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用 geth 搭建以太坊私链

因为公共网络的区块数量太多，同步耗时太长，我们为了方便快捷了解 Geth，可以试着用它来搭一个只属于自己的私链。

1. 编写创世区块

首先，我们需要创建网络的“创世”（genesis）状态，这写在一个小小的 JSON 文件里（例如，我们将其命名为 genesis.json）：新建一个文件 /usr/local/GethProjects/genesis.json

```
{
  "config": {
    "chainId": 15
  },
  "difficulty": "2000",
  "gasLimit": "2100000",
  "alloc": {
    "7df9a875a174b3bc565e6424a0050ebc1b2d1d82": { "balance": "300000" },
    "f41c74c9ae680c1aa78f42e5647a62f353b7bdde": { "balance": "400000" }
  }
}
```

//config: 区块的信息

//chainId: 你这个测试网络的 Id，不要和主网等其他测试网络相同

//difficulty: 挖矿难度

//gasLimit: 一个块最多含有多少 gas 的上限

//alloc: 分配：在创世时，就给该地址多少代币

```

1 192.168.213.128 x +
{
  "config": {
    "chainId": 15
  },
  "difficulty": "2000",
  "gasLimit": "2100000",
  "alloc": {
    "0x8cbf968154223254306C41C03F0110FC97B200BA": { "balance": "3000000000000000" }
  }
}

```

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0x8cbf968154223254306C41C03F0110FC97B200BA: 是我的 MetaMask 地址

2. 初始化创世区块

```

[root@Q1nChanCentos GethProjects]# geth --datadir . init genesis.json
INFO [07-12|00:35:53.916] Maximum peer count                ETH=50 LES=0 total=50
INFO [07-12|00:35:53.916] Smartcard socket not found, disabling err="stat /run/pcscd/pcscd.comm: no such file or directory"
INFO [07-12|00:35:53.918] Allocated cache and file handles database=/usr/local/GethProjects/geth/chaindata
cache=16.00MiB handles=16
INFO [07-12|00:35:53.922] Persisted trie from memory database nodes=1 size=147.00B time=9.378µs gcnodes=0 gcsi
ze=0.00B gctime=0s livenodes=1 livesize=0.00B
INFO [07-12|00:35:53.922] Successfully wrote genesis state database=chaindata
hash=8d464d...6f7d43
INFO [07-12|00:35:53.922] Allocated cache and file handles database=/usr/local/GethProjects/geth/lightchain
data cache=16.00MiB handles=16
INFO [07-12|00:35:53.925] Persisted trie from memory database nodes=1 size=147.00B time=4.418µs gcnodes=0 gcsi
ze=0.00B gctime=0s livenodes=1 livesize=0.00B
INFO [07-12|00:35:53.925] Successfully wrote genesis state database=lightchaindata
hash=8d464d...6f7d43
[root@Q1nChanCentos GethProjects]#

```

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```

[root@Q1nChanCentos GethProjects]# ll
总用量 12
-rw-r--r--. 1 root root 180 7月 12 00:31 genesis.json
drwxr-xr-x. 4 root root 4096 7月 12 00:34 geth
drwx----- 2 root root 4096 7月 12 00:34 keystore
[root@Q1nChanCentos GethProjects]# cd geth
[root@Q1nChanCentos geth]# ll
总用量 8
drwxr-xr-x. 2 root root 4096 7月 12 00:35 chaindata
drwxr-xr-x. 2 root root 4096 7月 12 00:35 lightchaindata
[root@Q1nChanCentos geth]# cd lightchaindata/
[root@Q1nChanCentos lightchaindata]# ll
总用量 24
-rw-r--r--. 1 root root 706 7月 12 00:35 000002.ldb
-rw-r--r--. 1 root root 166 7月 12 00:35 000003.log
-rw-r--r--. 1 root root 16 7月 12 00:35 CURRENT
-rw-r--r--. 1 root root 16 7月 12 00:35 CURRENT.bak
-rw-r--r--. 1 root root 0 7月 12 00:34 LOCK
-rw-r--r--. 1 root root 1105 7月 12 00:35 LOG
-rw-r--r--. 1 root root 239 7月 12 00:35 MANIFEST-000004

```

GethProjects 目录下的 geth 是初始化之后生成的

3. 运行私链

```
[root@Q1nChanCentos GethProjects]# geth --datadir . --networkid 15
WARN [07-12|00:41:35.006] Sanitizing cache to Go's GC limits    provided=1024 updated=660
INFO [07-12|00:41:35.007] Maximum peer count                      ETH=50 LES=0 total=50
INFO [07-12|00:41:35.007] Smartcard socket not found, disabling   err="stat /run/pcscd/pcscd.comm: no such file or directory"
INFO [07-12|00:41:35.009] Starting peer-to-peer node              instance=Geth/v1.9.8-stable-d62e9b28/linux-amd64/go1.13.4
INFO [07-12|00:41:35.009] Allocated trie memory caches            clean=165.00MiB dirty=165.00MiB
INFO [07-12|00:41:35.009] Allocated cache and file handles        database=/usr/local/GethProjects/geth/chaindata
cache=330.00MiB handles=2048
INFO [07-12|00:41:35.016] Opened ancient database                 database=/usr/local/GethProjects/geth/chaindata/ancient
INFO [07-12|00:41:35.016] Initialised chain configuration          config="{ChainID: 15 Homestead: <nil> DAO: <nil> DAOSupport: false EIP150: <nil> EIP155: <nil> EIP158: <nil> Byzantium: <nil> Constantinople: <nil> Petersburg: <nil> Istanbul: <nil> Engine: unknown}"
INFO [07-12|00:41:35.016] Disk storage enabled for ethash caches   dir=/usr/local/GethProjects/geth/ethash count=3
INFO [07-12|00:41:35.016] Disk storage enabled for ethash DAGs     dir=/root/.ethash count=2
INFO [07-12|00:41:35.016] Initialising Ethereum protocol          versions="[64 63]" network=15 dbversion=<nil>
WARN [07-12|00:41:35.016] Upgrade blockchain database version       from=<nil> to=7
INFO [07-12|00:41:35.017] Loaded most recent local header          number=0 hash=8d464d...6f7d43 td=2000 age=53y3mo2w
INFO [07-12|00:41:35.017] Loaded most recent local full block      number=0 hash=8d464d...6f7d43 td=2000 age=53y3mo2w
INFO [07-12|00:41:35.017] Loaded most recent local fast block      number=0 hash=8d464d...6f7d43 td=2000 age=53y3mo2w
INFO [07-12|00:41:35.017] Regenerated local transaction journal     transactions=0 accounts=0
INFO [07-12|00:41:35.020] Allocated fast sync bloom               size=330.00MiB
INFO [07-12|00:41:35.022] Initialized fast sync bloom              items=1 errorrate=0.000 elapsed=1.240ms
INFO [07-12|00:41:35.026] New local node record                   seq=1 id=f95d151b9d9fe5ba ip=127.0.0.1 udp=30303 tcp=30303
INFO [07-12|00:41:35.026] Started P2P networking                  self=enode://24830741ffa6b57ffab7b28382c6ad35da1c16d134b6bcca9bf9a3ee5fc92a00116d867a810a3b13c5da4b9517680ae0eae054091e369178f2b0eede71c1619@127.0.0.1:30303
INFO [07-12|00:41:35.027] IPC endpoint opened                     url=/usr/local/GethProjects/geth.ipc
INFO [07-12|00:41:39.359] New local node record                   seq=2 id=f95d151b9d9fe5ba ip=120.84.9.74 csn@lev1_104=295
```

geth 控制台操作

- geth --datadir . --networkid 15 console: 进入控制台
- web3: 调出 web3 对象

```
Welcome to the Geth JavaScript console!

instance: Geth/v1.9.8-stable-d62e9b28/linux-amd64/go1.13.4
at block: 0 (Thu, 01 Jan 1970 08:00:00 CST)
datadir: /usr/local/GethProjects
modules: admin:1.0 debug:1.0 eth:1.0 ethash:1.0 miner:1.0 net:1.0 personal:1.0 rpc:1.0 txpool:1.0 web3:1.0

> INFO [07-12|13:18:22.783] New local node record          seq=4 id=f95d151b9d9fe5ba ip=120.84.11.13 udp=37556 tcp=30303
> web3
{
  admin: {
    datadir: "/usr/local/GethProjects",
    nodeInfo: {
      enode: "enode://24830741ffa6b57ffab7b28382c6ad35da1c16d134b6bcca9bf9a3ee5fc92a00116d867a810a3b13c5da4b9517680ae0eae054091e369178f2b0eede71c1619@120.84.11.13:30303?discport=37556",
      enr: "enr:-J-40GIqfGSyBN3rqLgyytfjKjMiD05UVhAeQCHiX7HZHFZrVUAaHw4-LR4gl1vezKgn0HKGkgELBTzxR898qNL9FgPMEg2V0aMfGhHENWW6Agm1kgnY0gm1whHhUCw2Jc2Vjc0II1NmsxoQMkgwdB_6a1f_q3so0Cxp012hwW0TS2vMqb-aPuX8kqAIN0Y3CCdL-DdWRwgpK0hHVkcDaCdL8",
      id: "f95d151b9d9fe5bad619d0ae5b74f1ec96be62f5ead26e7bf22810e7b3d05454",
      ip: "120.84.11.13",
      listenAddr: "[::]:30303",
      name: "Geth/v1.9.8-stable-d62e9b28/linux-amd64/go1.13.4",
      ports: {
        discovery: 37556,
        listener: 30303
      },
      protocols: {
        eth: {

```

○ admin: 和权限相关的东西

- admin
- {
- datadir: "/usr/local/GethProjects",
- nodeInfo: {
- //nodeInfo: 我们启动一个节点的完整的信息
- enode:
"enode://24830741ffa6b57ffab7b28382c6ad35da1c16d134b6bcca9bf9a3ee5fc92a00116d867a810a3b13c5da4b9517680ae0eae054091e369178f2b0eede71c1619@120.84.11.13:30303?discport=37556",
- enr: "enr:-J-4QG1qfGSyBN3rqLgyytfjKjMiD05UVhAeQCHiX7HZHFZrVUAaHw4-LR4glvezKgnOHKGkgElBTzxR898qNL9FgPMEg2V0aMfGhHENWW6AgmlkgnY0gmlwhHhUCw2Jc2VjcDI1NmsxoQMkgwDB_6alf_q3so0Cxxq012hwW0TS2vMqb-aPuX8kqAIN0Y3CCd1-DdWRwgpK0hHVkcDaCd18",
- id:
"f95d151b9d9fe5bad619d0ae5b74f1ec96be62f5ead26e7bf22810e7b3d05454",
- ip: "120.84.11.13",
- listenAddr: "[::]:30303",
- //listenAddr: 监听的地址
- name: "Geth/v1.9.8-stable-d62e9b28/linux-amd64/go1.13.4",
- ports: {
- discovery: 37556,
- listener: 30303
- },
- protocols: {
- eth: {
- config: {...},
- difficulty: 2000,
- genesis:
"0x8d464df7c77e9e659073ca4a6dbb7bce4814e754e0b43370806f519c036f7d43",
- head:
"0x8d464df7c77e9e659073ca4a6dbb7bce4814e754e0b43370806f519c036f7d43",
- network: 15
- }
- }
- },
- peers: [],
- addPeer: function(),
- addTrustedPeer: function(),
- clearHistory: function(),
- exportChain: function(),
- getDatadir: function(callback),
- getNodeInfo: function(callback),
- getPeers: function(callback),
- importChain: function(),
- removePeer: function(),
- removeTrustedPeer: function(),

- sleep: function github.com/ethereum/go-ethereum/console.(*bridge).Sleep-fm(),
- sleepBlocks: function github.com/ethereum/go-ethereum/console.(*bridge).SleepBlocks-fm(),
- startRPC: function(),
- startWS: function(),
- stopRPC: function(),
- stopWS: function()
- }

○ personal 属性：控制用户账户

- {
- listAccounts: [],
- listWallets: [],
- deriveAccount: function(),
- ecRecover: function(),
- getListAccounts: function(callback),
- getListWallets: function(callback),
- importRawKey: function(),
- initializeWallet: function(),
- lockAccount: function(),
- newAccount: function github.com/ethereum/go-ethereum/console.(*bridge).NewAccount-fm(),
- //newAccount: 用于创建账户
- openWallet: function github.com/ethereum/go-ethereum/console.(*bridge).OpenWallet-fm(),
- sendTransaction: function(),
- sign: function github.com/ethereum/go-ethereum/console.(*bridge).Sign-fm(),
- signTransaction: function(),
- unlockAccount: function github.com/ethereum/go-ethereum/console.(*bridge).UnlockAccount-fm(),
- unpair: function()
- }
-

○ eth

- WARN [07-12|13:30:50.950] Served eth_coinbase reqid=69 t=25.278µs err="etherbase must be explicitly specified"
- {
- accounts: [],
- blockNumber: 0,
- WARN [07-12|13:30:50.953] Served eth_coinbase reqid=80 t=7.173µs err="etherbase must be explicitly specified"
- coinbase: undefined,
- compile: {
- lll: function(),
- serpent: function(),

- solidity: function()
- },
- defaultAccount: undefined,
- defaultBlock: "latest",
- gasPrice: 1000000000, //我们设定的 gasLimited
- hashrate: 0,
- mining: false,
- pendingTransactions: [],
- protocolVersion: "0x40",
- syncing: false,
- call: function(),
- chainId: function(),
- contract: function(abi),
- estimateGas: function(),
- fillTransaction: function(),
- filter: function(options, callback, filterCreationErrorCallback),
- getAccounts: function(callback),
- getBalance: function(),
- getBlock: function(),
- getBlockByHash: function(),
- getBlockByNumber: function(),
- getBlockNumber: function(callback),
- getBlockTransactionCount: function(),
- getBlockUncleCount: function(),
- getCode: function(),
- getCoinbase: function(callback),
- getCompilers: function(),
- getGasPrice: function(callback),
- getHashrate: function(callback),
- getHeaderByHash: function(),
- getHeaderByNumber: function(),
- getMining: function(callback),
- getPendingTransactions: function(callback),
- getProof: function(),
- getProtocolVersion: function(callback),
- getRawTransaction: function(),
- getRawTransactionFromBlock: function(),
- getStorageAt: function(),
- getSyncing: function(callback),
- getTransaction: function(),
- getTransactionCount: function(),
- getTransactionFromBlock: function(),
- getTransactionReceipt: function(),
- getUncle: function(),
- getWork: function(),
- iban: function(iban),
- icapNamereg: function(),
- isSyncing: function(callback),
- namereg: function(),

- resend: function(),
- sendIBANTransaction: function(),
- sendRawTransaction: function(),
- sendTransaction: function(),
- sign: function(),
- signTransaction: function(),
- submitTransaction: function(),
- submitWork: function()
- }
-
- providers: 简单理解为服务提供商
- txpool: 交易池(目前什么都没)
- {
 - content: {
 - pending: {},
 - queued: {}
 - },
 - inspect: {
 - pending: {},
 - queued: {}
 - },
 - status: {
 - pending: 0,
 - queued: 0
 - },
 - getContent: function(callback),
 - getInspect: function(callback),
 - getStatus: function(callback)
 - }
- miner
 - {
 - getHashrate: function(),
 - setEtherbase: function(),
 - setExtra: function(), //写进区块的附加信息
 - setGasPrice: function(),
 - setRecommitInterval: function(),
 - //start, stop: 开始、停止挖矿的选项
 - start: function(),
 - stop: function()
 - }
-

Geth Console 是一个交互式的 JavaScript 执行环境，里面内置了一些用来操作以太坊的 JavaScript 对象，我们可以直接调用这些对象来获取区块链上的相关信息。这些对象主要包括：

eth: 主要包含对区块链进行访问和交互相关的方法；

net: 主要包含查看 p2p 网络状态的方法;

admin: 主要包含与管理节点相关的方法;

miner: 主要包含挖矿相关的一些方法;

personal: 包含账户管理的方法;

txpool: 包含查看交易内存池的方法;

web3: 包含以上所有对象, 还包含一些通用方法。

常用命令有: `personal.newAccount()`: 创建账户;

`personal.unlockAccount()`: 解锁账户;

`eth.accounts`: 列出系统中的账户;

`eth.getBalance()`: 查看账户余额, 返回值的单位是 Wei;

`eth.blockNumber`: 列出当前区块高度;

`eth.getTransaction()`: 获取交易信息;

`eth.getBlock()`: 获取区块信息;

`miner.start()`: 开始挖矿;

`miner.stop()`: 停止挖矿;

`web3.fromWei()`: Wei 换算成以太币;

`web3.toWei()`: 以太币换算成 Wei;

`txpool.status`: 交易池中的状态;

(1)

`eth.accounts` 没有东西: 因为只有在 geth 下创建的用户才存在 keystore 文件夹里面, 而创世区块的信息是不在里面的


```

> eth.accounts
[]
> eth.getBalance("0x8cbf968154223254306C41C03F0110FC97B200BA")
3000000000000000
> web3.fromWei(eth.getBalance("0x8cbf968154223254306C41C03F0110FC97B200BA"))
... )
0.003
> web3.from(eth.getBalance("0x8cbf968154223254306C41C03F0110FC97B200BA"), 'ether')
TypeError: 'from' is not a function
    at <anonymous>:1:1
> web3.fromWei(eth.getBalance("0x8cbf968154223254306C41C03F0110FC97B200BA"), 'ether')
0.003
> █

```

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(2) 创建区块

```

> personal.newAccount()
Password:
Repeat password:
INFO [07-12|13:52:40.987] Your new key was generated          address=0xA95DeF0F6890F2c79Bb2f6ca006c18ef0Ad56417
WARN [07-12|13:52:40.987] Please backup your key file!          path=/usr/local/GethProjects/keystore/UTC--2022-07-12T05-52-39.285998661Z--a95def0f6890f2c79bb2f6ca006c18ef0ad56417
WARN [07-12|13:52:40.987] Please remember your password!
"0xa95def0f6890f2c79bb2f6ca006c18ef0ad56417"
> eth.accounts
["0xa95def0f6890f2c79bb2f6ca006c18ef0ad56417"]

```

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crypto: cipher 是加密方式, ciphertext 是加密内容

```

[root@Q1nChanCentos GethProjects]# ll
总用量 16
-rw-r--r--. 1 root root 180 7月 12 00:31 genesis.json
drwxr-xr-x. 5 root root 4096 7月 12 13:18 geth
-rw----- 1 root root 385 7月 12 13:54 history
drwx----- 2 root root 4096 7月 12 13:52 keystore
[root@Q1nChanCentos GethProjects]# cd keystore/
[root@Q1nChanCentos keystore]# ll
总用量 4
-rw----- 1 root root 491 7月 12 13:52 UTC--2022-07-12T05-52-39.285998661Z--a95def0f6890f2c79bb2f6ca006c18ef0ad56417
[root@Q1nChanCentos keystore]# cat UTC--2022-07-12T05-52-39.285998661Z--a95def0f6890f2c79bb2f6ca006c18ef0ad56417
{"address":"a95def0f6890f2c79bb2f6ca006c18ef0ad56417","crypto":{"cipher":"aes-128-ctr","ciphertext":"248a292da3d159532df4fd45a54d2fd60c09cecb8c540114a4884718743544a1","cipherparams":{"iv":"ad7d7d4efc11beb1ba3b49309acc025a"},"kdf":"scrypt","kdfparams":{"dklen":32,"n":262144,"p":1,"r":8,"salt":"b9333e3a8e4ce813254d1bcc9d7e81e637971a9d5ec5a6b0e85c3bfd2f94bbfc"},"mac":"e8644f545528183f7fefeb3e54c6e3b127cb12ff0157580b4ad621dbd6da08e4"},"id":"cf450301-a831-4934-8a78-c47c27ffc191","version":3}[root@Q1nChanCentos keystore]# █

```

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