Blockchain Course Wiki

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There's a notion of a chain data directory where all the data related to the blockchain is stored including the blocks themselves and your account data (public/private keys). If you lose or delete your public keys that account is gone and not recoverable. First we'll learn how to create and back up an account.

Geth Ethereum Node basics

Note: with many of these commands on Windows the "./" at the start can or must be omitted (it's a unix thing).

Specify a chain data directory with geth:

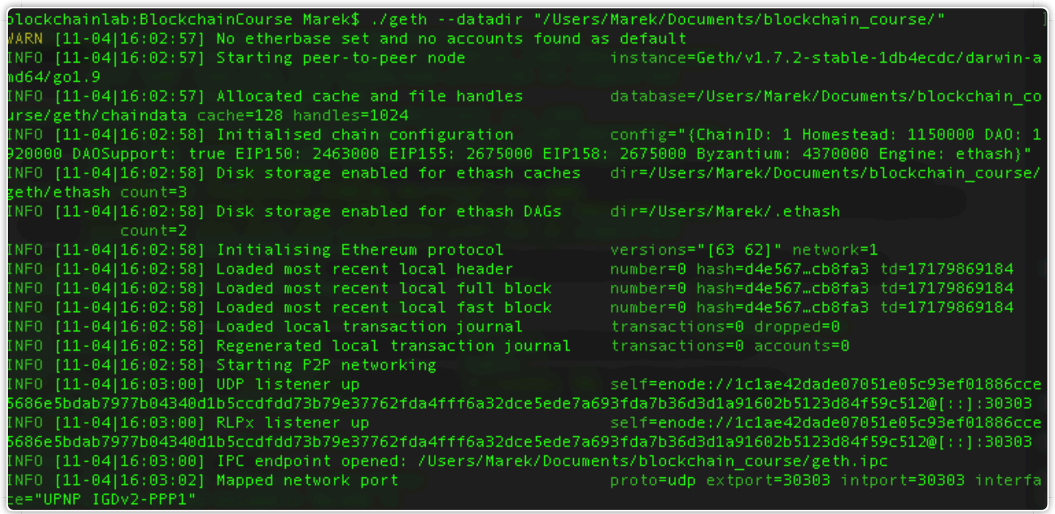
```
$ ./geth --datadir "/path/to/your/chaindata/directory/you/chose"
```

IF YOU ARE RUNNING WINDOWS DO THE FOLLOWING:

```
geth --datadir "/path/to/your/chaindata/directory/you/chose"
```

press ctrl+c to quit geth. otherwise configured this way, it will download the ethereum blockchain.

You should see something like the following:

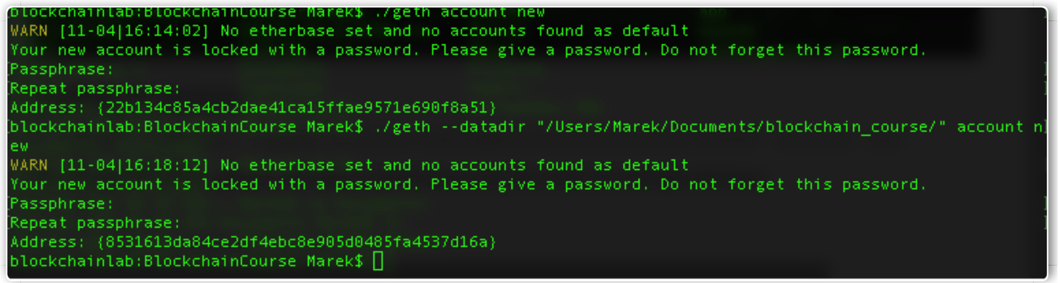


```
blockchainlab:BlockchainCourse Marek$ ./geth --datadir "/Users/Marek/Documents/blockchain_course/"
WARN [11-04|16:02:57] No etherbase set and no accounts found as default
INFO [11-04|16:02:57] Starting peer-to-peer node              instance=Geth/v1.7.2-stable-1db4ecdc/darwin-a
md64/go1.9
INFO [11-04|16:02:57] Allocated cache and file handles        database=/Users/Marek/Documents/blockchain_co
urse/geth/chaindata cache=128 handles=1024
INFO [11-04|16:02:58] Initialised chain configuration         config="{ChainID: 1 Homestead: 1150000 DAO: 1
920000 DAOSupport: true EIP150: 2463000 EIP155: 2675000 EIP158: 2675000 Byzantium: 4370000 Engine: ethash}"
INFO [11-04|16:02:58] Disk storage enabled for ethash caches   dir=/Users/Marek/Documents/blockchain_course/
geth/ethash count=3
INFO [11-04|16:02:58] Disk storage enabled for ethash DAGs     dir=/Users/Marek/.ethash
           count=2
INFO [11-04|16:02:58] Initialising Ethereum protocol          versions="[63 62]" network=1
INFO [11-04|16:02:58] Loaded most recent local header         number=0 hash=d4e567…cb8fa3 td=17179869184
INFO [11-04|16:02:58] Loaded most recent local full block     number=0 hash=d4e567…cb8fa3 td=17179869184
INFO [11-04|16:02:58] Loaded most recent local fast block     number=0 hash=d4e567…cb8fa3 td=17179869184
INFO [11-04|16:02:58] Loaded local transaction journal        transactions=0 dropped=0
INFO [11-04|16:02:58] Regenerated local transaction journal    transactions=0 accounts=0
INFO [11-04|16:02:58] Starting P2P networking
INFO [11-04|16:03:00] UDP listener up                         self=enode://1c1ae42dade07051e05c93ef01886cce
5686e5bdab7977b04340d1b5ccdfdd73b79e37762fda4fff6a32dce5ede7a693fda7b36d3d1a91602b5123d84f59c512@[::]:30303
INFO [11-04|16:03:00] RLPx listener up                        self=enode://1c1ae42dade07051e05c93ef01886cce
5686e5bdab7977b04340d1b5ccdfdd73b79e37762fda4fff6a32dce5ede7a693fda7b36d3d1a91602b5123d84f59c512@[::]:30303
INFO [11-04|16:03:00] IPC endpoint opened: /Users/Marek/Documents/blockchain_course/geth.ipc
INFO [11-04|16:03:02] Mapped network port                     proto=udp extport=30303 intport=30303 interfa
ce="UPNP IGDv2-PPP1"
```

creating an account

```
$ ./geth --datadir "/path/to/your/chaindata/directory/you/chose" account new
```

You should see similar output to the below, and find your key file inside the /keystore directory inside the specified datadir directory.



```
blockchainlab:BlockchainCourse Marek$ ./geth account new
WARN [11-04|16:14:02] No etherbase set and no accounts found as default
Your new account is locked with a password. Please give a password. Do not forget this password.
Passphrase:
Repeat passphrase:
Address: {22b134c85a4cb2dae41ca15ffae9571e690f8a51}
blockchainlab:BlockchainCourse Marek$ ./geth --datadir "/Users/Marek/Documents/blockchain_course/" account n
ew
WARN [11-04|16:18:12] No etherbase set and no accounts found as default
Your new account is locked with a password. Please give a password. Do not forget this password.
Passphrase:
Repeat passphrase:
Address: {8531613da84ce2df4ebc8e905d0485fa4537d16a}
blockchainlab:BlockchainCourse Marek$ 
```

Your file will be named something like UTC<date and time>, and have contents similar to the following:

{"address":"8531613da84ce2df4ebc8e905d0485fa4537d16a","crypto":{"cipher":"aes-128-ctr","ciphertext":"a9b9a46117fb813948f532efd7f90c221150c2d44e13c690395c4b36d810e4bf","cipherparams":{"iv":"d1f8614a094cf6b8e5fdb53770a802a1"},"kdf":"scrypt","kdfparams":{"dklen":32,"n":262144,"p":1,"r":8,"salt":"4cd025155840c5cd85ca9d774086fcc008c4f2cc7af27644d001707bb888f706"},"mac":"d6c5e79d1f56eda2

DOCUMENT INFO

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```
c108258d2a2b534e60657b46e68b494c787830b72e5f1cc5"},"id":"39b73b60-4ef0-4403-8401-f37248ab4164","
version":3}
```

Which contains your public key and your private key which has been encrypted using the password you provided when you created the account.

Initialize the blockchain:

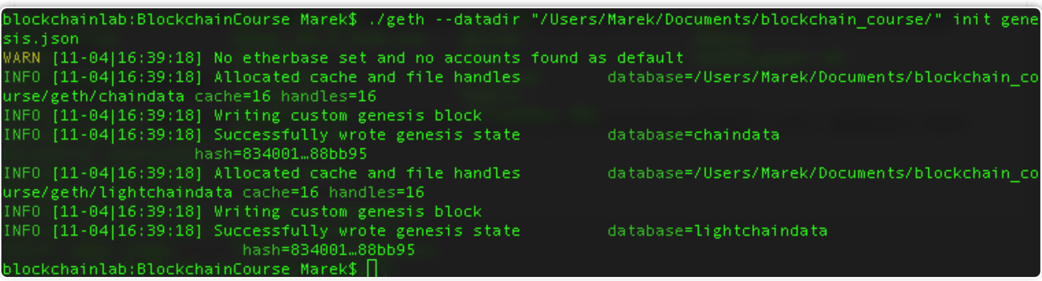
Save the genesis.json file contents in the same directory you have your geth client downloaded to (note: not the datadir directory).

Then, run the following:

```
$ ./geth --datadir "/path/to/your/chaindata/directory/you/chose" init genesis.json
```

example json file

genesis.json



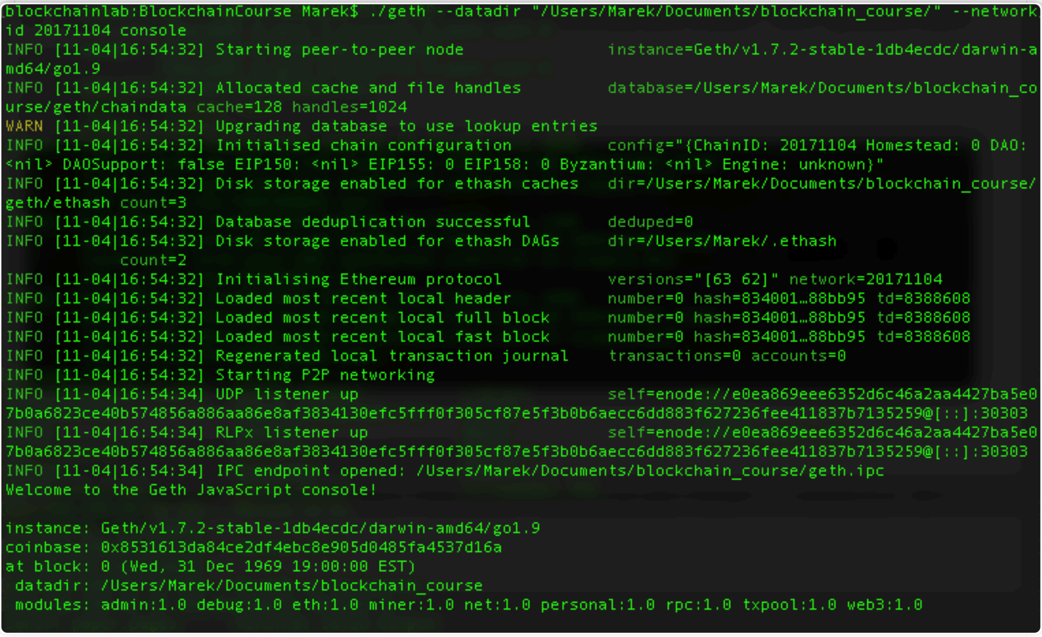
```
blockchainlab:BlockchainCourse Marek$ ./geth --datadir "/Users/Marek/Documents/blockchain_course/" init gene
sis.json
WARN [11-04|16:39:18] No etherbase set and no accounts found as default
INFO [11-04|16:39:18] Allocated cache and file handles         database=/Users/Marek/Documents/blockchain_co
urse/geth/chaindata cache=16 handles=16
INFO [11-04|16:39:18] Writing custom genesis block
INFO [11-04|16:39:18] Successfully wrote genesis state         database=chaindata
                    hash=834001…88bb95
INFO [11-04|16:39:18] Allocated cache and file handles         database=/Users/Marek/Documents/blockchain_co
urse/geth/lightchaindata cache=16 handles=16
INFO [11-04|16:39:18] Writing custom genesis block
INFO [11-04|16:39:18] Successfully wrote genesis state         database=lightchaindata
                         hash=834001…88bb95
blockchainlab:BlockchainCourse Marek$ 
```

Running geth on our custom private network:

```
$ ./geth --datadir "/path/to/your/chaindata/directory/you/chose" --networkid 20171104 console
```

(note the above should be all on one line...)

You should see something like this:



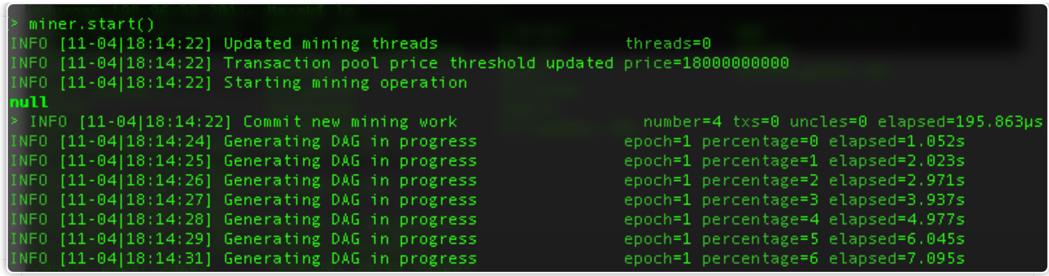
```
blockchainlab:BlockchainCourse Marek$ ./geth --datadir "/Users/Marek/Documents/blockchain_course/" --network
id 20171104 console
INFO [11-04|16:54:32] Starting peer-to-peer node               instance=Geth/v1.7.2-stable-1db4ecdc/darwin-a
md64/go1.9
INFO [11-04|16:54:32] Allocated cache and file handles         database=/Users/Marek/Documents/blockchain_co
urse/geth/chaindata cache=128 handles=1024
WARN [11-04|16:54:32] Upgrading database to use lookup entries
INFO [11-04|16:54:32] Initialised chain configuration          config="{ChainID: 20171104 Homestead: 0 DAO:
<nil> DAOSupport: false EIP150: <nil> EIP155: 0 EIP158: 0 Byzantium: <nil> Engine: unknown}"
INFO [11-04|16:54:32] Disk storage enabled for ethash caches   dir=/Users/Marek/Documents/blockchain_course/
geth/ethash count=3
INFO [11-04|16:54:32] Database deduplication successful        deduped=0
INFO [11-04|16:54:32] Disk storage enabled for ethash DAGs     dir=/Users/Marek/.ethash
            count=2
INFO [11-04|16:54:32] Initialising Ethereum protocol           versions="[63 62]" network=20171104
INFO [11-04|16:54:32] Loaded most recent local header          number=0 hash=834001…88bb95 td=8388608
INFO [11-04|16:54:32] Loaded most recent local full block      number=0 hash=834001…88bb95 td=8388608
INFO [11-04|16:54:32] Loaded most recent local fast block      number=0 hash=834001…88bb95 td=8388608
INFO [11-04|16:54:32] Regenerated local transaction journal    transactions=0 accounts=0
INFO [11-04|16:54:32] Starting P2P networking
INFO [11-04|16:54:34] UDP listener up                          self=enode://e0ea869eee6352d6c46a2aa4427ba5e0
7b0a6823ce40b574856a886aa86e8af3834130efc5fff0f305cf87e5f3b0b6aecc6dd883f627236fee411837b7135259@[::]:30303
INFO [11-04|16:54:34] RLPx listener up                         self=enode://e0ea869eee6352d6c46a2aa4427ba5e0
7b0a6823ce40b574856a886aa86e8af3834130efc5fff0f305cf87e5f3b0b6aecc6dd883f627236fee411837b7135259@[::]:30303
INFO [11-04|16:54:34] IPC endpoint opened: /Users/Marek/Documents/blockchain_course/geth.ipc
Welcome to the Geth JavaScript console!

instance: Geth/v1.7.2-stable-1db4ecdc/darwin-amd64/go1.9
coinbase: 0x8531613da84ce2df4ebc8e905d0485fa4537d16a
at block: 0 (Wed, 31 Dec 1969 19:00:00 EST)
 datadir: /Users/Marek/Documents/blockchain_course
 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
```

To start mining at this point type:

```
miner.start()
```

You should see something like the following:



```
> miner.start()
INFO [11-04|18:14:22] Updated mining threads                   threads=0
INFO [11-04|18:14:22] Transaction pool price threshold updated price=18000000000
INFO [11-04|18:14:22] Starting mining operation
null
> INFO [11-04|18:14:22] Commit new mining work                   number=4 txs=0 uncles=0 elapsed=195.863µs
INFO [11-04|18:14:24] Generating DAG in progress               epoch=1 percentage=0 elapsed=1.052s
INFO [11-04|18:14:25] Generating DAG in progress               epoch=1 percentage=1 elapsed=2.023s
INFO [11-04|18:14:26] Generating DAG in progress               epoch=1 percentage=2 elapsed=2.971s
INFO [11-04|18:14:27] Generating DAG in progress               epoch=1 percentage=3 elapsed=3.937s
INFO [11-04|18:14:28] Generating DAG in progress               epoch=1 percentage=4 elapsed=4.977s
INFO [11-04|18:14:29] Generating DAG in progress               epoch=1 percentage=5 elapsed=6.045s
INFO [11-04|18:14:31] Generating DAG in progress               epoch=1 percentage=6 elapsed=7.095s
```

To stop mining:

```
miner.stop()
```

Before mining you need an account. To list accounts type:

```
eth.accounts
```

If needed you can create an account:

```
personal.newAccount()
```

Verbosity affects how much information the user of geth sees. to see more information about what geth is doing turn up the verbosity such as

```
debug.verbosity(6)

and then to see fewer messages you can decrease the verbosity as follows:


debug.verbosity(1)

Verbosity ONLY affects how much info you see for debugging purposes.
```

To find out more about your node configuration try

```
admin.nodeInfo
```

notice the enode id - this uniquely identifies your node to the network

mine is this:

```
"enode://e0ea869eee6352d6c46a2aa4427ba5e07b0a6823ce40b574856a886aa86e8af3834130efc5fff0f305cf87e5f3b0b6aecc6dd883f627236fee411837b7135259@192.168.1.131:30303"
```

you can add me as a peer by typing:

```
admin.addPeer("enode://e0ea869eee6352d6c46a2aa4427ba5e07b0a6823ce40b574856a886aa86e8af3834130efc5fff0f305cf87e5f3b0b6aecc6dd883f627236fee411837b7135259@192.168.1.131:30303")
```

to see who you are connected with in the network type:

```
admin.peers

to simply see the count of people you have on the network:

net.peerCount
```

To list your default account where mining proceeds go (eth.coinbase is a shorthand for your default account):

```
eth.coinbase
```

You can check the balance of any account using

```
eth.getBalance(<address>)
```

So to check your mining address account in wei:

```
eth.getBalance(eth.coinbase)
```

covert our account balance to ethers:

```
web3.fromWei(eth.getBalance(eth.coinbase), "ether")
```

Try reading my account balance in addition to yours: To send a transaction:

```
web3.fromWei(eth.getBalance("0x8531613da84ce2df4ebc8e905d0485fa4537d16a"),"ether")
```

To send a transaction:

```
eth.sendTransaction({from: <your account you want to send from>, to: "<destination address>", value: <value in wei>, data: "<additional data, hexadecimal encoded>"})
```

For Example:

```
eth.sendTransaction({from: eth.coinbase, to: "0x6303814c110c5897f9965b39bc16e7a3c611e454", value: 1234567890})
```

Note: you will have to unlock your account first before you can send (sign) a transaction -this is because ethereum signs the transaction using your private key - which is why the same password is used! However, you don't need to have an unlocked account or even be online to receive funds. They are assigned to your Ethereum address and stored on the blockchain.

```
personal.unlockAccount(eth.coinbase)
```

there's an advanced way to unlock account with your plaintext password for a specified amount of time:

```
personal.unlockAccount(eth.coinbase, "my password", duration_in_seconds)
```

```
personal.unlockAccount(eth.coinbase, "1234", 10000)
```

Once you have successfully called eth.sendTransaction with an unlocked account, you should get back a transaction id like the following:

```
"0x3d76b1a0bf3b2295399fb89d10d1c9fb84cfa408508f2e71b25dafbd030356e5"
```

you can check the status of this transaction with:

```
eth.getTransaction("0x3d76b1a0bf3b2295399fb89d10d1c9fb84cfa408508f2e71b25dafbd030356e5")
```

We can encode ascii text as a hexadecimal number as follows:

```
web3.toHex(asciiEncodedString)
```

and decode the data using the following:

```
web3.toAscii(hexEncodedString)
```

The Geth Javascript console can accept any javascript. For example the following can be used to find transactions to a particular account

getTransactionsByAccount.js:

getTransactionsByAcco...

load the script from within the same directory with:

```
loadScript("getTransactionsByAccount.js")
getTransactionsByAccount("0x17699841619146d6f4bf5e1e5b0ec73c55ded822", 0, eth.blockNumber)
```

To learn more about the "web3" javascript interface in geth go here:

https://github.com/ethereum/wiki/wiki/JavaScript-API

or to our own wiki page called
Interface-web3.js