# BLOCKCHAIN NODES

GOETHEREUM, TESTRPC AND OTHERS

# WHAT IS A BLOCKCHAIN NODE?

- An Ethereum Blockchain node implements the Ethereum Protocol
- Connects possibly to other nodes
- Gives you access to the blockchain
- Can do eventually more things, like mining,…

# MOST IMPORTANT NODES

- First nodes were written in three languages
  - Go (Go Ethereum - Geth) – Most popular, we will use it
  - C++ (Ethereum-cpp)
  - Python
- Parity
  - Written in Rust
- Other clients
  - MetaMask

# SIMULATION OF THE ETHEREUM PROTOCOL

- Ethereumjs-TestRPC

- Why?
  - Unit-Testing smart contracts take time
  - „Mining“ is simulated -> takes almost no time
  - Very easy to setup

- How?
  - Just simulating that mining works blazing fast

# FULL NODES VS. LIGHT CLIENTS

- Full Nodes download the whole Chain
  - Very large (30 GiB)
  - Resource intensive!
  - Not possible on low-end hardware (phones, embedded systems, …)
- Light Ethereum Subprotocol
  - In Development
  - Only headers are fetched (1KiB/2sec)
  - Only fetch data concerning the client
  - Full functionality in terms of safely accessing the blockchain

# GETH IN PRACTICE

- Download geth:
  - https://geth.ethereum.org/downloads/
  - It's not updating from alone – check for new versions frequently!
  - V1.6.6 currently

- Open a command line window
  - Or a shell on any system ☺
- Type in „geth“
  - A new Process will start in the background
  - It will print a lot of information
  - Comparably to starting mysql – it will open a port (30303) and connect to other nodes

# GETH IN PRACTICE

```
$ geth
WARN [07-08|17:35:55] No etherbase set and no accounts found as default
INFO [07-08|17:35:55] Starting peer-to-peer node               instance=Geth/v1.6.6-stable-10a45cb5/windows-amd64/go1.8.3
INFO [07-08|17:35:55] Allocated cache and file handles         database=C:\\Users\\thoma\\AppData\\Roaming\\Ethereum\\geth
\\chaindata cache=128 handles=1024
INFO [07-08|17:35:55] Initialised chain configuration          config="{ChainID: 1 Homestead: 1150000 DAO: 1920000 DAOSupp
ort: true EIP150: 2463000 EIP155: 2675000 EIP158: 2675000 Metropolis: 9223372036854775807 Engine: ethash}"
INFO [07-08|17:35:55] Disk storage enabled for ethash caches   dir=C:\\Users\\thoma\\AppData\\Roaming\\Ethereum\\geth\\eth
ash count=3
INFO [07-08|17:35:55] Disk storage enabled for ethash DAGs     dir=C:\\Users\\thoma\\AppData\\Ethash
    count=2
INFO [07-08|17:35:55] Initialising Ethereum protocol           versions="[63 62]" network=1
INFO [07-08|17:35:55] Loaded most recent local header          number=0 hash=d4e567…cb8fa3 td=17179869184
INFO [07-08|17:35:55] Loaded most recent local full block      number=0 hash=d4e567…cb8fa3 td=17179869184
INFO [07-08|17:35:55] Loaded most recent local fast block      number=0 hash=d4e567…cb8fa3 td=17179869184
INFO [07-08|17:35:55] Starting P2P networking
INFO [07-08|17:35:57] UDP listener up                          self=enode://1ed5a3508de643ed486d0666494985bb05f261be84948c
6cb27bfcce19e96173379a0e373f05bee416f1418f6193239f2a2805a09524d4f9a6dd77ef4227a3f3@[::]:30303
INFO [07-08|17:35:57] RLPx listener up                         self=enode://1ed5a3508de643ed486d0666494985bb05f261be84948c
6cb27bfcce19e96173379a0e373f05bee416f1418f6193239f2a2805a09524d4f9a6dd77ef4227a3f3@[::]:30303
INFO [07-08|17:35:57] IPC endpoint opened: \\.\pipe\geth.ipc
```

# GETH DEFAULT DIRECTORIES

- Geth accepts a `--datadir=...` parameter
- But by default it will work in this directories
  - Mac: ~/Library/Ethereum
  - Linux: ~/.ethereum
  - Windows: %APPDATA%/Roaming/Ethereum
- Geth also accepts plenty of other parameters
  - We are going to come back to them later

# GETH STANDARD PORT AND IPC FILE

- Geth will try to talk to other nodes on UDP Port 30303
  - If already open it will throw an error!
- Geth will put an geth.ipc file into the datadir directory
  - Used for other processes connecting to geth (IPC = inter process communication)
  - MIST, Ethereum Wallet or "geth attach"
  - We talk about this soon, but keep it in mind!
- Only one blockchain node can (and should) run at the time

# GETH IPC FILE AND PORT

```
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```

# ETHEREUMJS-TESTRPC IN PRACTICE

- Used in combination with automated testing
- Great because it only simulates the environment
- Downloadable via the node package manager (npm)

- First install NPM if not yet done
  - https://nodejs.org/en/

- Then open a console and install ethereumjs-testrpc
  - But currently use the beta version:"npm install –g ethereumjs-testrpc@beta"
  - Visit http://truffleframework.com/blog/removing-installation-issues-continued-testrpc for more information

- We will do this later together!

# METAMASK

- A plugin for Chrome
  - It‘s a „bridge“
- (Private) Key Store
  - And can sign transactions
- Doesn‘t download the chain-data
- Not a full node, nor a light client.
  - Trust in the MetaMask Server

# WHAT YOU LEARNED

- A full node downloads all the chain data
- Light clients are in development

- Geth is a process that is running in the background and opening a new port (at least 30303)
  - IPC file for inter-process communication
- Ethereumjs-TestRPC for development
- MetaMask is a Chrome Plugin that „bridges“ to the underlaying blockchain

# QUESTIONS/SUGGESTIONS?

- Head over to the Q&A
  - We‘re here for you!
- Feedback?
  - We love to hear it!
- Disappointed?
  - Send us a message, we‘ll try to resolve!
  - 100% satisfaction is important to us.