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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，我们为了方便快速了解 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": "30000000000000000000000000000000" }
  }
}
CSDN @LEVI_104
```

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]# CSDN @LEVI_104
```

```
[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 CSDN @LEVI_104
```

GethProjects 目录下的 geth 是初始化之后生成的

### 3. 运行私链

```
[root@QInChanCentos GethProjects]# geth --datadir . --networkid 15
WARN [07-12|00:41:35.006] Sanitizing cache to Go's GC limits
INFO [07-12|00:41:35.007] Maximum peer count
INFO [07-12|00:41:35.007] Smartcard socket not found, disabling
directory"
INFO [07-12|00:41:35.009] Starting peer-to-peer node
/gol.13.4
INFO [07-12|00:41:35.009] Allocated trie memory caches
INFO [07-12|00:41:35.009] Allocated cache and file handles
cache=330.00MiB handles=2048
INFO [07-12|00:41:35.016] Opened ancient database
ancient
INFO [07-12|00:41:35.016] Initialised chain configuration
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
INFO [07-12|00:41:35.016] Disk storage enabled for ethash DAGs
INFO [07-12|00:41:35.016] Initialising Ethereum protocol
WARN [07-12|00:41:35.016] Upgrade blockchain database version
INFO [07-12|00:41:35.017] Loaded most recent local header
INFO [07-12|00:41:35.017] Loaded most recent local full block
INFO [07-12|00:41:35.017] Loaded most recent local fast block
INFO [07-12|00:41:35.017] Regenerated local transaction journal
INFO [07-12|00:41:35.020] Allocated fast sync bloom
INFO [07-12|00:41:35.022] Initialized fast sync bloom
INFO [07-12|00:41:35.026] New local node record
tcp=30303
INFO [07-12|00:41:35.026] Started P2P networking
c16d134b6bcc9bf9a3ee5fc92a00116d867a810a3b13c5da4b9517680ae0eaeee054091e369178f2b0eede71c1619@127.0.0.1:30303
INFO [07-12|00:41:35.027] IPC endpoint opened
INFO [07-12|00:41:39.359] New local node record
provided=1024 updated=660
ETH=50 LES=0 total=50
err="stat /run/pcscd/pcscd.comm: no such file or
instance=Geth/v1.9.8-stable-d62e9b28/linux-amd64
clean=165.00MiB dirty=165.00MiB
database=/usr/local/GethProjects/geth/chaindata
database=/usr/local/GethProjects/geth/chaindata/
config="{ChainID: 15 Homestead: <nil> DAO: <nil>
dir=/usr/local/GethProjects/geth/ethash count=3
dir=/root/.ethash count=2
versions=[64 63] network=15 dbversion=<nil>
from=<nil> to=7
number=0 hash=8d464d..6f7d43 td=2000 age=53y3mo2w
number=0 hash=8d464d..6f7d43 td=2000 age=53y3mo2w
number=0 hash=8d464d..6f7d43 td=2000 age=53y3mo2w
transactions=0 accounts=0
size=330.00MiB
items=1 errorrate=0.000 elapsed=1.240ms
seq=1 id=f95d151b9d9fe5ba ip=127.0.0.1 udp=30303
self=enode://24830741ffa6b57ffab7b28382c6ad35da1
url=/usr/local/GethProjects/geth.ipc
seq=2 id=f95d151b9d9fe5ba ip=120.84.9.74 csdn@e295

```

## 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/gol.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
37556 tcp=30303
> web3
{
  admin: {
    datadir: "/usr/local/GethProjects",
    nodeInfo: {
      enode: "enode://24830741ffa6b57ffab7b28382c6ad35da1c16d134b6bcc9bf9a3ee5fc92a00116d867a810a3b13c5da4b9517680ae0eaeee054091e369178f2b0eede71c1619@120.84.11.13:30303?discport=37556",
      enr: "enr:-J-4QGIqfGsyBN3rqLgyytfjKjM1D05UVhAeQChiXTHZHFZrVUAAhW4-LR4g1vezKgnOHKGkgElBTzxR898qNL9FgPM Eg2V0aMfGhHENW6AgmIkgnY0gmlwhHnUCw2Jc2VjcD1NmsxoQMkgwdB_6alf_q3so0Cxq012hwW0TS2vMqb-aPuX8kqAIN0Y3CCd1-DdWRwgpkOhHVkcDaCdl8",
      id: "f95d151b9d9fe5bad619d0ae5b74f1ec96be62f5ead26e7bf22810e7b3d05454",
      ip: "120.84.11.13",
      listenAddr: "[::]:30303",
      name: "Geth/v1.9.8-stable-d62e9b28/linux-amd64/gol.13.4",
      ports: {
        discovery: 37556,
        listener: 30303
      },
      protocols: {
        eth: 1
      }
    }
  }
}

  seq=4 id=f95d151b9d9fe5ba ip=120.84.11.13 udp=

```

- 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://24830741ffa6b57ffab7b28382c6ad35da1c16d134b6bcc9bf9a3ee5fc92a00116d867a810a3b13c5da4b9517680ae0eaee054091e369178f2b0eede71c1619@120.84.11.13:30303?discport=37556",
  - enr: "enr:-J-4QGIqfGSyBN3rqLgyytfjKjMiD05UVhAeQCHiX7HZHFZrVUAaHw4-LR4g1vezKgnOHKGkgE1BTzxR898qNL9FgPMEg2V0aMfGhHENWW6Agm1kgnY0gmlwhHhUCw2Jc2VjcDI1NmsxoQMkgwdB\_6a1f\_q3so0Cxq012hwWOTS2vMqb-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=0xA95Def0F6890f2c79bb2f6ca006c18ef0Ad564
17
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@QInChanCentos 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@QInChanCentos GethProjects]# cd keystore/
[root@QInChanCentos keystore]# ll
总用量 4
-rw----- 1 root root 491 7月 12 13:52 UTC--2022-07-12T05-52-39.285998661Z--a95def0f6890f2c79bb2f6ca006c18ef0ad5
6417
[root@QInChanCentos keystore]# cat UTC--2022-07-12T05-52-39.285998661Z--a95def0f6890f2c79bb2f6ca006c18ef0ad56417
{"address": "a95def0f6890f2c79bb2f6ca006c18ef0ad56417", "crypto": {"cipher": "aes-128-ctr", "ciphertext": "248a292da3d159
532df4fd45a54d2fd60c09cecb8c540114a4884718743544a1", "cipherparams": {"iv": "ad7d7d4efc11beb1ba3b49309acc025a"}, "kdf": "scrypt", "kdfparams": {"dklen": 32, "n": 262144, "p": 1, "r": 8, "salt": "b9333e3a8e4ce813254d1bcc9d7e81e637971a9d5ec5a6b0e85
c3bfd2f94bbfc"}, "mac": "e8644f545528183f7fefeb3e54c6e3b127cb12ff0157580b4ad621dbd6da08e4"}, "id": "cf450301-a831-4934-
8a78-c47c27fffc191", "version": 3}[root@QInChanCentos keystore]# █

```

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