



# **WRAP UP**

**KEY TAKE AWAYS**

# BLOCKCHAIN

- Starts with a „Genesis“-Block
- And every block builds upon the previous one
- Multiple transactions in one block
- Roughly 20s per Block in Ethereum

# SMART CONTRACTS

- Written in a high-level language like Solidity
- Compiled to bytecode
- EVM Instructions
  - Assembler
- Once deployed cannot be changed
- Executed by every single node participating in the network

# BLOCKCHAIN NODES

- Implement the Ethereum Protocol
- Running on the client-side
  - Except MetaMask and Blockchain as a Service (BaaS)
- Different implementations
  - GoEthereum
  - Parity
  - EthereumCPP
- Expose a JavaScript RPC via HTTP (localhost:8545)

# GENESIS.JSON FILE

- Is a configuration file for GoEthereum
  - „Geth“
- Used for creating a private network
- „geth --datadir=/path/to/empty/directory init /path/to/genesis.json”

# CALL/TRANSACTION

- Calls
  - Return data immediately (except MetaMask)
  - Don't cost gas, are free
  - Executed on the node
  - Don't change the state/are not visible on the network
- Transactions
  - Need to be mined
  - Cost gas (for every instruction in EVM assembly)
  - Executed „on the network“
  - Change the state and visible as transaction

# ETHEREUMJS-TESTRPC

- Simulation of the ethereum protocol in memory
  - No waiting time for mining a new block
- Install via Node Package Manager
- Gives you 10 accounts and 10 private keys with 100 ether each
- Restart it with the same Mnemonic seed to get the same accounts
  - „testrpc -m MNEMONIC“

# WEB3.JS AND BROWSER/BLOCKCHAIN

- Web3.js is a javascript library
  - Running in the Browser
- Connects to a blockchain node
  - HTTP Json-RPC Interface
  - Running on a different port
- On localhost
  - Or injected (MIST/MetaMask)
- Be careful about CORS Problems



# MIST/ETHEREUM WALLET

- Ethereum Wallet is a Dapp
  - <http://wallet.ethereum.org>
- MIST is a browser
  - Can inject Web3 & give access to an account
- Itself an electron HTML5 App
- Has a geth-node running in the background
- Can connect to other nodes (--rpc parameter...)

# METAMASK

- A „Blockchain Bridge“
- Chrome Plugin
- It's a KeyStore
- Can connect to any Json-RPC node
  - Communicates with infura (Blockchain as a Service) by default

# REMIX

- Development Environment in the Browser
- Simulated Blockchain Environment
  - Injected/localhost web3 possible
- Step-by-step debugger
- Great features like Static analysis, code highlighting

# TRUFFLE

- Development Framework
- Great for (Unit) Testing
- Great abstraction
  - Works with promises
  - No ugly „wait for transaction to be mined“ necessary
- Great extensions for Frontend development (Webpack, React, Redux)

# THANKS!

- Questions?
  - Head over to the course Q&A!
- Feedback!
  - Consider giving us feedback if you like it
- Other?
  - Send us a message.