INFO [07-09|12:04:32] Loaded most recent local full block  number=0 hash=9b8d4a...9021ba td=131072
INFO [07-09|12:04:32] Loaded most recent local fast block  number=0 hash=9b8d4a...9021ba td=131072
INFO [07-09|12:04:32] Starting P2P networking
INFO [07-09|12:04:34] UDP listener up                     self=enode://38fee0b3a69cdcafa57beb6186b0fff6c099bf95e01c5f62514abe14d69887757227ad6b0ef37b8897e519ee6cd5ae5ebbf66f3f576dd8ec2ad3b7e9fc6d23c@[::]:30303
INFO [07-09|12:04:34] RLPx listener up                   self=enode://38fee0b3a69cdcafa57beb6186b0fff6c099bf95e01c5f62514abe14d69887757227ad6b0ef37b8897e519ee6cd5ae5ebbf66f3f576dd8ec2ad3b7e9fc6d23c@[::]:30303
INFO [07-09|12:04:34] IPC endpoint opened: \\.\\pipe\\geth.ipc
Welcome to the Geth JavaScript console!

instance: Geth/v1.6.6-stable-10a45cb5/windows-amd64/go1.8.3
modules: admin:1.0 debug:1.0 eth:1.0 miner:1.0 net:1.0 personal:1.0 rpc:1.0 txpool:1.0 web3:1.0

> |
```

HTTP RESTFUL INTERFACE

- „geth –rpc“
 - Will open a RPC Port on 8545
- Problem with CORS
 - Cross Origin Resource Sharing

CORS

Browser Opens Website (e.g. localhost:8080)

WebServer send website content to browser (html/javascript/images/...)

JavaScript tries to connect to RESTful interface on Port 8545
(localhost:8545)

Browser sees this as different resource (website is on port 8080, RESTful API on 8545)

Browser asks via headers first if allowed to access 8545 (CORS headers)

GETH AND CORS HEADERS

- Solution: add a CORS header

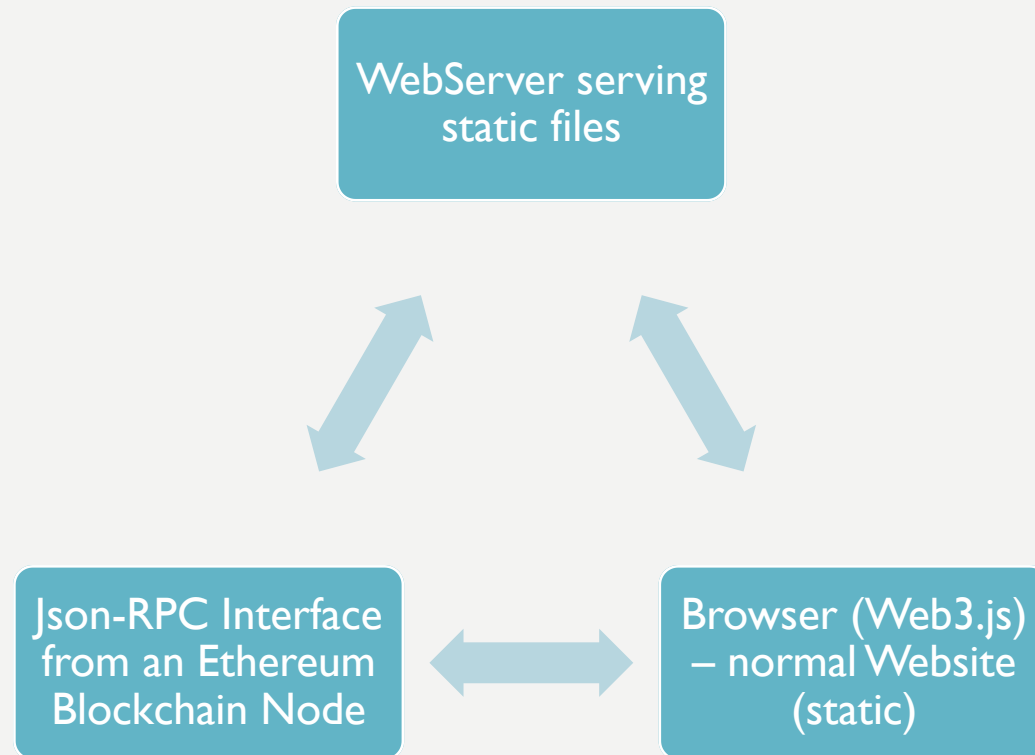
```
— $ geth --datadir=./chaindata/ console --rpc --rpccorsdomain "*"
WARN [07-09|12:12:28] No etherbase set and no accounts found as default
INFO [07-09|12:12:28] Starting peer-to-peer node           instance=Geth/v1.6.6-stable-10a45cb5/windows-amd64/go1.8.3
INFO [07-09|12:12:28] Allocated cache and file handles     database=C:\\Users\\thoma\\Dropbox\\Projects\\chaindata\\geth\\chaindata
cache=128 handles=1024
INFO [07-09|12:12:28] Initialised chain configuration      config="{ChainID: 15 Homestead: 0 DAO: 0 EIP155: 0 EIP158: 0 Metropolis: <nil> Engine: unknown}"
INFO [07-09|12:12:28] Disk storage enabled for ethash      dir=C:\\Users\\thoma\\Dropbox\\Projects\\chaindata\\ethash
caches count=3
INFO [07-09|12:12:28] Disk storage enabled for ethash DAGs dir=C:\\Users\\thoma\\AppData\\Local\\Ethereum\\geth\\chaindata\\ethash
count=2
INFO [07-09|12:12:28] Initialising Ethereum protocol       versions="[63 62]" network=1
INFO [07-09|12:12:28] Loaded most recent local header      number=0 hash=9b8d4a...9021ba td=131072
INFO [07-09|12:12:28] Loaded most recent local full block  number=0 hash=9b8d4a...9021ba td=131072
INFO [07-09|12:12:28] Loaded most recent local fast block  number=0 hash=9b8d4a...9021ba td=131072
INFO [07-09|12:12:28] Starting P2P networking
INFO [07-09|12:12:31] UDP listener up                      self=enode://38fee0b3a69cdcafa57beb618617227ad6b0ef37b8897e519ee6cd5ae5ebba6f66f3f576dd8ec2ad3b7e9fc6d23c@[::]:30303
INFO [07-09|12:12:31] RLPx listener up                    self=enode://38fee0b3a69cdcafa57beb618617227ad6b0ef37b8897e519ee6cd5ae5ebba6f66f3f576dd8ec2ad3b7e9fc6d23c@[::]:30303
INFO [07-09|12:12:31] IPC endpoint opened: \\.\\pipe\\geth.ipc
INFO [07-09|12:12:31] HTTP endpoint opened: http://127.0.0.1:8545
Welcome to the Geth JavaScript console!

instance: Geth/v1.6.6-stable-10a45cb5/windows-amd64/go1.8.3
modules: admin:1.0 debug:1.0 eth:1.0 miner:1.0 net:1.0 personal:1.0 rpc:1.0 txpool:1.0 web3:1.0
>
```

WEB3.JS

- Is a JavaScript library
- Abstracts the Json-RPC from the blockchain node
- „eth.sendTransaction(...)“ on the js-console
 - „web3.eth.sendTransaction(...)“ in the browser
- A Blockchain-Node must be running
 - Either geth with an RPC domain
 - OR testrpc that simulates the ethereum protocol

VISUALLY



WHAT YOU LEARNED

- Access to the blockchain is not a „magic new protocol“
 - It's a normal REST interface returning „json“
 - A Blockchain-Node must be running in the background and responding
- Web3.js is a Javascript library
 - It makes interacting with the blockchain easier because no hashes have to be encoded and decoded manually
 - Remember `sha3(„function(uint,uint)“);`
- RESTful Services come with all Browser security like CORS
- The Standard-Port is 8545

QUESTIONS/SUGGESTIONS?

- One great benefit of this course is the Q&A section
- Feedback is always welcome (and appreciated)