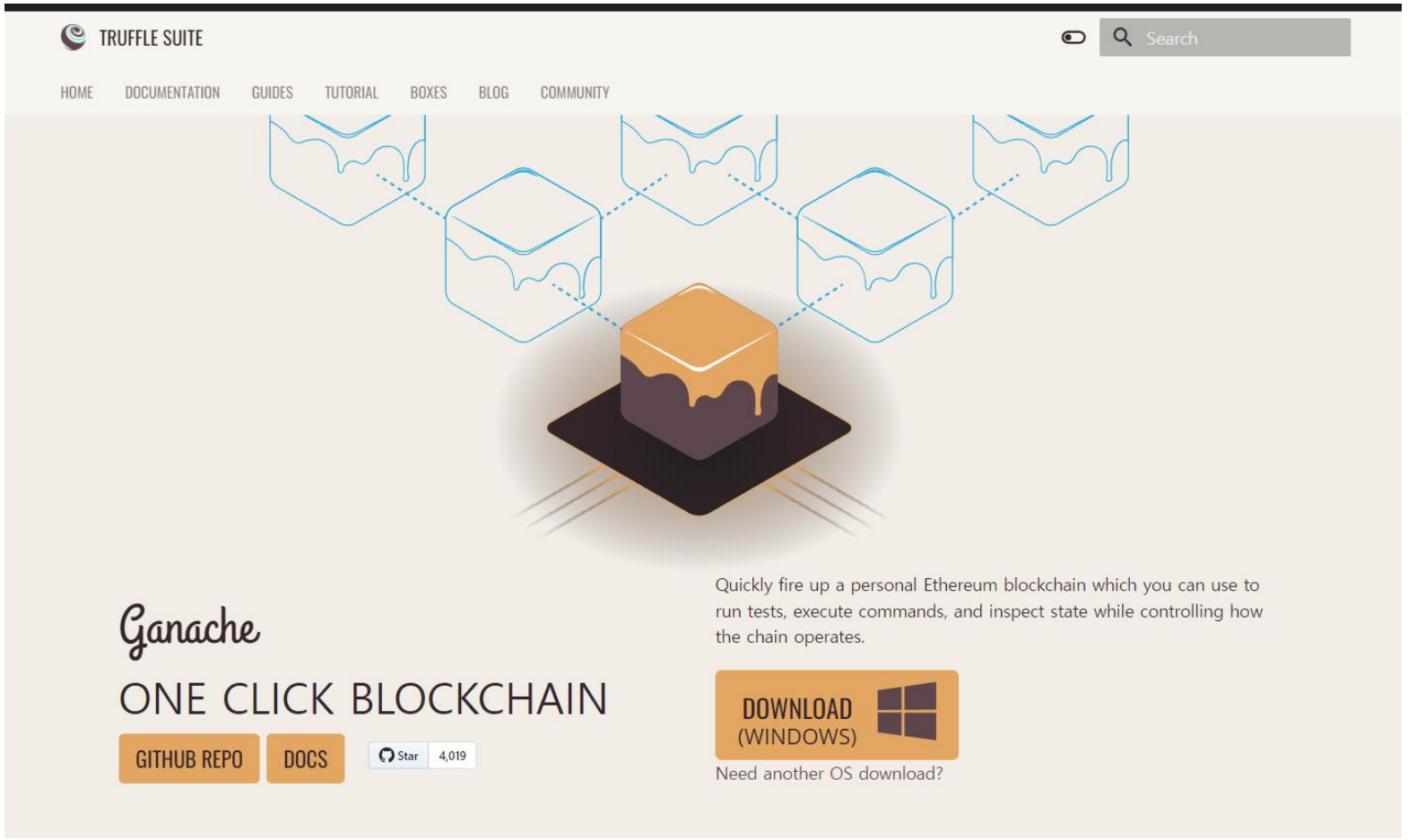
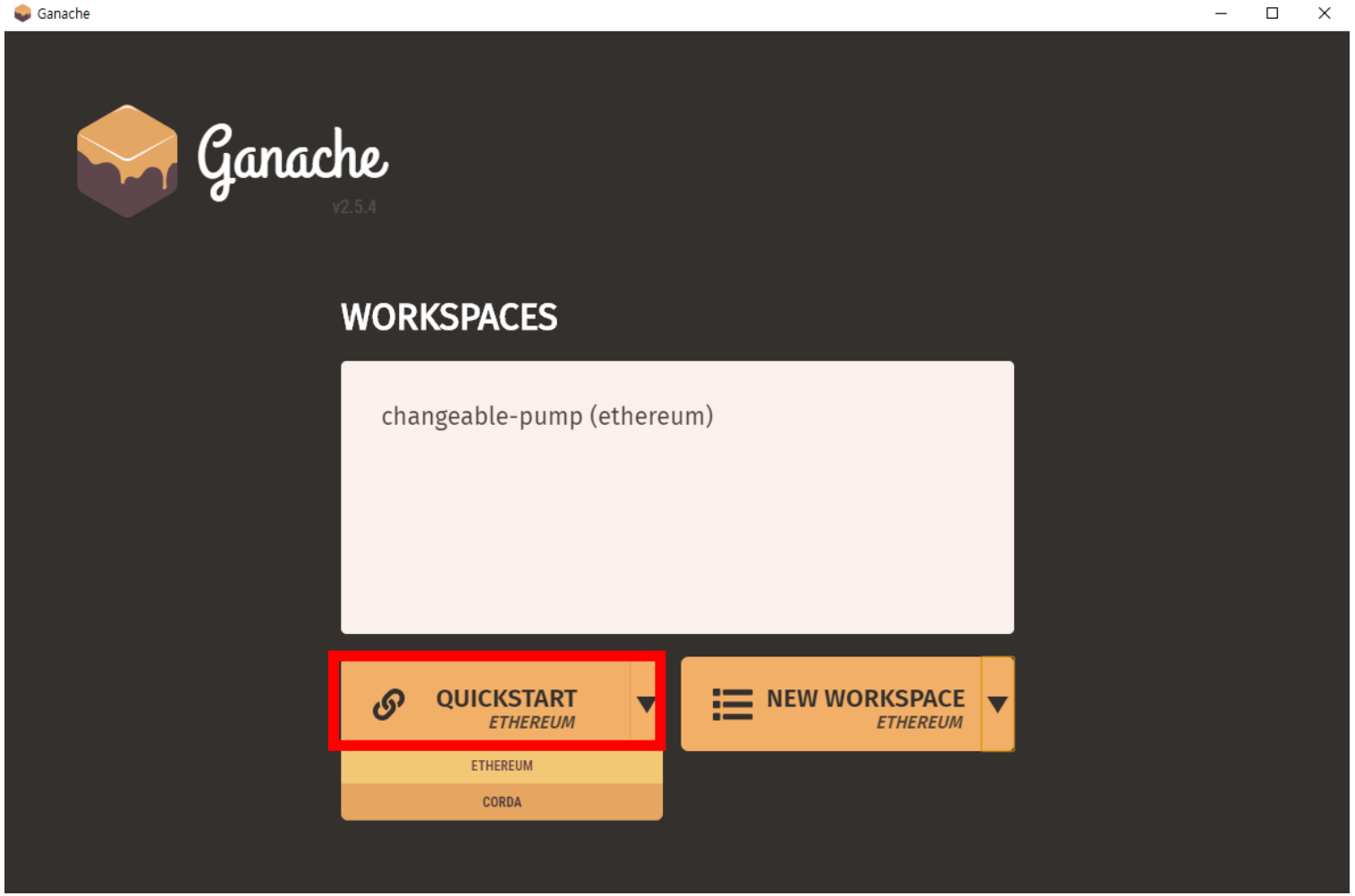
이더리움 프라이빗 네트워크 구축

Ganache

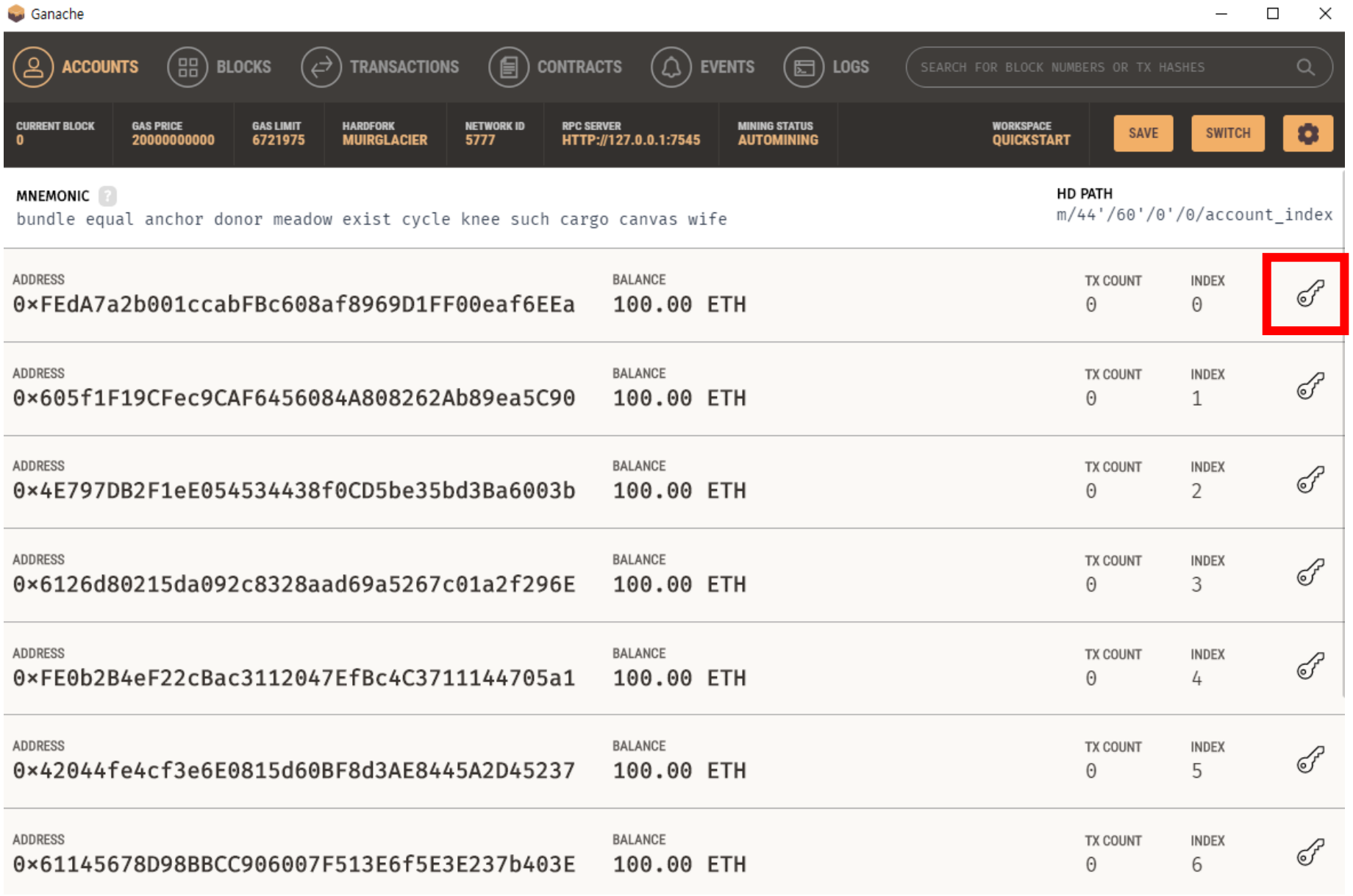
https://trufflesuite.com/ganache/index.html



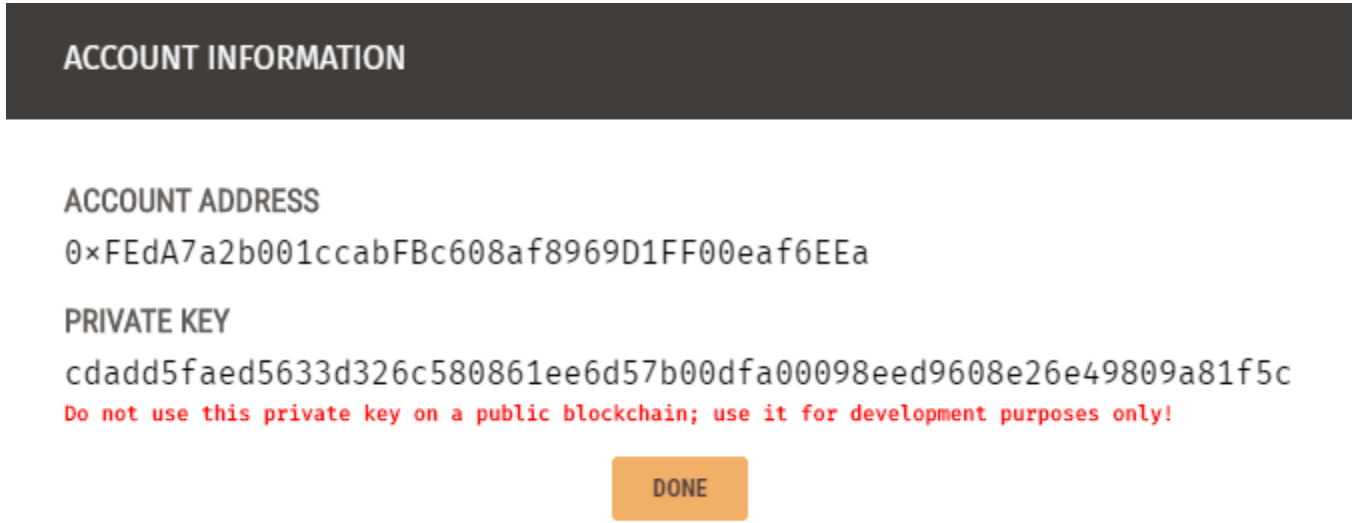
Ganache


Ganache
Ganache
v2.5.4
WORKSPACES
changeable-pump (ethereum)
QUICKSTART
ETHEREUM
NEW WORKSPACE
ETHEREUM
ETHEREUM
CORDA

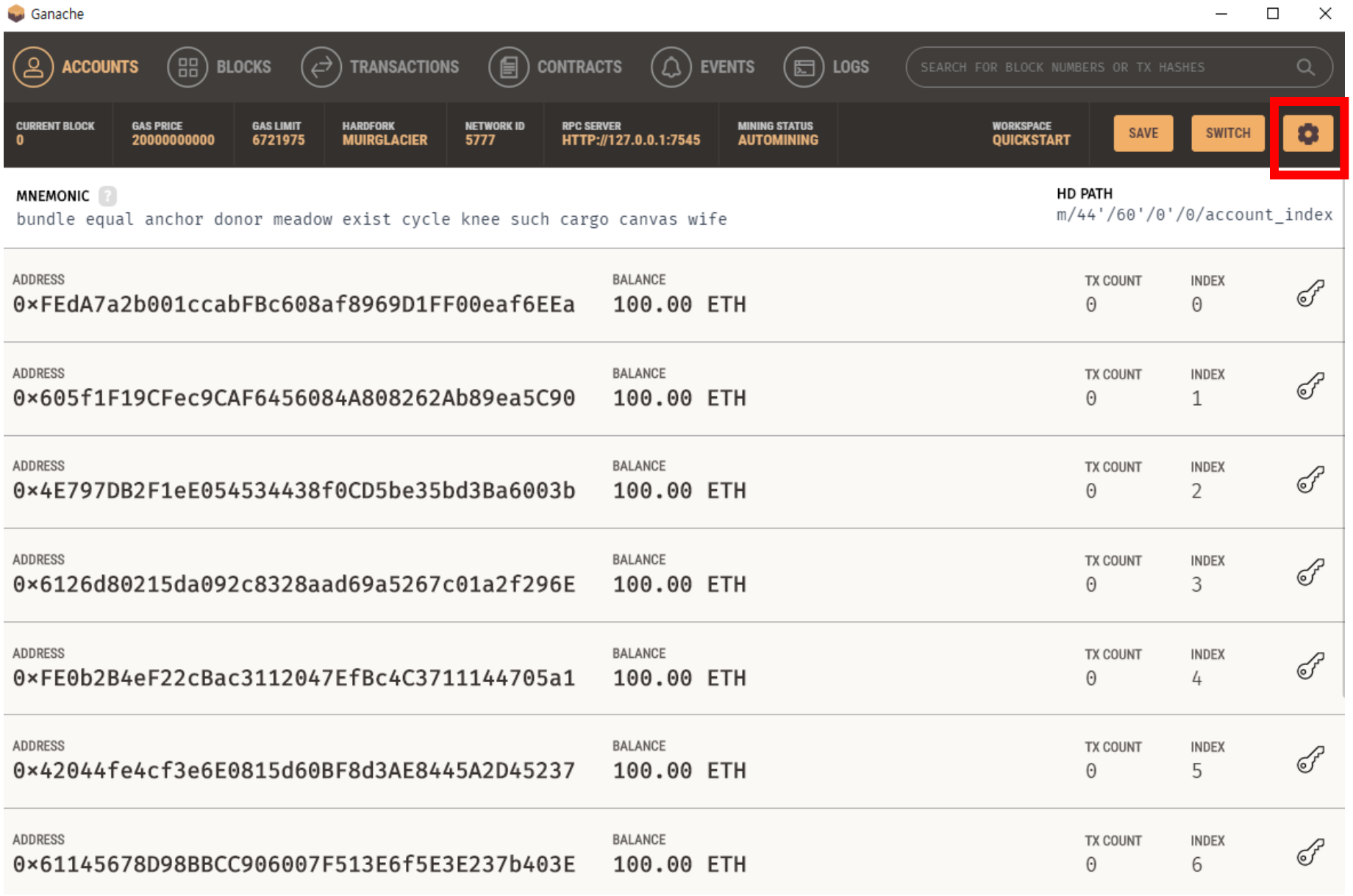
Ganache


Ganache
ACCOUNTS
BLOCKS
TRANSACTIONS
CONTRACTS
EVENTS
LOGS
SEARCH FOR BLOCK NUMBERS OR TX HASHES
CURRENT BLOCK 0
GAS PRICE 20000000000
GAS LIMIT 6721975
HARDFORK MUIRGLACIER
NETWORK ID 5777
RPC SERVER HTTP://127.0.0.1:7545
MINING STATUS AUTOMINING
WORKSPACE QUICKSTART
SAVE
SWITCH
MNEMONIC
bundle equal anchor donor meadow exist cycle knee such cargo canvas wife
HD PATH
m/44'/60'/0'/0/account_index
ADDRESS 0×FEdA7a2b001ccabFBc608af8969D1FF00eaf6EEa BALANCE 100.00 ETH TX COUNT 0 INDEX 0
ADDRESS 0×605f1F19CFec9CAF6456084A808262Ab89ea5C90 BALANCE 100.00 ETH TX COUNT 0 INDEX 1
ADDRESS 0×4E797DB2F1eE054534438f0CD5be35bd3Ba6003b BALANCE 100.00 ETH TX COUNT 0 INDEX 2
ADDRESS 0×6126d80215da092c8328aad69a5267c01a2f296E BALANCE 100.00 ETH TX COUNT 0 INDEX 3
ADDRESS 0×FE0b2B4eF22cBac3112047EfBc4C3711144705a1 BALANCE 100.00 ETH TX COUNT 0 INDEX 4
ADDRESS 0×42044fe4cf3e6E0815d60BF8d3AE8445A2D45237 BALANCE 100.00 ETH TX COUNT 0 INDEX 5
ADDRESS 0×61145678D98BBCC906007F513E6f5E3E237b403E BALANCE 100.00 ETH TX COUNT 0 INDEX 6

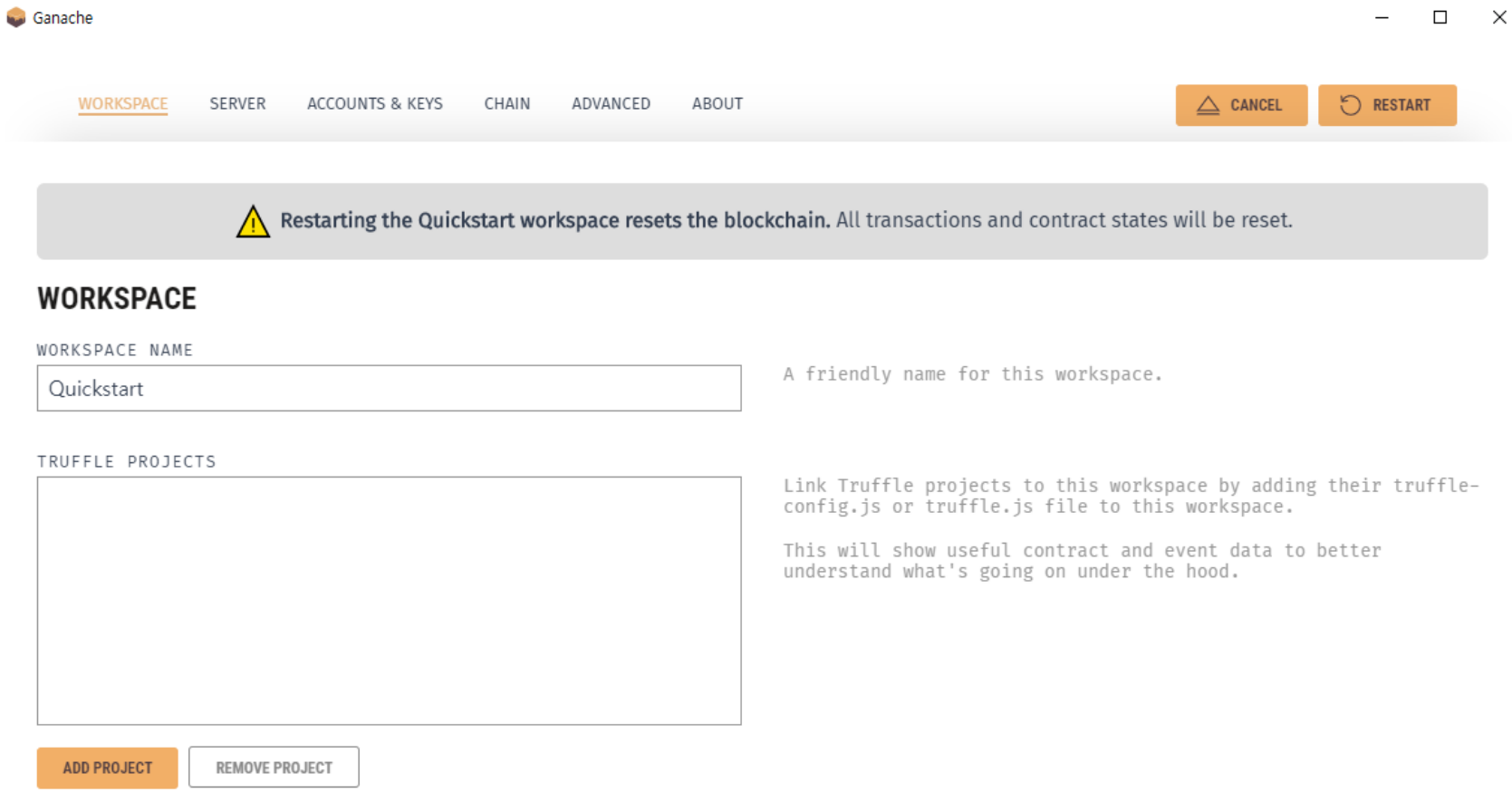
Ganache


ACCOUNT INFORMATION
ACCOUNT ADDRESS
0×FEdA7a2b001ccabFBc608af8969D1FF00eaf6EEa
PRIVATE KEY
cdadd5faed5633d326c580861ee6d57b00dfa00098eed9608e26e49809a81f5c
Do not use this private key on a public blockchain; use it for development purposes only!
DONE

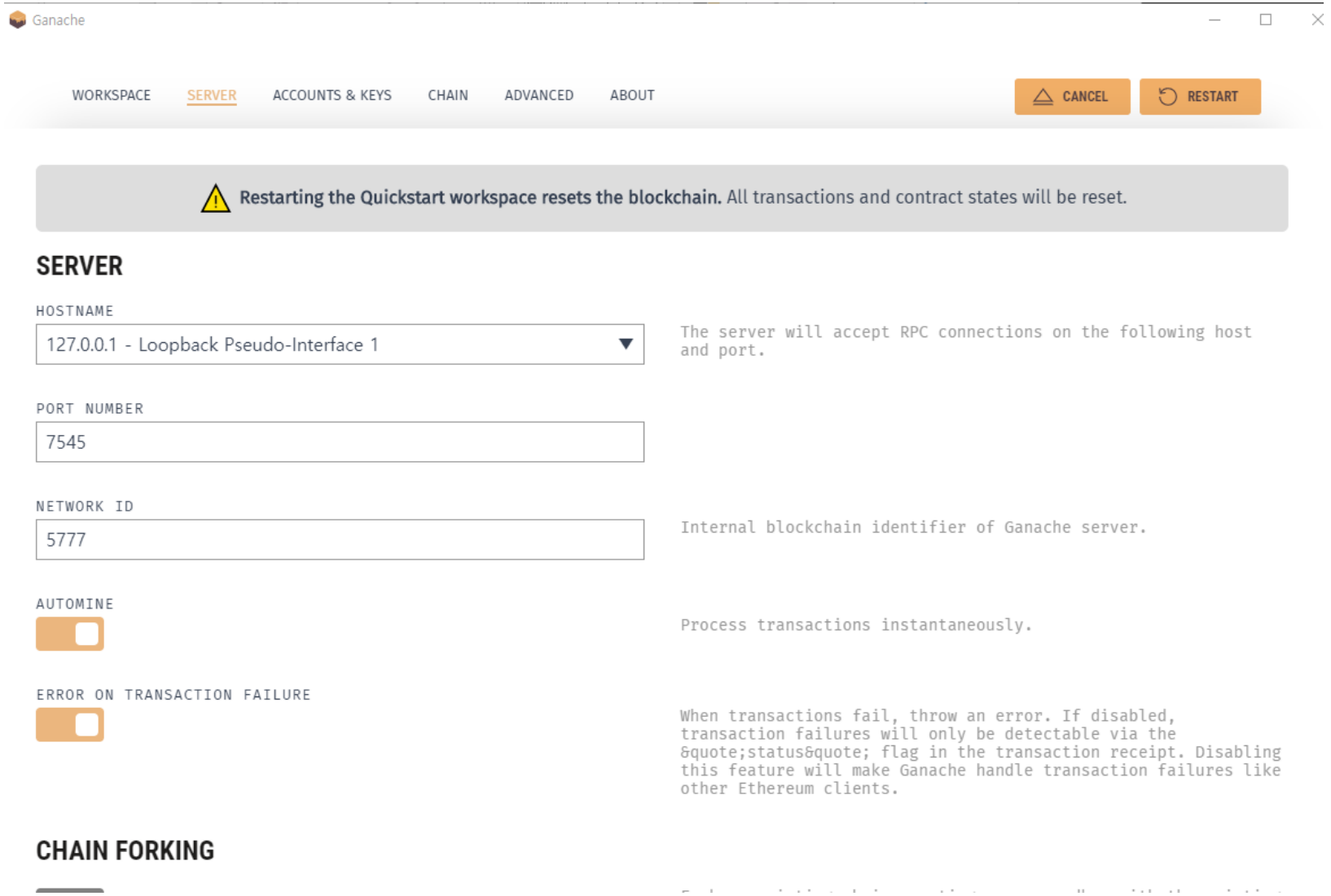
Ganache


Ganache
ACCOUNTS
BLOCKS
TRANSACTIONS
CONTRACTS
EVENTS
LOGS
SEARCH FOR BLOCK NUMBERS OR TX HASHES
CURRENT BLOCK 0
GAS PRICE 20000000000
GAS LIMIT 6721975
HARDFORK MUIRGLACIER
NETWORK ID 5777
RPC SERVER HTTP://127.0.0.1:7545
MINING STATUS AUTOMINING
WORKSPACE QUICKSTART
SAVE
SWITCH
MNEMONIC
bundle equal anchor donor meadow exist cycle knee such cargo canvas wife
HD PATH
m/44'/60'/0'/0/account_index
ADDRESS 0×FEdA7a2b001ccabFBc608af8969D1FF00eaf6EEa BALANCE 100.00 ETH TX COUNT 0 INDEX 0
ADDRESS 0×605f1F19CFec9CAF6456084A808262Ab89ea5C90 BALANCE 100.00 ETH TX COUNT 0 INDEX 1
ADDRESS 0×4E797DB2F1eE054534438f0CD5be35bd3Ba6003b BALANCE 100.00 ETH TX COUNT 0 INDEX 2
ADDRESS 0×6126d80215da092c8328aad69a5267c01a2f296E BALANCE 100.00 ETH TX COUNT 0 INDEX 3
ADDRESS 0×FE0b2B4eF22cBac3112047EfBc4C3711144705a1 BALANCE 100.00 ETH TX COUNT 0 INDEX 4
ADDRESS 0×42044fe4cf3e6E0815d60BF8d3AE8445A2D45237 BALANCE 100.00 ETH TX COUNT 0 INDEX 5
ADDRESS 0×61145678D98BBCC906007F513E6f5E3E237b403E BALANCE 100.00 ETH TX COUNT 0 INDEX 6

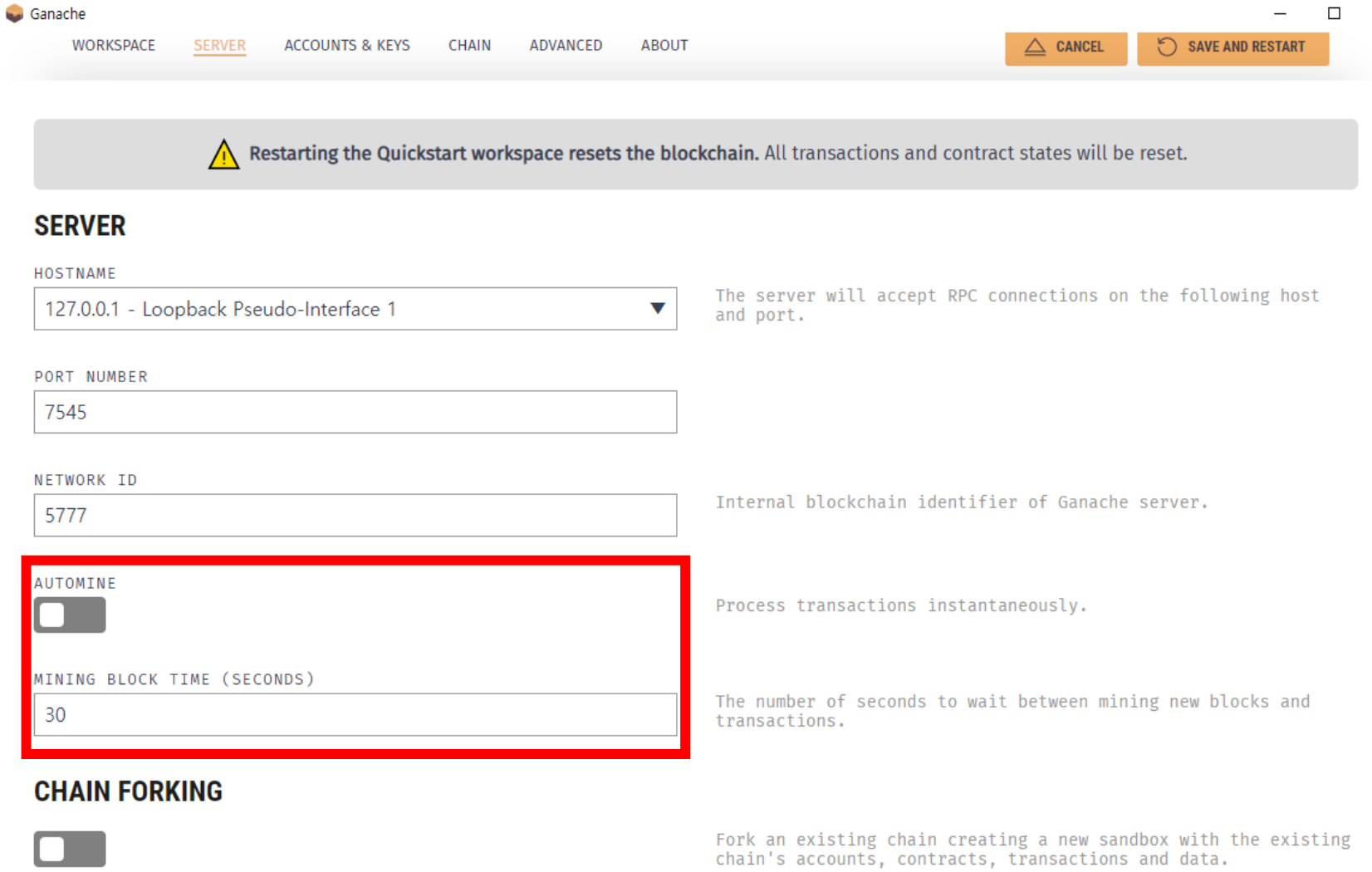
Ganache


Ganache
WORKSPACE
SERVER
ACCOUNTS & KEYS
CHAIN
ADVANCED
ABOUT
CANCEL
RESTART
Restarting the Quickstart workspace resets the blockchain. All transactions and contract states will be reset.
WORKSPACE
WORKSPACE NAME
Quickstart
A friendly name for this workspace.
TRUFFLE PROJECTS
Link Truffle projects to this workspace by adding their truffle-config.js or truffle.js file to this workspace.
This will show useful contract and event data to better understand what's going on under the hood.
ADD PROJECT
REMOVE PROJECT

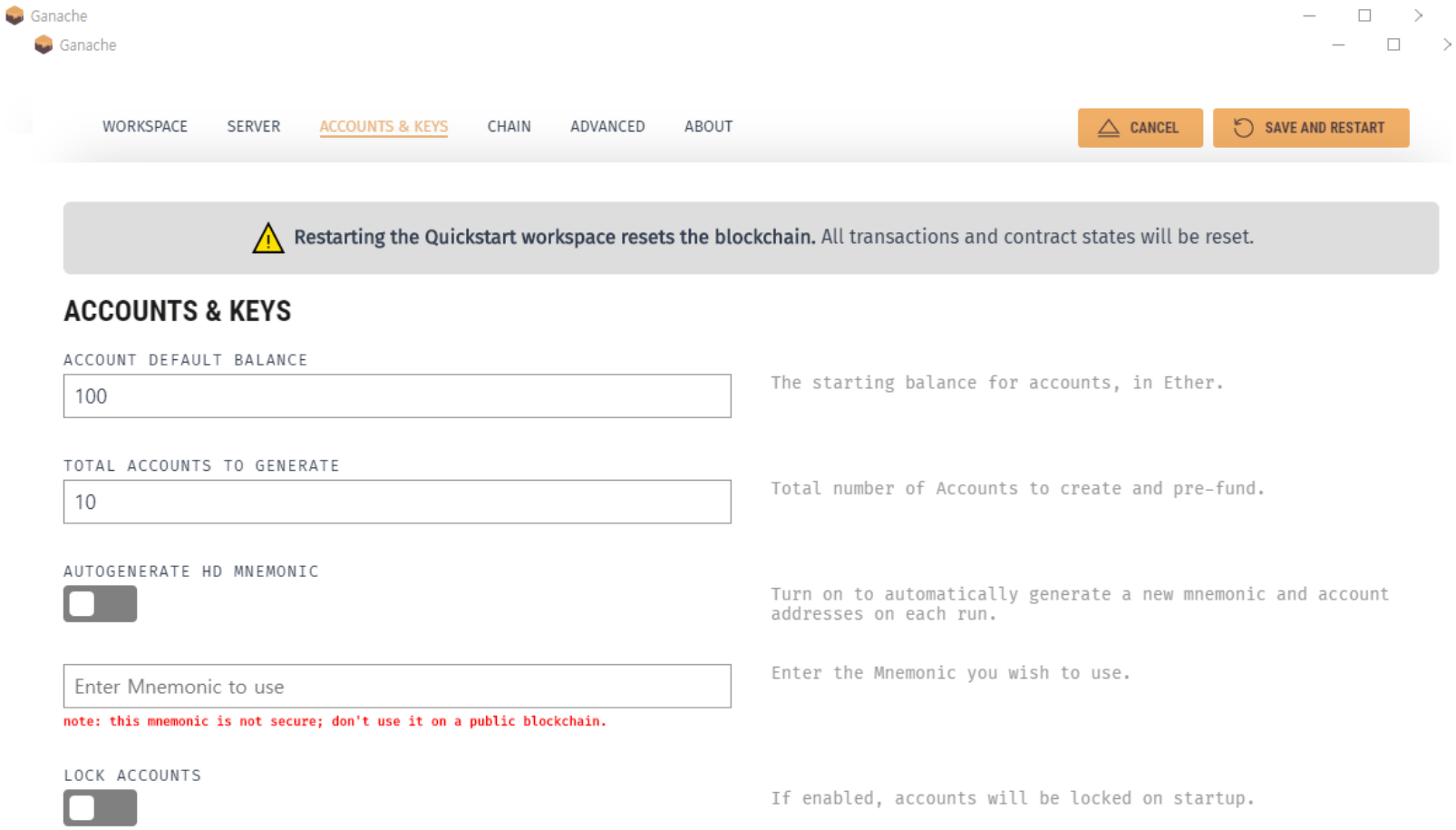
Ganache


Ganache
WORKSPACE
SERVER
ACCOUNTS & KEYS
CHAIN
ADVANCED
ABOUT
CANCEL
RESTART
Restarting the Quickstart workspace resets the blockchain. All transactions and contract states will be reset.
SERVER
HOSTNAME
127.0.0.1 - Loopback Pseudo-Interface 1
The server will accept RPC connections on the following host and port.
PORT NUMBER
7545
NETWORK ID
5777
Internal blockchain identifier of Ganache server.
AUTOMINE
Process transactions instantaneously.
ERROR ON TRANSACTION FAILURE
When transactions fail, throw an error. If disabled, transaction failures will only be detectable via the &quote;status&quote; flag in the transaction receipt. Disabling this feature will make Ganache handle transaction failures like other Ethereum clients.
CHAIN FORKING

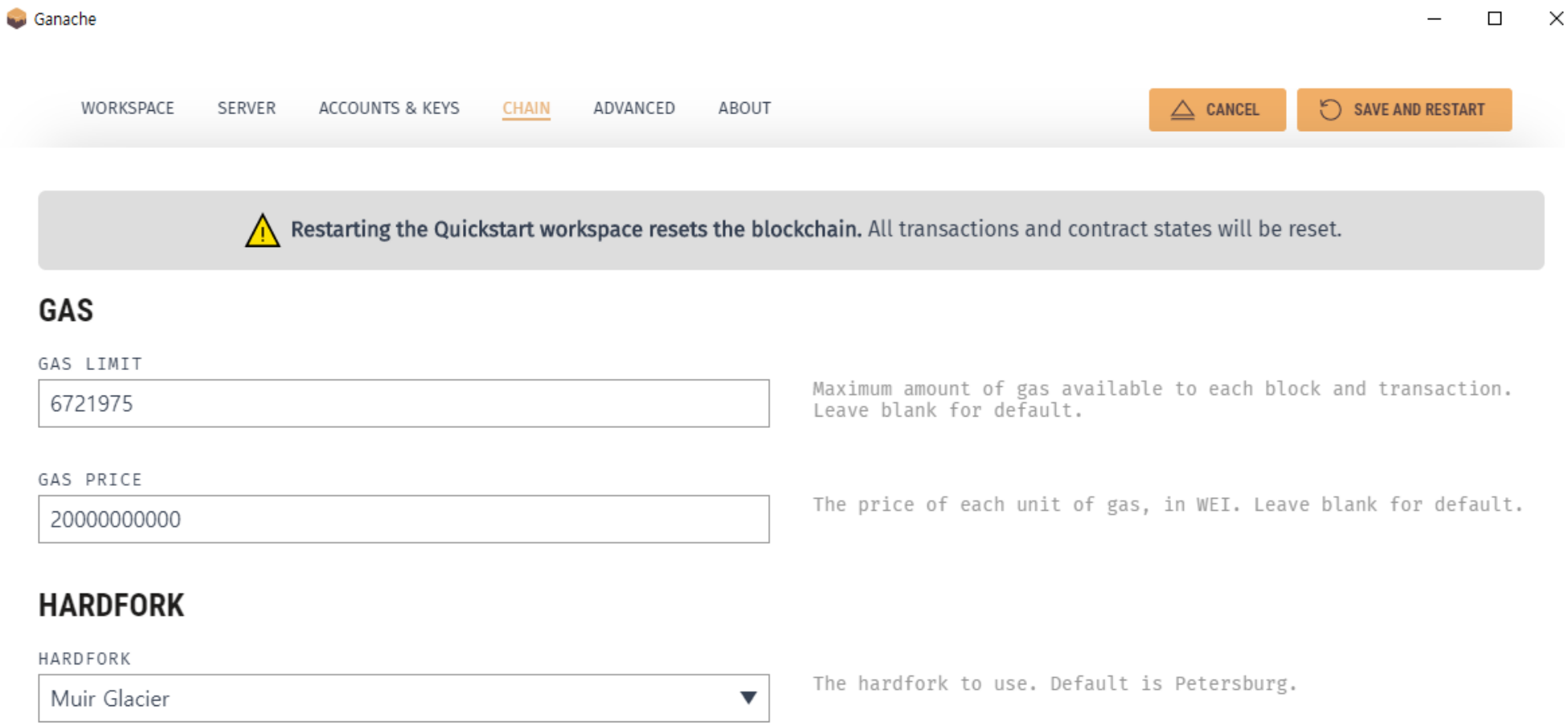
Ganache


Ganache
WORKSPACE
SERVER
ACCOUNTS & KEYS
CHAIN
ADVANCED
ABOUT
CANCEL
SAVE AND RESTART
Restarting the Quickstart workspace resets the blockchain. All transactions and contract states will be reset.
SERVER
HOSTNAME
127.0.0.1 - Loopback Pseudo-Interface 1
The server will accept RPC connections on the following host and port.
PORT NUMBER
7545
NETWORK ID
5777
Internal blockchain identifier of Ganache server.
AUTOMINE
Process transactions instantaneously.
MINING BLOCK TIME (SECONDS)
30
The number of seconds to wait between mining new blocks and transactions.
CHAIN FORKING
Fork an existing chain creating a new sandbox with the existing chain's accounts, contracts, transactions and data.

Ganache


Ganache
Ganache
WORKSPACE
SERVER
ACCOUNTS & KEYS
CHAIN
ADVANCED
ABOUT
CANCEL
SAVE AND RESTART
Restarting the Quickstart workspace resets the blockchain. All transactions and contract states will be reset.
ACCOUNTS & KEYS
ACCOUNT DEFAULT BALANCE
100
The starting balance for accounts, in Ether.
TOTAL ACCOUNTS TO GENERATE
10
Total number of Accounts to create and pre-fund.
AUTOGENERATE HD MNEMONIC
Turn on to automatically generate a new mnemonic and account addresses on each run.
Enter Mnemonic to use
Enter the Mnemonic you wish to use.
note: this mnemonic is not secure; don't use it on a public blockchain.
LOCK ACCOUNTS
If enabled, accounts will be locked on startup.

Ganache


Ganache
WORKSPACE
SERVER
ACCOUNTS & KEYS
CHAIN
ADVANCED
ABOUT
CANCEL
SAVE AND RESTART
Restarting the Quickstart workspace resets the blockchain. All transactions and contract states will be reset.
GAS
GAS LIMIT
6721975
Maximum amount of gas available to each block and transaction. Leave blank for default.
GAS PRICE
20000000000
The price of each unit of gas, in WEI. Leave blank for default.
HARDFORK
HARDFORK
Muir Glacier
The hardfork to use. Default is Petersburg.

Testnet 접속

https://geth.ethereum.org/downloads/

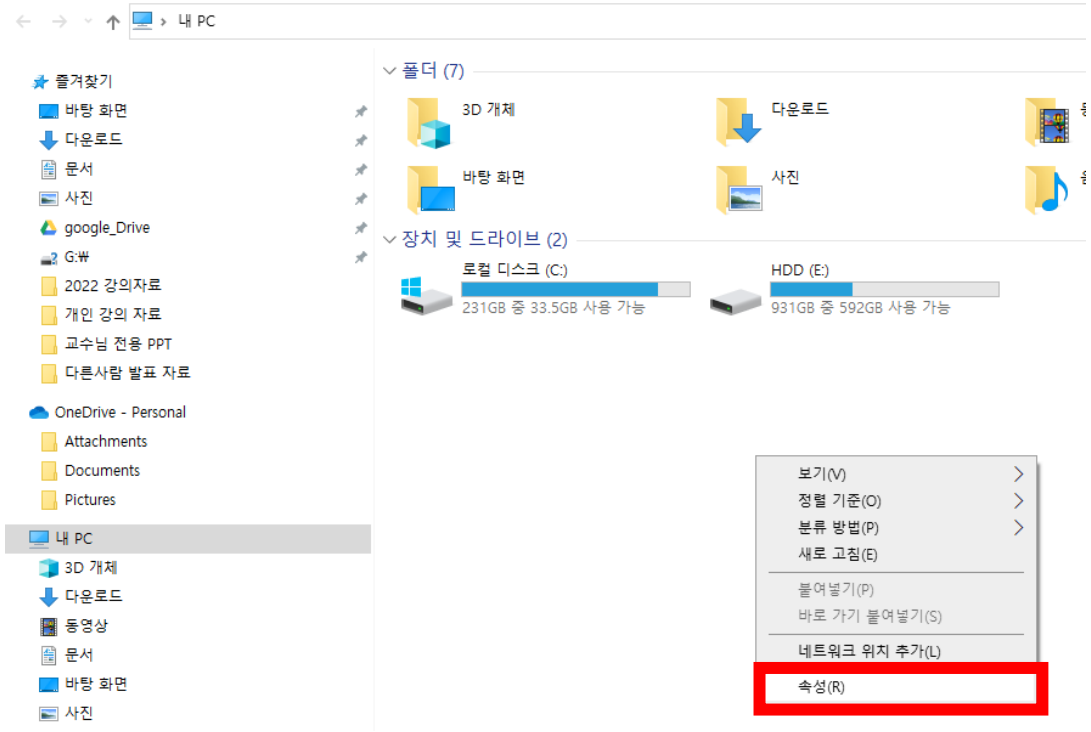
V3 같은 안티 바이러스 프로그램에 의해서
설치가 안될 수도 있음 잠시 꺼두고 설치 진행

Testnet 접속

```
PS C:₩WINDOWS₩system32> geth
INFO [03-02|13:01:25.188] Starting Geth on Ethereum mainnet...
INFO [03-02|13:01:25.347] Bumping default cache on mainnet         provided=1024 updated=4096
INFO [03-02|13:01:25.351] Maximum peer count                       ETH=50 LES=0 total=50
INFO [03-02|13:01:25.355] Set global gas cap                       cap=50,000,000
INFO [03-02|13:01:25.357] Allocated trie memory caches             clean=614.00MiB dirty=1024.00MiB
INFO [03-02|13:01:25.360] Allocated cache and file handles         database=C:₩Users₩system888₩AppData₩Local₩Ethereum₩ge
th₩chaindata cache=2.00GiB handles=8192
INFO [03-02|13:01:25.397] Opened ancient database                  database=C:₩Users₩system888₩AppData₩Local₩Ethereum₩ge
th₩chaindata₩ancient readonly=false
INFO [03-02|13:01:25.405] Initialised chain configuration          config="{ChainID: 1 Homestead: 1150000 DAO: 1920000 D
AOSupport: true EIP150: 2463000 EIP155: 2675000 EIP158: 2675000 Byzantium: 4370000 Constantinople: 7280000 Petersburg: 7
280000 Istanbul: 9069000, Muir Glacier: 9200000, Berlin: 12244000, London: 12965000, Arrow Glacier: 13773000, MergeFork:
 <nil>, Engine: ethash}"
INFO [03-02|13:01:25.422] Disk storage enabled for ethash caches   dir=C:₩Users₩system888₩AppData₩Local₩Ethereum₩geth₩et
hash count=3
INFO [03-02|13:01:25.426] Disk storage enabled for ethash DAGs     dir=C:₩Users₩system888₩AppData₩Local₩Ethash count=2
INFO [03-02|13:01:25.430] Initialising Ethereum protocol           network=1 dbversion=8
INFO [03-02|13:01:25.441] Loaded most recent local header          number=12096 hash=2f09b7..d71a2f td=3,680,646,855,500
,152 age=6y8mo5d
INFO [03-02|13:01:25.448] Loaded most recent local full block      number=0     hash=d4e567..cb8fa3 td=17,179,869,184
     age=52y11mo3d
INFO [03-02|13:01:25.452] Loaded most recent local fast block      number=11728 hash=0c7171..7070f2 td=3,418,697,698,712
,871 age=6y8mo5d
INFO [03-02|13:01:25.456] Loaded local transaction journal         transactions=0 dropped=0
INFO [03-02|13:01:25.461] Regenerated local transaction journal    transactions=0 accounts=0
INFO [03-02|13:01:25.464] Gasprice oracle is ignoring threshold set threshold=2
INFO [03-02|13:01:25.468] Starting peer-to-peer node               instance=Geth/v1.10.16-stable-20356e57/windows-amd64/
go1.17.5
INFO [03-02|13:01:25.508] New local node record                    seq=9 id=be5075bb2754c96f ip=127.0.0.1 udp=30303 tcp=
30303
INFO [03-02|13:01:25.514] Started P2P networking                   self=enode://766d6719f7ba77901df01dbf05a4799d11ec0061
276978b91491a699e558bbeea116da42cb6d22cd72f4262654c4fde6deb519773a28b5c7ae8d2edeabef85c5@127.0.0.1:30303
INFO [03-02|13:01:25.515] IPC endpoint opened                      url=₩₩.₩pipe₩geth.ipc
INFO [03-02|13:01:26.029] Got interrupt, shutting down...
INFO [03-02|13:01:26.032] IPC endpoint closed                      url=₩₩.₩pipe₩geth.ipc
INFO [03-02|13:01:26.035] Ethereum protocol stopped
INFO [03-02|13:01:26.039] Transaction pool stopped
INFO [03-02|13:01:26.041] Writing snapshot state to disk           root=d7f897..0f0544
INFO [03-02|13:01:26.043] Persisted trie from memory database      nodes=0 size=0.00B time=0s gcnodes=0 gcsize=0.00B gct
ime=0s livenodes=1 livesize=0.00B
INFO [03-02|13:01:26.051] Writing clean trie cache to disk         path=C:₩Users₩system888₩AppData₩Local₩Ethereum₩geth₩t
riecache threads=12
INFO [03-02|13:01:26.070] Persisted the clean trie cache           path=C:₩Users₩system888₩AppData₩Local₩Ethereum₩geth₩t
riecache elapsed=14.637ms
INFO [03-02|13:01:26.075] Blockchain stopped
```

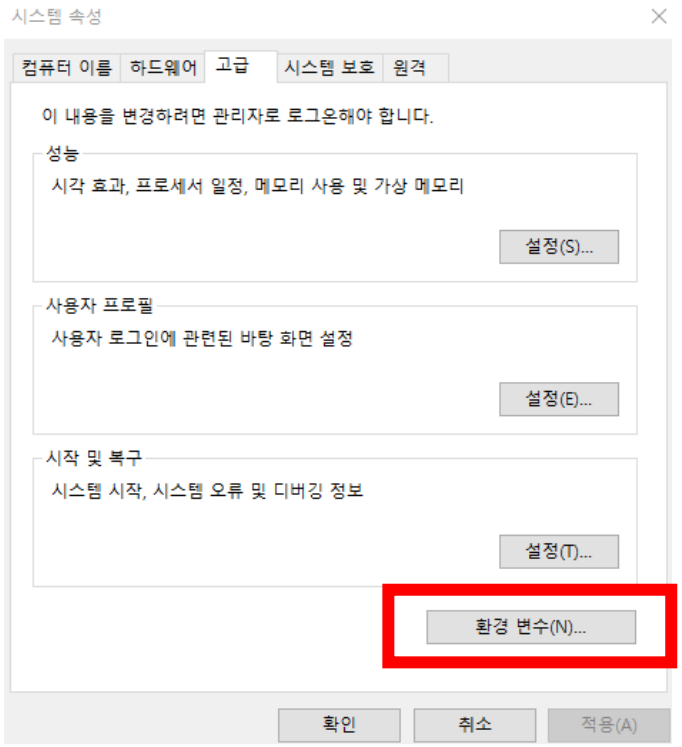
Testnet 접속

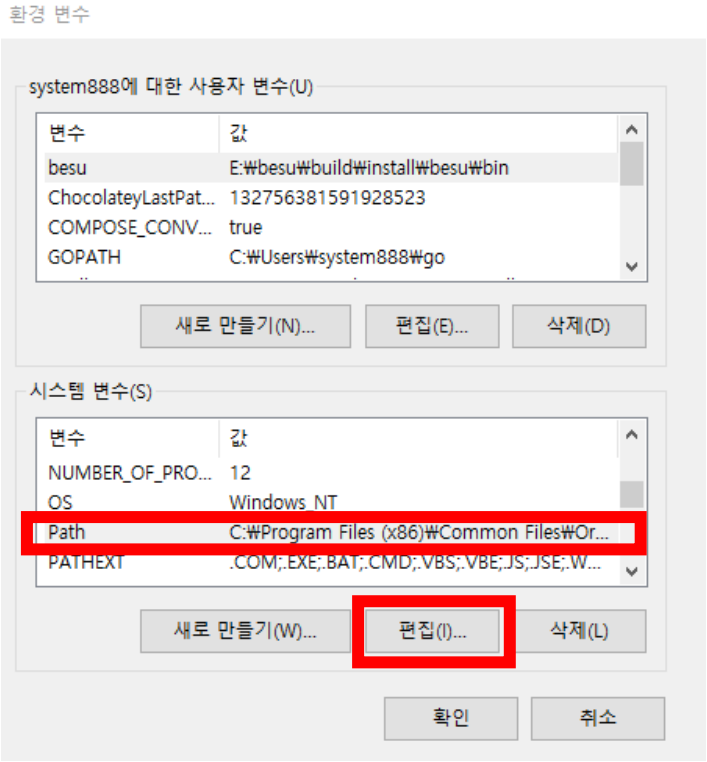
경로가 없다고 뜰 경우



Testnet 접속

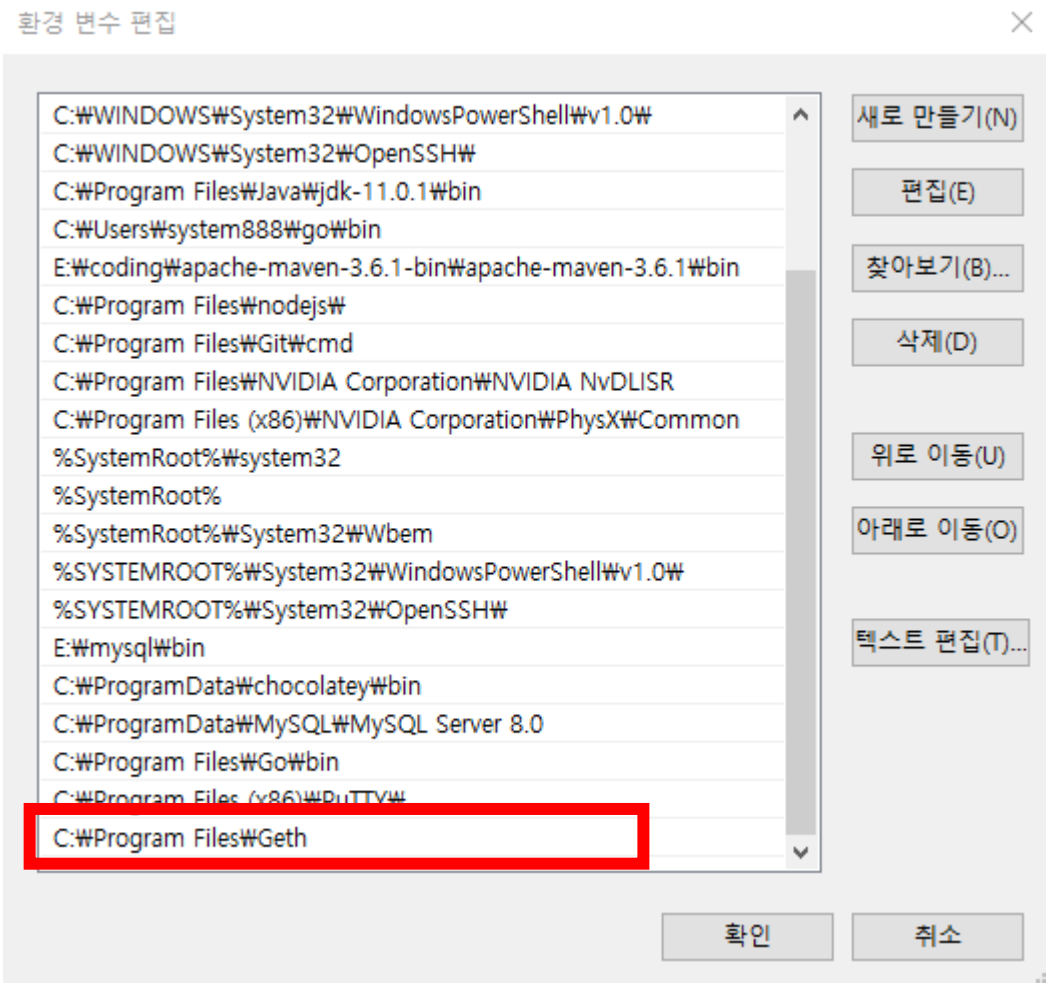
경로가 없다고 뜰 경우





Testnet 접속

경로가 없다고 뜰 경우



Testnet 접속

작업 폴더 만들고 해당 폴더
위치에서 cmd 창 열기

```
system888@DESKTOP-GM35NPN MINGW64 ~/Desktop/ethereum testnet
$ geth --datadir ./datadir/ account new
INFO [03-02|13:18:53.368] Maximum peer count                       ETH=50 LES=0 total=50
Your new account is locked with a password. Please give a password. Do not forget this password.
!! Unsupported terminal, password will be echoed.
```

```
Your new account is locked with a password. Please give a password. Do not forget this password.
!! Unsupported terminal, password will be echoed.
Password: 1234

Repeat password: 1234

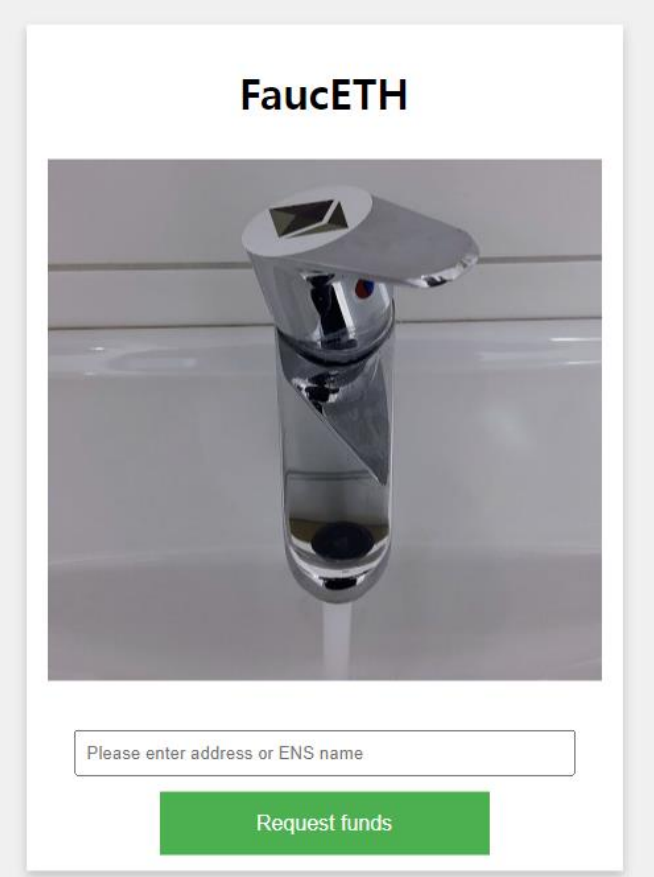

Your new key was generated

Public address of the key:   0xF85ceEb8b153f54fc67bE2a48a662b6eDf2274B4
Path of the secret key file: datadir\keystore\UTC--2022-03-02T04-19-21.218834200Z--f85ceeb8b153f54fc67be2a48a
662b6edf2274b4

- You can share your public address with anyone. Others need it to interact with you.
- You must NEVER share the secret key with anyone! The key controls access to your funds!
- You must BACKUP your key file! Without the key, it's impossible to access account funds!
- You must REMEMBER your password! Without the password, it's impossible to decrypt the key!
```

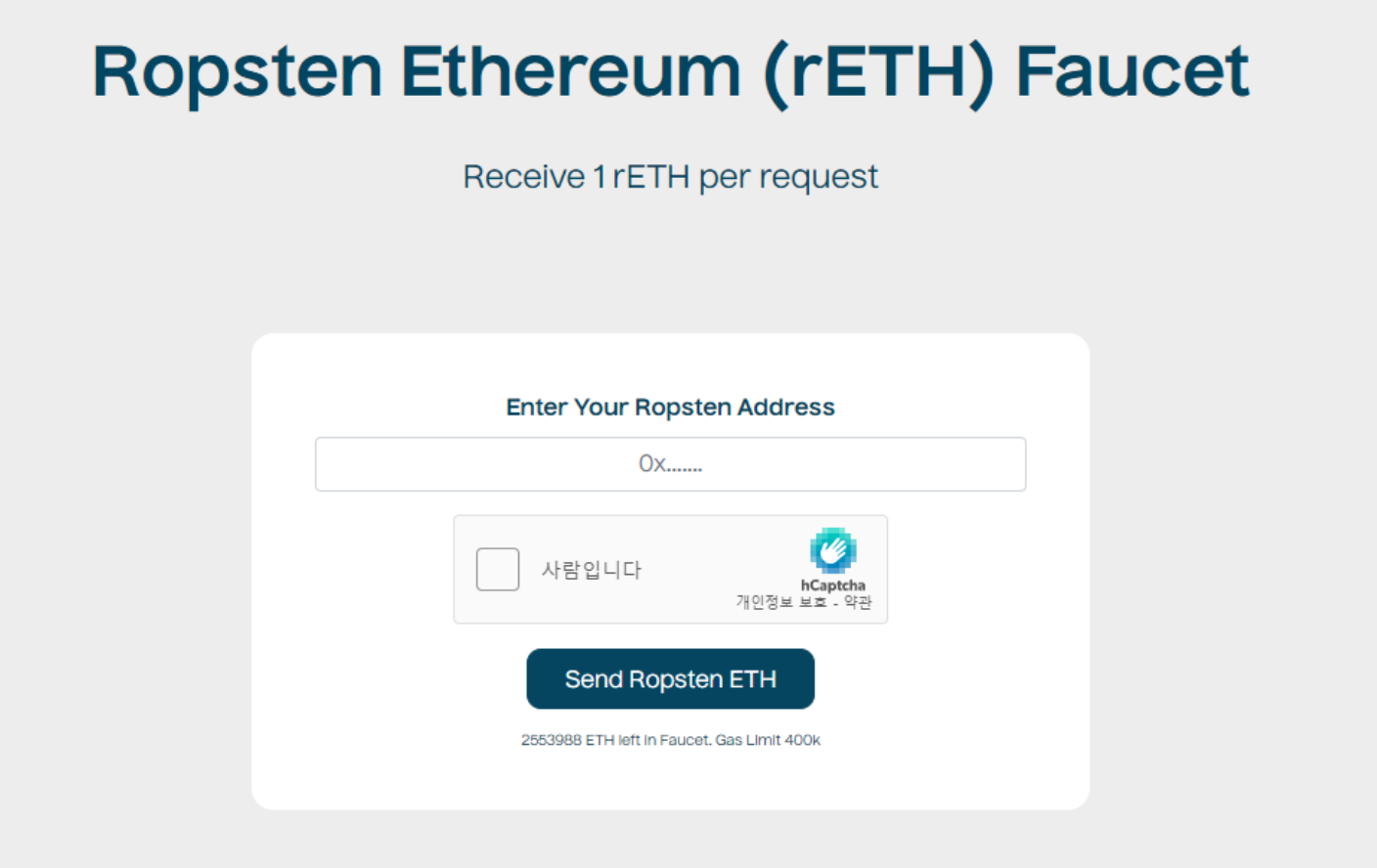
Testnet 접속

https://fauceth.komputing.org/

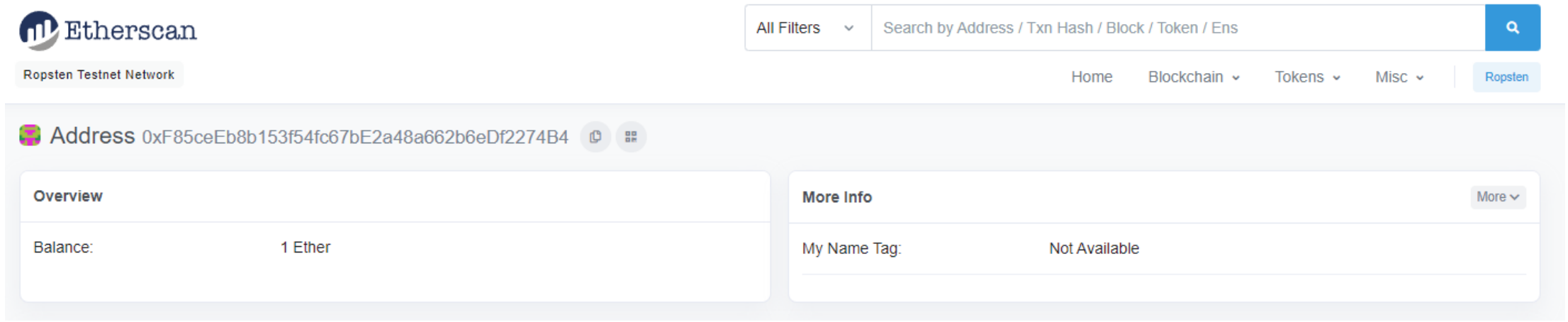


Testnet 접속

https://faucet.dimensions.network/

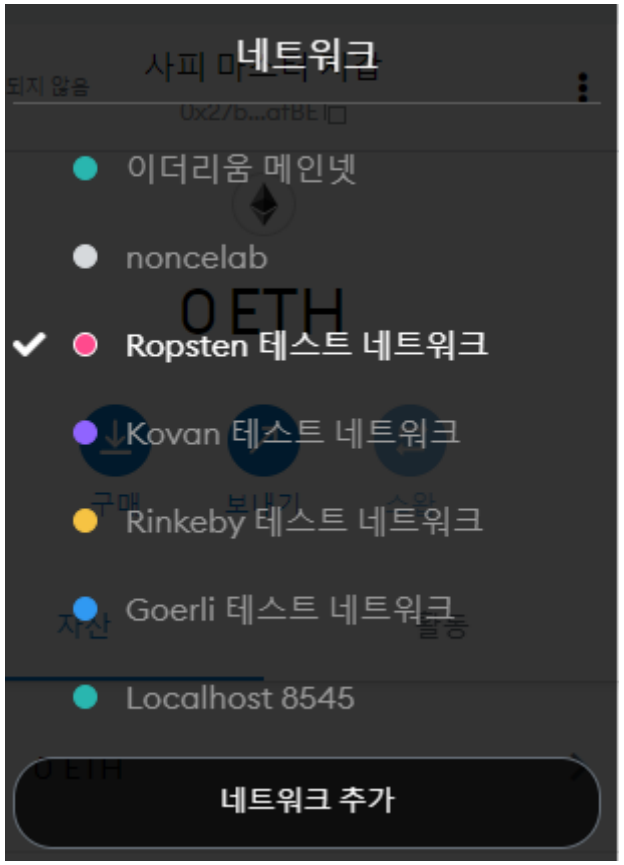


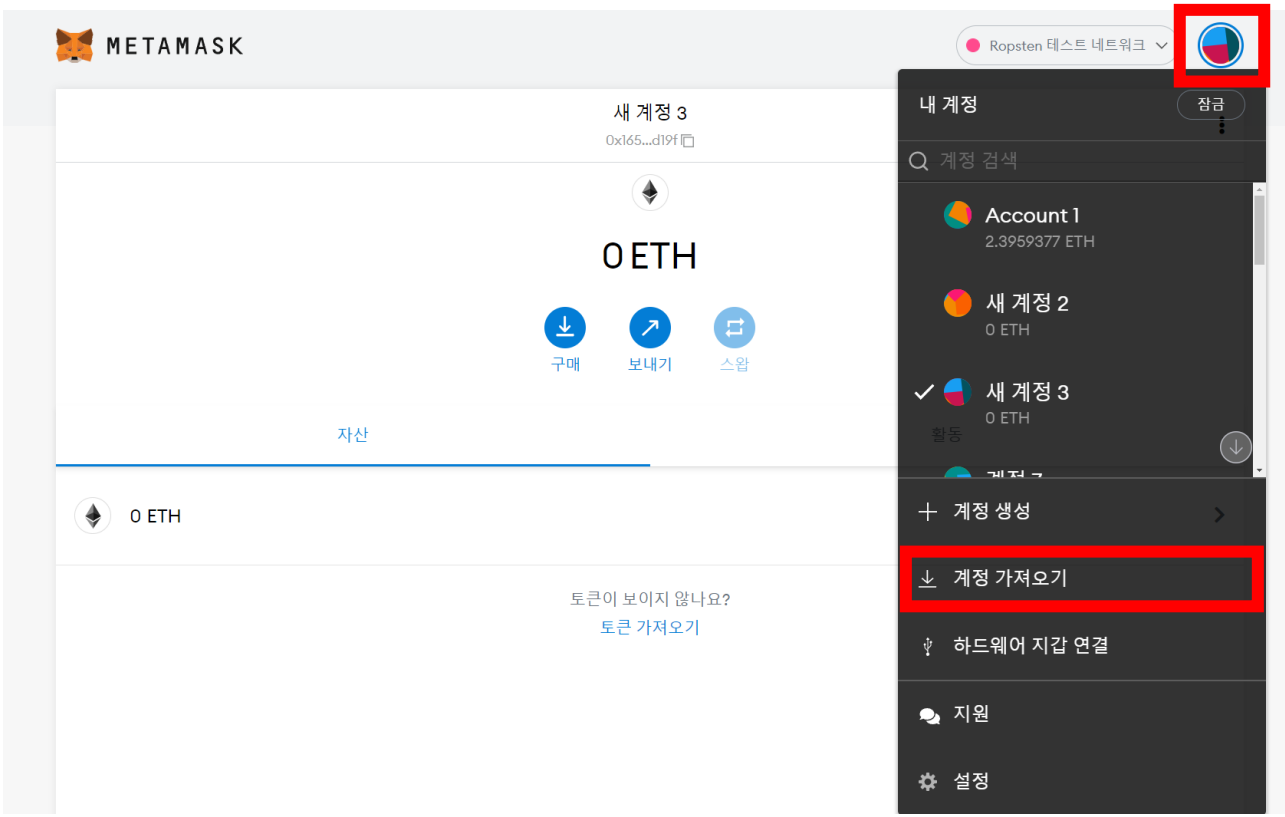
Testnet 접속


Etherscan
Ropsten Testnet Network
All Filters
Search by Address / Txn Hash / Block / Token / Ens
Home
Blockchain
Tokens
Misc
Ropsten
Address 0xF85ceEb8b153f54fc67bE2a48a662b6eDf2274B4
Overview
Balance:
1 Ether
More Info
More
My Name Tag:
Not Available

Testnet 접속

메타 마스크 설치후 접속





Testnet 접속

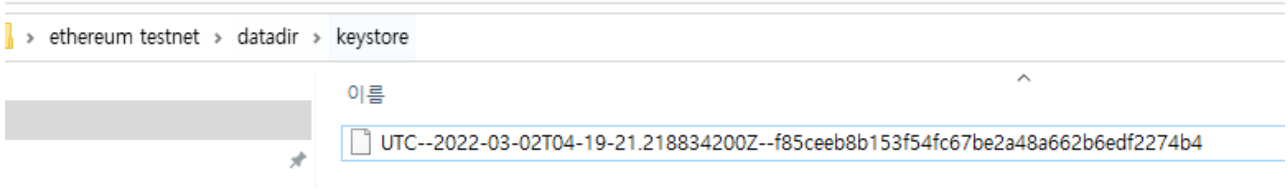
계정 가져오기

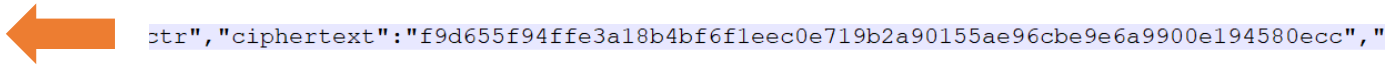
가져온 계정은 생성한 MetaMask 계정 비밀 복구 구문 원본에 연결되지 않습니다. 가져온 계정에 대해 자세히 알아보기 여기

유형 선택 비공개 키

여기에 비공개 키 문자열을 붙여넣으세요.

취소 가져오기





Te

METAMASK

Ropsten 테스트 네트워크

Account 14

0x0Ba...0461

0 ETH

구매 보내기 스왑

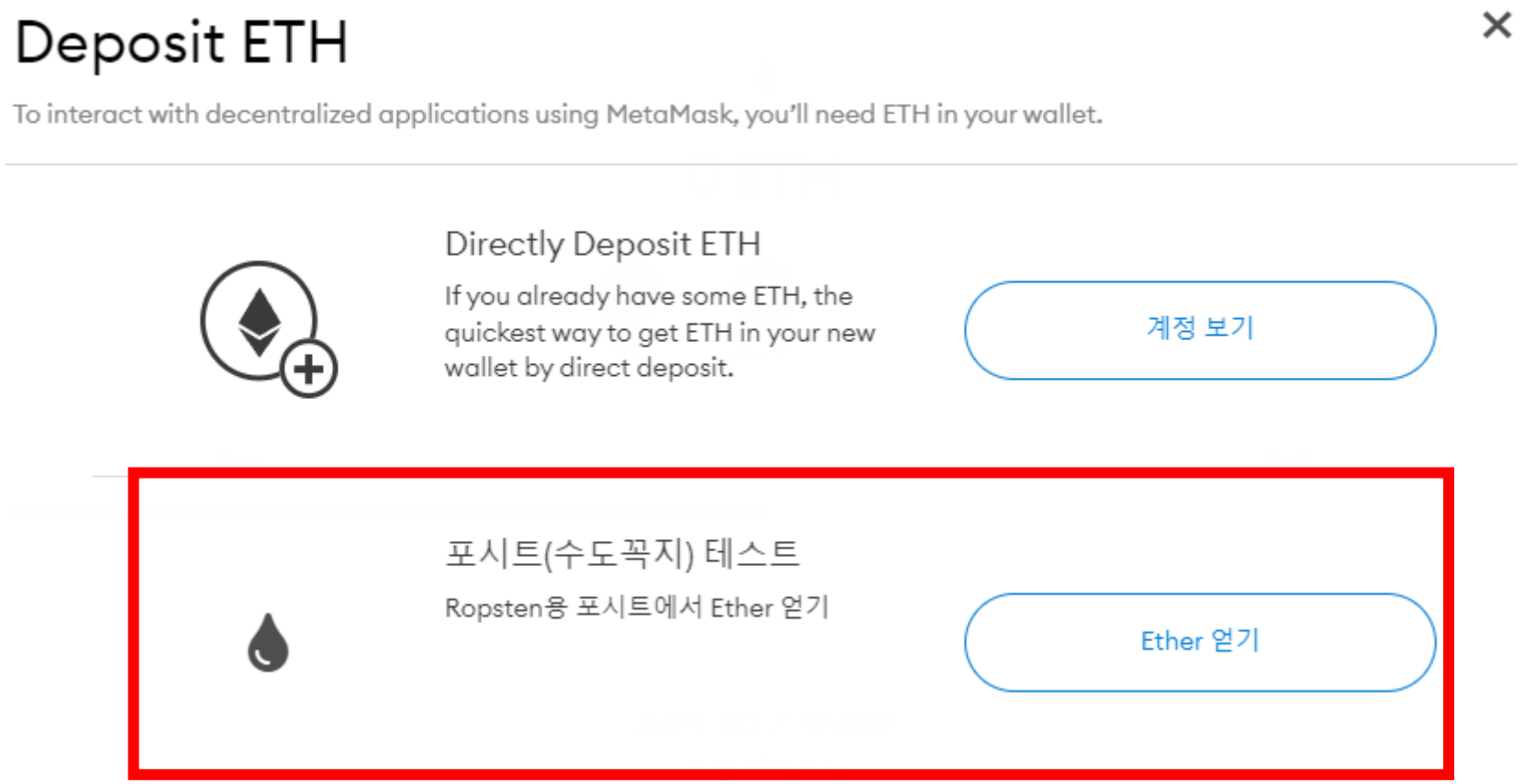
자산 활동

0 ETH

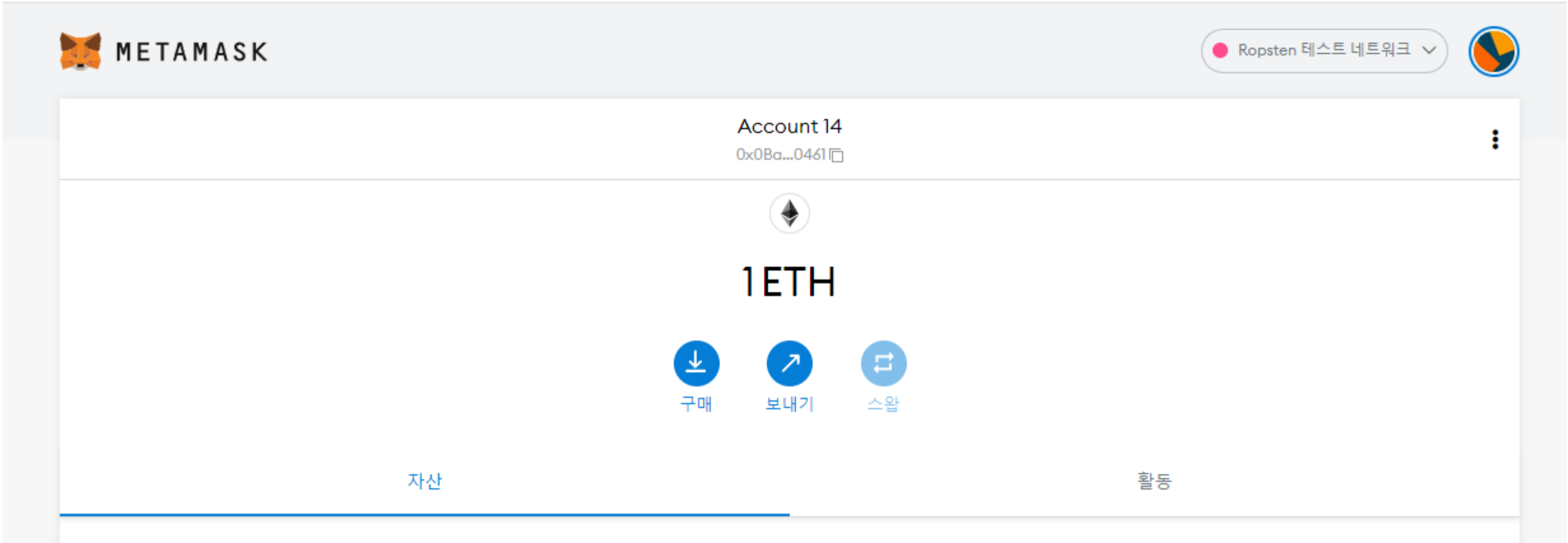
토큰이 보이지 않나요?

토큰 가져오기

Testnet 접속


Deposit ETH
To interact with decentralized applications using MetaMask, you'll need ETH in your wallet.
Directly Deposit ETH
If you already have some ETH, the quickest way to get ETH in your new wallet by direct deposit.
계정 보기
포시트(수도꼭지) 테스트
Ropsten용 포시트에서 Ether 얻기
Ether 얻기

Testnet 접속


METAMASK
Ropsten 테스트 네트워크
Account 14
0x0Ba...0461
1ETH
구매
보내기
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Testnet 접속

테스트넷 동기화

```
$ geth --ropsten --datadir /c/Users/system888/Desktop/ethereum_testnet/datadir/
--http --http.addr 0.0.0.0 -http.api eth,net,web3,personal --http.corsdomain * -
-allow-insecure-unlock
INFO [03-02|14:22:38.126] Starting Geth on Ropsten testnet...
INFO [03-02|14:22:38.207] Maximum peer count                       ETH=50 LES=0
total=50
```

Testnet 접속

테스트넷 동기화

```
ERROR[03-02|14:27:57.171] Expired request does not exist       peer=fc317a320a99bad16e61134945b4ab4eda2ab5975dfd10e8a40bb5d
6cfba3
INFO [03-02|14:27:57.263] Imported new block receipts          count=2048 elapsed=134.167ms number=396,107 hash=3f0190..6b24e
 age=5y2mo3d   size=1004.73KiB
INFO [03-02|14:27:57.374] Imported new block receipts          count=1183 elapsed=107.503ms number=397,290 hash=25f14f..784e2
 age=5y2mo3d   size=738.56KiB
INFO [03-02|14:27:57.475] Imported new block headers           count=2048 elapsed=51.900ms  number=434,176 hash=574770..379d9
 age=5y1mo3w
INFO [03-02|14:27:57.532] Imported new block headers           count=2048 elapsed=55.742ms  number=436,224 hash=d74795..61942
 age=5y1mo3w
INFO [03-02|14:27:57.590] Imported new block headers           count=2048 elapsed=56.221ms  number=438,272 hash=ae341b..519ae
 age=5y1mo3w
INFO [03-02|14:27:58.107] Imported new block receipts          count=704  elapsed=116.970ms number=397,994 hash=7e8671..74581
 age=5y2mo3d   size=535.59KiB
```

```
apsed=3.670ms     number=12,035,801 hash=e3aea1..a25e9d
INFO [03-03|10:35:53.542] State sync in progress                synced=99.11%
 state=66.09GiB accounts=40,045,280@8.68GiB slots=225,968,525@47.31GiB codes=1,9
64,061@10.09GiB eta=8m9.944s
INFO [03-03|10:36:06.074] Imported new block headers            count=1    el
apsed=3.580ms     number=12,035,802 hash=befe87..fd11c4 age=1m10s
INFO [03-03|10:36:12.338] Imported new block headers            count=1    el
apsed=3.538ms     number=12,035,803 hash=5c696b..3b1b82 age=1m3s
INFO [03-03|10:36:12.526] Downloader queue stats                receiptTasks=
0      blockTasks=0      itemSize=36.92KiB  throttle=7101
INFO [03-03|10:36:25.704] State sync in progress                synced=99.14%
 state=66.10GiB accounts=40,053,792@8.69GiB slots=226,019,180@47.32GiB codes=1,9
64,443@10.09GiB eta=7m36.951s
INFO [03-03|10:36:30.971] Imported new block headers            count=1    el
apsed=3.788ms     number=12,035,804 hash=4ed432..62a87c
INFO [03-03|10:36:37.242] Imported new block headers            count=1    el
apsed=4.020ms     number=12,035,805 hash=6fbf75..a59493
```

Testnet 접속

새로운 Console창 띄우고

```
$ geth attach http://localhost:8545
Welcome to the Geth JavaScript console!

instance: Geth/v1.10.16-stable-20356e57/windows-amd64/go1.17.5
coinbase: 0xf85ceeb8b153f54fc67be2a48a662b6edf2274b4
at block: 0 (Thu Jan 01 1970 09:00:00 GMT+0900 (KST))
 modules: eth:1.0 net:1.0 personal:1.0 rpc:1.0 web3:1.0

To exit, press ctrl-d or type exit
> net.listening

true
> eth.syncing

{
  currentBlock: 12035703,
  healedBytecodeBytes: 0,
  healedBytecodes: 0,
  healedTrienodeBytes: 0,
  healedTrienodes: 0,
  healingBytecode: 0,
  healingTrienodes: 0,
  highestBlock: 12035810,
  startingBlock: 7139705,
  syncedAccountBytes: 9328718164,
  syncedAccounts: 40062310,
  syncedBytecodeBytes: 10839661977,
  syncedBytecodes: 1965257,
  syncedStorage: 230193804,
  syncedStorageBytes: 51858405209
}
```

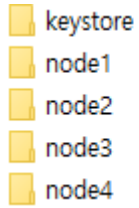
```
> net.peerCount

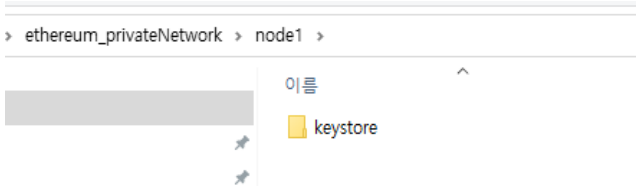
16
> eth.syncing.currentBlock

12035703
```

Private Network 구축

특정 폴더를 만들고 다음과 같이 생성

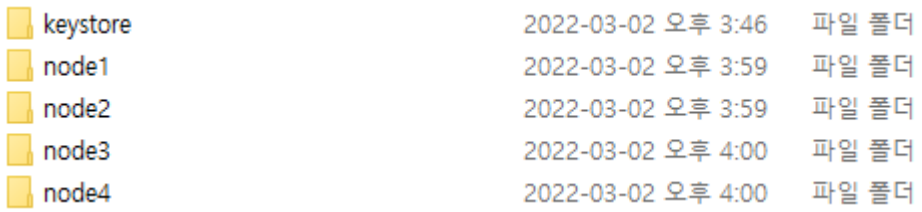


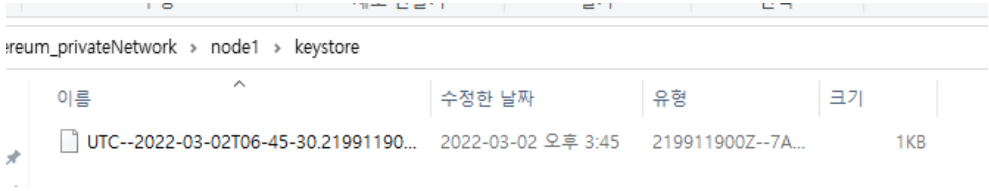


Private Network 구축

해당 명령어를 4번 반복해서 Key 생성 및
Public key 따로 기록

```
system888@DESKTOP-GM35NPN MINGW64 /e/ethereum_privateNetwork
$ geth --datadir /e/ethereum_privateNetwork/keystore account new
```





Keystore에 저장되어있는 key 파일들을 하나씩
각 노드 파일의 keystore 폴더로 복사

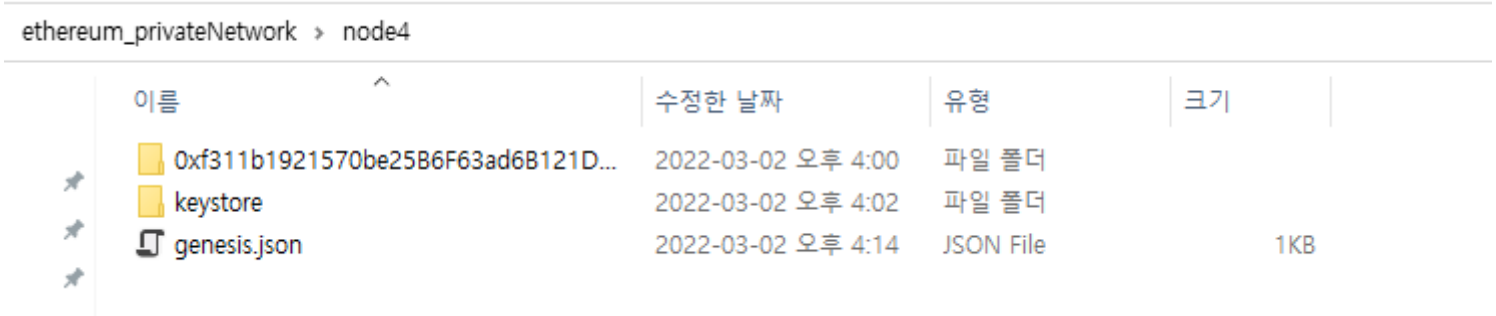
Private Network 구축

genesis.json 파일 생성

```
{
  "config": {
    "chainId": 1005,
    "homesteadBlock": 0,
    "eip150Block": 0,
    "eip155Block": 0,
    "eip158Block": 0,
    "byzantiumBlock": 0,
    "constantinopleBlock": 0,
    "petersburgBlock": 0,
    "ethash": {}
  },
  "difficulty": "1",
  "gasLimit": "8000000",
  "alloc": {
    "7a8fF062901918521989e609488C65628b87eE3E": { "balance": "400000"},
    "D13446791110B9831a26225F80936C43d56b12aB": { "balance": "300000"},
    "e510DecE1d305B03EdE8c01E17E602bcc36aCe90": { "balance": "200000"},
    "f311b1921570be25B6F63ad6B121D8A4F3CDc35d": { "balance": "100000"}
  }
}
```

Private Network 구축

생성된 genesis.json 파일을
각각의 노드 폴더안으로 이동



Private Network 구축

genesis.json 초기화

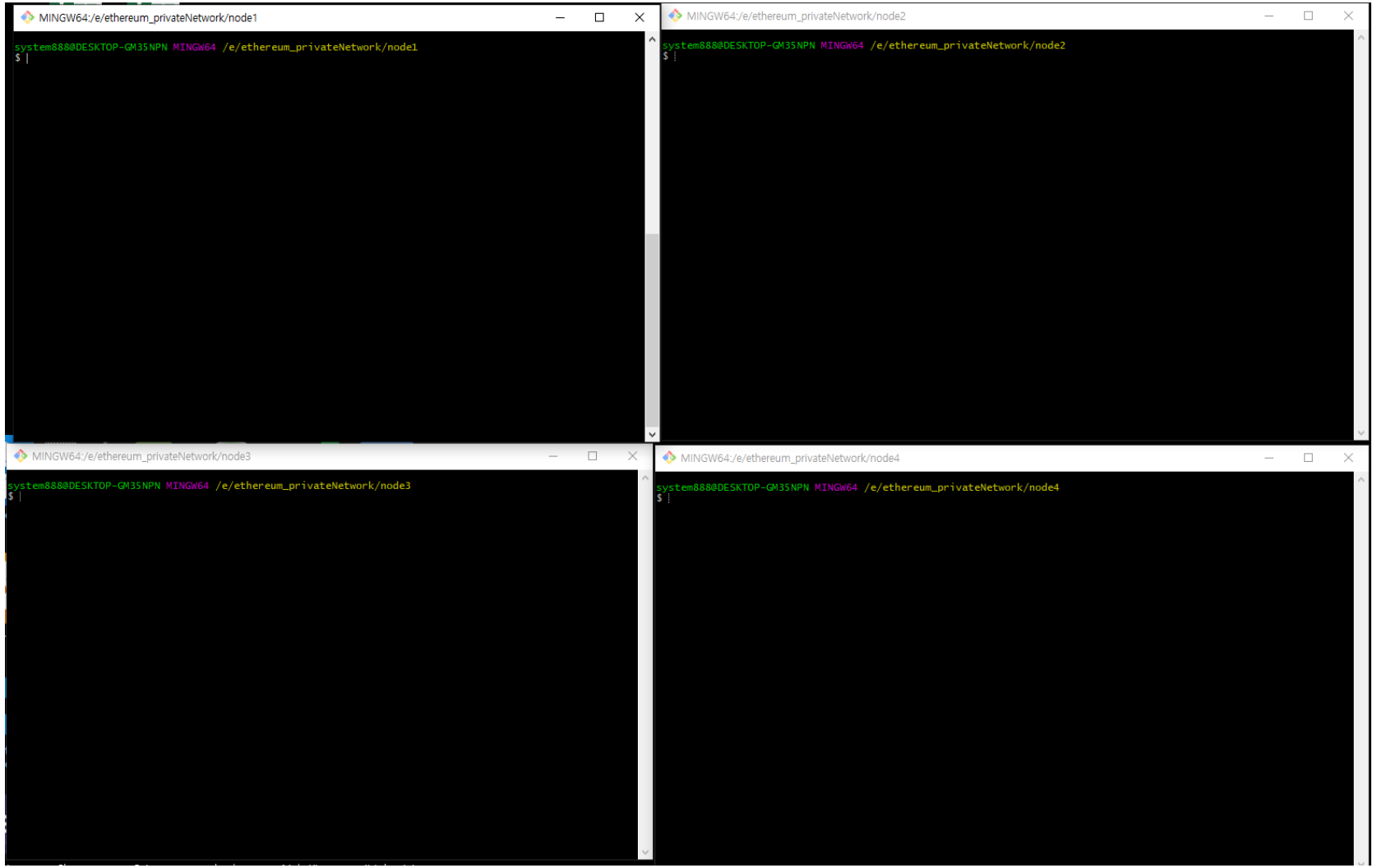
```
$ geth --datadir /e/ethereum_privateNetwork/node1 init genesis.json
INFO [03-02|16:20:35.577] Maximum peer count                       ETH=50 LES=0
total=50
INFO [03-02|16:20:35.656] Set global gas cap                       cap=50,000,00
0
INFO [03-02|16:20:35.656] Allocated cache and file handles         database=E:\e
thereum_privateNetwork\node1\geth\chaindata cache=16.00MiB handles=16
INFO [03-02|16:20:35.971] Writing custom genesis block
INFO [03-02|16:20:35.988] Persisted trie from memory database      nodes=7 size=
893.00B time=16.7556ms gcnodes=0 gcsize=0.00B gctime=0s livenodes=1 livesize=0.0
0B
INFO [03-02|16:20:35.991] Successfully wrote genesis state         database=chai
ndata hash=945154..f79f6d
INFO [03-02|16:20:35.991] Allocated cache and file handles         database=E:\e
thereum_privateNetwork\node1\geth\lightchaindata cache=16.00MiB handles=16
INFO [03-02|16:20:36.479] Writing custom genesis block
INFO [03-02|16:20:36.480] Persisted trie from memory database      nodes=7 size=
893.00B time="521.3µs" gcnodes=0 gcsize=0.00B gctime=0s livenodes=1 livesize=0.0
0B
INFO [03-02|16:20:36.482] Successfully wrote genesis state         database=ligh
tchaindata hash=945154..f79f6d
```

```
$ geth --datadir /e/ethereum_privateNetwork/node2 init genesis.json
INFO [03-02|16:21:02.095] Maximum peer count                       ETH=50 LES=0 total=50
INFO [03-02|16:21:02.175] Set global gas cap                       cap=50,000,000
INFO [03-02|16:21:02.175] Allocated cache and file handles         database=E:\ethereum_privateNetwork\
node2\geth\chaindata cache=16.00MiB handles=16
INFO [03-02|16:21:02.894] Writing custom genesis block
INFO [03-02|16:21:02.911] Persisted trie from memory database      nodes=7 size=893.00B time=15.8326ms
gcnodes=0 gcsize=0.00B gctime=0s livenodes=1 livesize=0.00B
INFO [03-02|16:21:02.913] Successfully wrote genesis state         database=chaindata hash=945154..f79f
6d
INFO [03-02|16:21:02.913] Allocated cache and file handles         database=E:\ethereum_privateNetwork\
node2\geth\lightchaindata cache=16.00MiB handles=16
INFO [03-02|16:21:03.702] Writing custom genesis block
INFO [03-02|16:21:03.725] Persisted trie from memory database      nodes=7 size=893.00B time=23.2234ms
gcnodes=0 gcsize=0.00B gctime=0s livenodes=1 livesize=0.00B
INFO [03-02|16:21:03.728] Successfully wrote genesis state         database=lightchaindata hash=945154.
.f79f6d
```

```
$ geth --datadir /e/ethereum_privateNetwork/node3 init genesis.json
INFO [03-02|16:21:29.912] Maximum peer count                       ETH=50 LES=0 total=50
INFO [03-02|16:21:29.998] Set global gas cap                       cap=50,000,000
INFO [03-02|16:21:29.998] Allocated cache and file handles         database=E:\ethereum_privateNetwork\
node3\geth\chaindata cache=16.00MiB handles=16
INFO [03-02|16:21:30.368] Writing custom genesis block
INFO [03-02|16:21:30.409] Persisted trie from memory database      nodes=7 size=893.00B time=40.7031ms
gcnodes=0 gcsize=0.00B gctime=0s livenodes=1 livesize=0.00B
INFO [03-02|16:21:30.412] Successfully wrote genesis state         database=chaindata hash=945154..f79f
6d
INFO [03-02|16:21:30.412] Allocated cache and file handles         database=E:\ethereum_privateNetwork\
node3\geth\lightchaindata cache=16.00MiB handles=16
INFO [03-02|16:21:30.760] Writing custom genesis block
INFO [03-02|16:21:30.801] Persisted trie from memory database      nodes=7 size=893.00B time=40.9781ms
gcnodes=0 gcsize=0.00B gctime=0s livenodes=1 livesize=0.00B
INFO [03-02|16:21:30.803] Successfully wrote genesis state         database=lightchaindata hash=945154.
.f79f6d
```

```
system888@DESKTOP-GM35NPN MINGW64 /e/ethereum_privateNetwork/node1
$ geth --datadir /e/ethereum_privateNetwork/node4 init genesis.json
INFO [03-02|16:21:54.558] Maximum peer count                       ETH=50 LES=0 total=50
INFO [03-02|16:21:54.643] Set global gas cap                       cap=50,000,000
INFO [03-02|16:21:54.643] Allocated cache and file handles         database=E:\ethereum_privateNetwork\
node4\geth\chaindata cache=16.00MiB handles=16
INFO [03-02|16:21:55.100] Writing custom genesis block
INFO [03-02|16:21:55.114] Persisted trie from memory database      nodes=7 size=893.00B time=13.9221ms
gcnodes=0 gcsize=0.00B gctime=0s livenodes=1 livesize=0.00B
INFO [03-02|16:21:55.117] Successfully wrote genesis state         database=chaindata hash=945154..f79f
6d
INFO [03-02|16:21:55.117] Allocated cache and file handles         database=E:\ethereum_privateNetwork\
node4\geth\lightchaindata cache=16.00MiB handles=16
INFO [03-02|16:21:55.599] Writing custom genesis block
INFO [03-02|16:21:55.614] Persisted trie from memory database      nodes=7 size=893.00B time=13.3818ms
gcnodes=0 gcsize=0.00B gctime=0s livenodes=1 livesize=0.00B
INFO [03-02|16:21:55.617] Successfully wrote genesis state         database=lightchaindata hash=945154.
.f79f6d
```

Private Network 구축



Private Network 구축

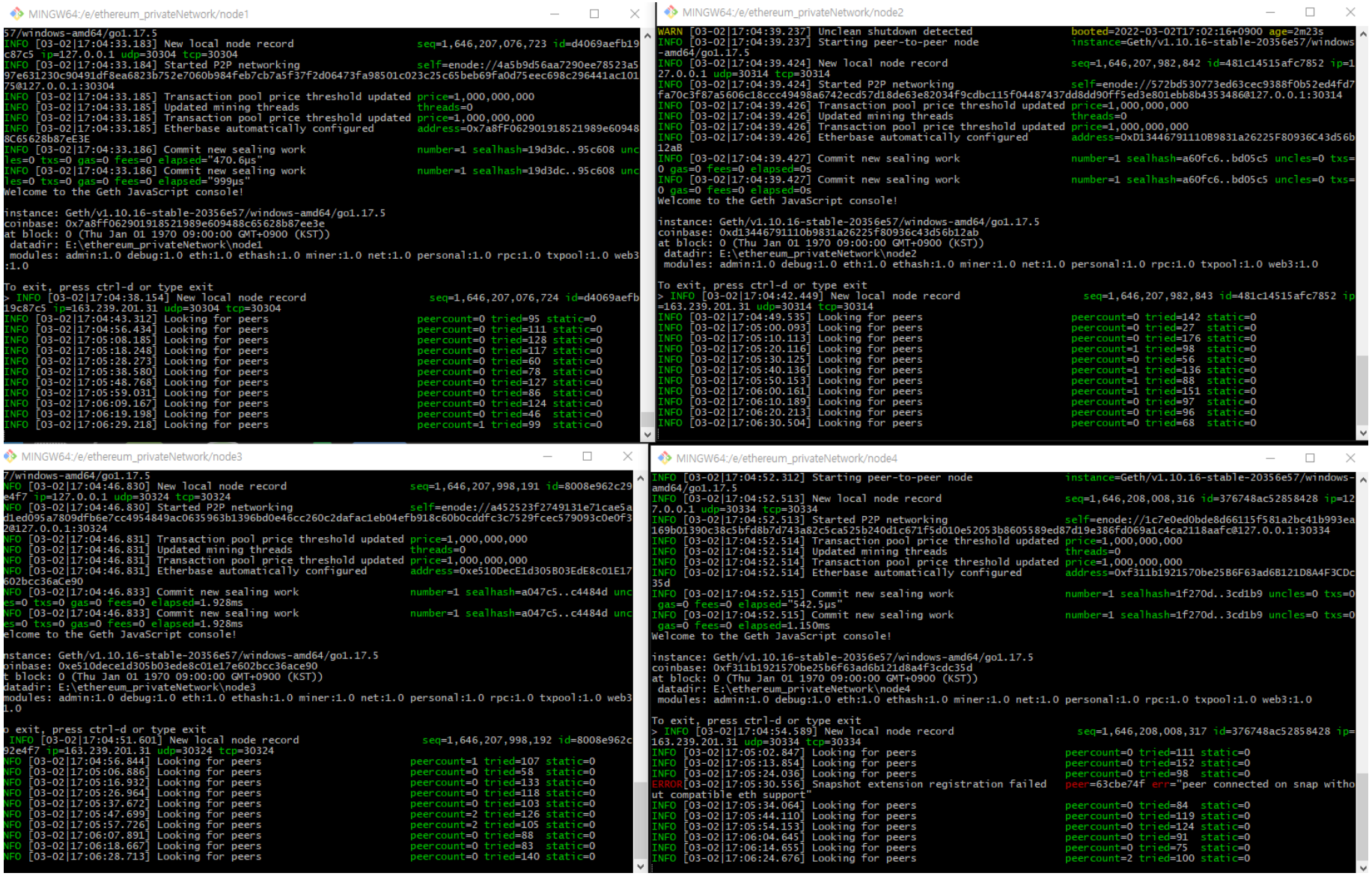
```
geth --networkid 1005 --datadir /e/ethereum_privateNetwork/node1/ --ipcdisable --http.port 8545 --ws.port 8546 --http.api
admin,db,eth,debug,miner,net,shh,txpool,personal,web3, --ws.api admin,db,eth,debug,miner,net,shh,txpool,personal,web3, --mine --port 30304 --allow-insecure-unlock
console --snapshot
```

```
geth --networkid 1005 --datadir /e/ethereum_privateNetwork/node2/ --ipcdisable --http.port 8555 --ws.port 8556 --http.api
admin,db,eth,debug,miner,net,shh,txpool,personal,web3, --ws.api admin,db,eth,debug,miner,net,shh,txpool,personal,web3, --mine --port 30314 --allow-insecure-unlock
console
```

```
geth --networkid 1005 --datadir /e/ethereum_privateNetwork/node3/ --ipcdisable --http.port 8565 --ws.port 8566 --http.api
admin,db,eth,debug,miner,net,shh,txpool,personal,web3, --ws.api admin,db,eth,debug,miner,net,shh,txpool,personal,web3, --mine --port 30324 --allow-insecure-unlock
console
```

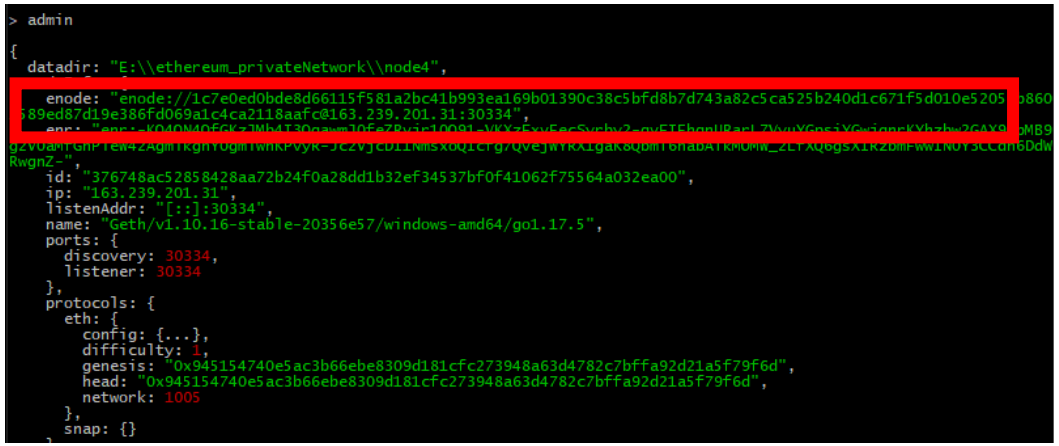
```
geth --networkid 1005 --datadir /e/ethereum_privateNetwork/node4/ --ipcdisable --http.port 8575 --ws.port 8576 --http.api
admin,db,eth,debug,miner,net,shh,txpool,personal,web3, --ws.api admin,db,eth,debug,miner,net,shh,txpool,personal,web3, --mine --port 30334 --allow-insecure-unlock
console
```

Private Network 구축



Private Network 구축

각 터미널에서 엔터 누른후
admin 입력



Private Network 구축

"enode://4a5b9d56aa7290ee78523a597e631230c90491df8ea6823b752e7060b984feb7cb7a5f37f2d06473fa98501c023c25c65beb69fa0d75eec698c296441ac10175@163.239.201.31:30304"

"enode://572bd530773ed63cec9388f0b52ed4fd7fa70c3f87a5606c18ccc49498a6742ecd57d18de63e82034f9cdbc115f04487437dd8dd90ff5ed3e801ebb8b4353486@163.239.201.31:30314"

"enode://a452523f2749131e71cae5a1d1ed095a7809dfb6e7cc4954849ac0635963b1396bd0e46cc260c2dafac1eb04efb918c60b0cddfc3c7529fcec579093c0e0f352@163.239.201.31:30324"

"enode://1c7e0ed0bde8d66115f581a2bc41b993ea169b01390c38c5bfd8b7d743a82c5ca525b240d1c671f5d010e52053b8605589ed87d19e386fd069a1c4ca2118aafc@163.239.201.31:30334"

Private Network 구축

노드 2,3,4 Terminal 이동

admin.addPeer("enode1 정보")

노드 3,4 Terminal 이동

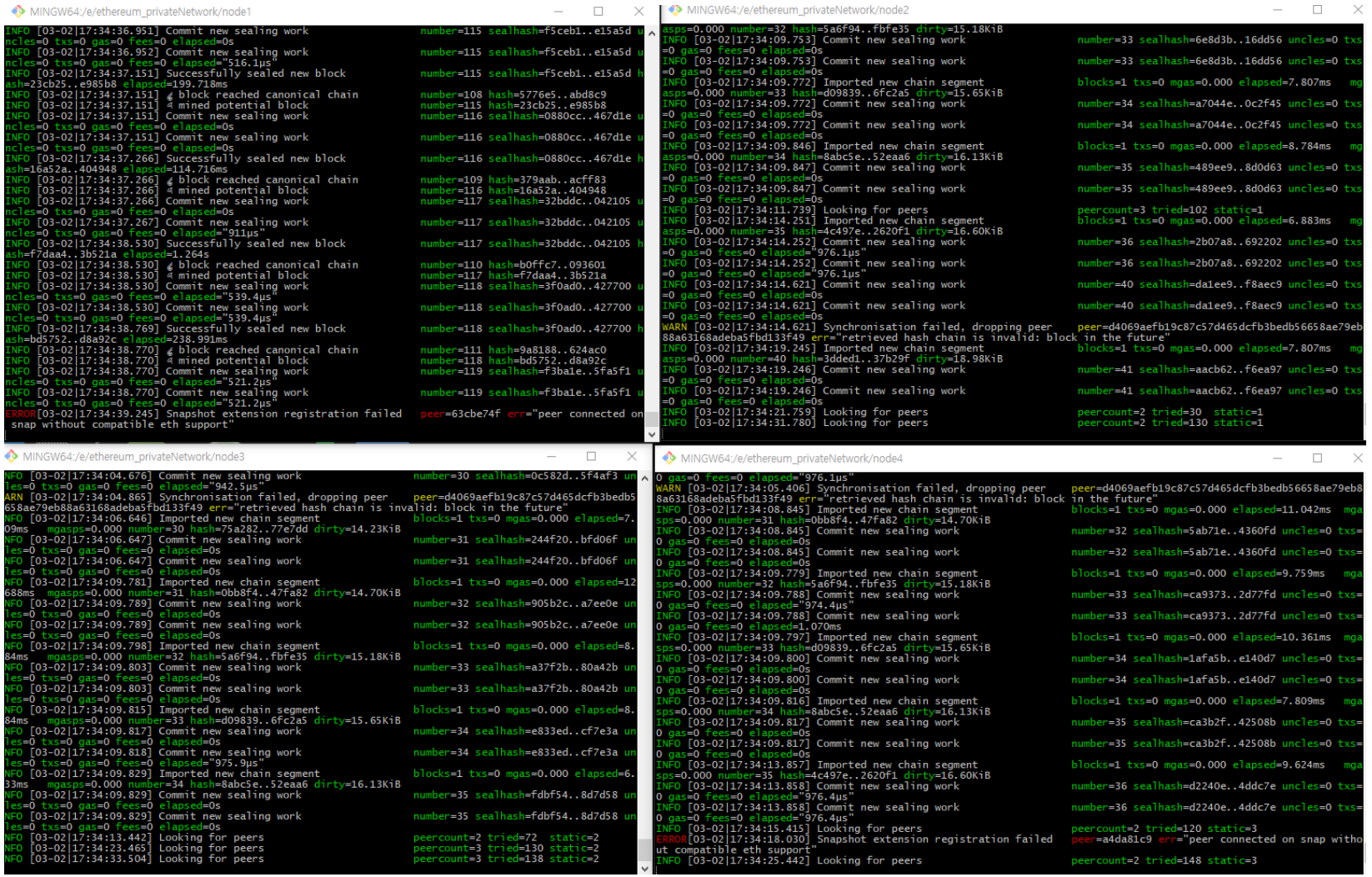
admin.addPeer("enode2 정보")

노드 4 Terminal 이동

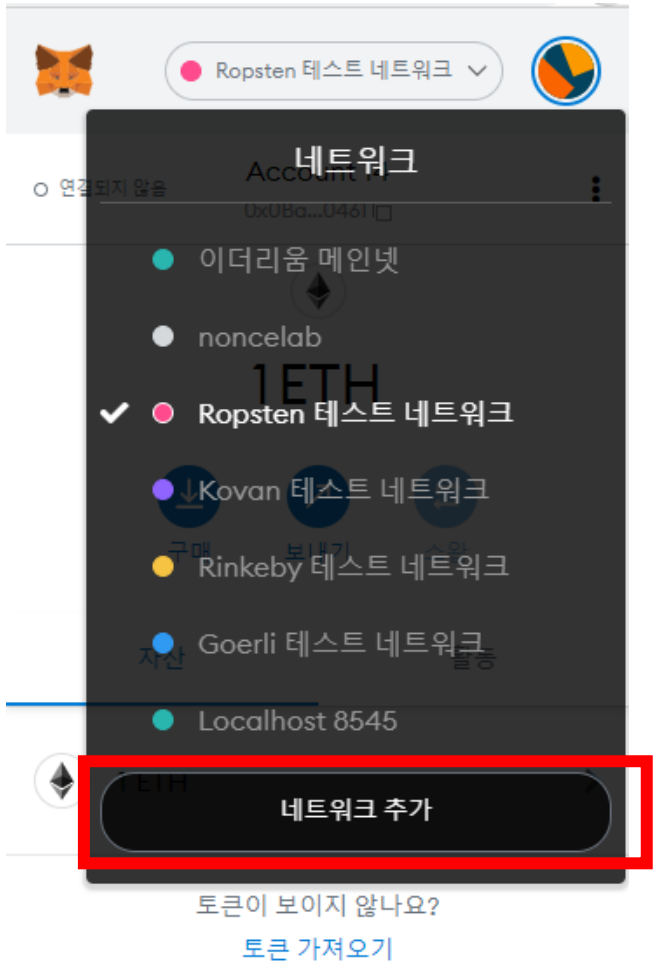
admin.addPeer("enode3 정보")

Private Network 구축

miner.start()



Private Network 구축



Private Network 구축

```
COMMANDS:
   account                  Manage accounts
   attach                   Start an interactive JavaScript environment (connect to node)
   console                  Start an interactive JavaScript environment
   db                       Low level database operations
   dump                     Dump a specific block from storage
   dumpconfig               Show configuration values
   dumpgenesis              Dumps genesis block JSON configuration to stdout
   export                   Export blockchain into file
   export-preimages         Export the preimage database into an RLP stream
   import                   Import a blockchain file
   import-preimages         Import the preimage database from an RLP stream
   init                     Bootstrap and initialize a new genesis block
   js                       Execute the specified JavaScript files
   license                  Display license information
   makecache                Generate ethash verification cache (for testing)
   makedag                  Generate ethash mining DAG (for testing)
   removedb                 Remove blockchain and state databases
   show-deprecated-flags    Show flags that have been deprecated
   snapshot                 A set of commands based on the snapshot
   version                  Print version numbers
   version-check            Checks (online) whether the current version suffers from any known security vulnerabilities
   wallet                   Manage Ethereum presale wallets
   help, h                  Shows a list of commands or help for one command
```

Private Network 구축

```
ETHEREUM OPTIONS:
  --config value                 TOML configuration file
  --datadir value                Data directory for the databases and keystore (default: "C:\\Users\\system888\\AppData\\Local\\Ethereum")
  --datadir.ancient value        Data directory for ancient chain segments (default = inside chaindata)
  --datadir.minfreedisk value    Minimum free disk space in MB, once reached triggers auto shut down (default = --cache.gc converted to MB, 0 = disabled)
  --keystore value               Directory for the keystore (default = inside the datadir)
  --usb                          Enable monitoring and management of USB hardware wallets
  --pcscdpath value              Path to the smartcard daemon (pcscd) socket file
  --networkid value              Explicitly set network id (integer)(For testnets: use --ropsten, --rinkeby, --goerli instead) (default: 1)
  --mainnet                      Ethereum mainnet
  --goerli                       Görli network: pre-configured proof-of-authority test network
  --rinkeby                      Rinkeby network: pre-configured proof-of-authority test network
  --ropsten                      Ropsten network: pre-configured proof-of-work test network
  --sepolia                      Sepolia network: pre-configured proof-of-work test network
  --syncmode value               Blockchain sync mode ("snap", "full" or "light") (default: snap)
  --exitwhensynced               Exits after block synchronisation completes
  --gcmode value                 Blockchain garbage collection mode ("full", "archive") (default: "full")
  --txlookuplimit value          Number of recent blocks to maintain transactions index for (default = about one year, 0 = entire chain) (default: 2350000)
  --ethstats value               Reporting URL of a ethstats service (nodename:secret@host:port)
  --identity value               Custom node name
  --lightkdf                     Reduce key-derivation RAM & CPU usage at some expense of KDF strength
  --whitelist value              Comma separated block number-to-hash mappings to enforce (<number>=<hash>)
```

Private Network 구축

```
LIGHT CLIENT OPTIONS:
  --light.serve value            Maximum percentage of time allowed for serving LES requests (multi-threaded processing allows
values over 100) (default: 0)
  --light.ingress value           Incoming bandwidth limit for serving light clients (kilobytes/sec, 0 = unlimited) (default: 0)
  --light.egress value            Outgoing bandwidth limit for serving light clients (kilobytes/sec, 0 = unlimited) (default: 0)
  --light.maxpeers value            Maximum number of light clients to serve, or light servers to attach to (default: 100)
  --ulc.servers value            List of trusted ultra-light servers
  --ulc.fraction value            Minimum % of trusted ultra-light servers required to announce a new head (default: 75)
  --ulc.onlyannounce              Ultra light server sends announcements only
  --light.nopruning              Disable ancient light chain data pruning
  --light.nosyncserve             Enables serving light clients before syncing

DEVELOPER CHAIN OPTIONS:
  --dev                      Ephemeral proof-of-authority network with a pre-funded developer account, mining enabled
  --dev.period value              Block period to use in developer mode (0 = mine only if transaction pending) (default: 0)
  --dev.gaslimit value            Initial block gas limit (default: 11500000)
```

Private Network 구축

```
ETHASH OPTIONS:
  --ethash.cachedir value          Directory to store the ethash verification caches (default = inside the datadir)
  --ethash.cachesinmem value       Number of recent ethash caches to keep in memory (16MB each) (default: 2)
  --ethash.cachesondisk value      Number of recent ethash caches to keep on disk (16MB each) (default: 3)
  --ethash.cacheslockmmap          Lock memory maps of recent ethash caches
  --ethash.dagdir value            Directory to store the ethash mining DAGs (default: "C:\\Users\\system888\\AppData\\Local\\Ethash")
  --ethash.dagsinmem value         Number of recent ethash mining DAGs to keep in memory (1+GB each) (default: 1)
  --ethash.dagsondisk value        Number of recent ethash mining DAGs to keep on disk (1+GB each) (default: 2)
  --ethash.dagslockmmap            Lock memory maps for recent ethash mining DAGs

TRANSACTION POOL OPTIONS:
  --txpool.locals value            Comma separated accounts to treat as locals (no flush, priority inclusion)
  --txpool.nolocals                Disables price exemptions for locally submitted transactions
  --txpool.journal value           Disk journal for local transaction to survive node restarts (default: "transactions.rlp")
  --txpool.rejournal value         Time interval to regenerate the local transaction journal (default: 1h0m0s)
  --txpool.pricelimit value        Minimum gas price limit to enforce for acceptance into the pool (default: 1)
  --txpool.pricebump value         Price bump percentage to replace an already existing transaction (default: 10)
  --txpool.accountslots value      Minimum number of executable transaction slots guaranteed per account (default: 16)
  --txpool.globalslots value       Maximum number of executable transaction slots for all accounts (default: 5120)
  --txpool.accountqueue value      Maximum number of non-executable transaction slots permitted per account (default: 64)
  --txpool.globalqueue value       Maximum number of non-executable transaction slots for all accounts (default: 1024)
  --txpool.lifetime value          Maximum amount of time non-executable transaction are queued (default: 3h0m0s)
```

Private Network 구축

```
PERFORMANCE TUNING OPTIONS:
  --cache value                Megabytes of memory allocated to internal caching (default = 4096 mainnet full node, 128 light mode) (default: 1024)
  --cache.database value           Percentage of cache memory allowance to use for database io (default: 50)
  --cache.trie value           Percentage of cache memory allowance to use for trie caching (default = 15% full mode, 30% archive mode) (default: 15)
  --cache.trie.journal value       Disk journal directory for trie cache to survive node restarts (default: "triecache")
  --cache.trie.rejournal value     Time interval to regenerate the trie cache journal (default: 1h0m0s)
  --cache.gc value             Percentage of cache memory allowance to use for trie pruning (default = 25% full mode, 0% archive mode) (default: 25)
  --cache.snapshot value           Percentage of cache memory allowance to use for snapshot caching (default = 10% full mode, 20% archive mode) (default: 10)
  --cache.noprefetch           Disable heuristic state prefetch during block import (less CPU and disk IO, more time waiting for data)
  --cache.preimages            Enable recording the SHA3/keccak preimages of trie keys

ACCOUNT OPTIONS:
  --unlock value               Comma separated list of accounts to unlock
  --password value             Password file to use for non-interactive password input
  --signer value               External signer (url or path to ipc file)
  --allow-insecure-unlock          Allow insecure account unlocking when account-related RPCs are exposed by http
```

Private Network 구축

```
API AND CONSOLE OPTIONS:
  --ipcdisable                  Disable the IPC-RPC server
  --ipcpath value               Filename for IPC socket/pipe within the datadir (explicit paths escape it)
  --http                        Enable the HTTP-RPC server
  --http.addr value             HTTP-RPC server listening interface (default: "localhost")
  --http.port value             HTTP-RPC server listening port (default: 8545)
  --http.api value              API's offered over the HTTP-RPC interface
  --http.rpcprefix value        HTTP path path prefix on which JSON-RPC is served. Use '/' to serve on all paths.
  --http.corsdomain value       Comma separated list of domains from which to accept cross origin requests (browser enforced)
  --http.vhosts value           Comma separated list of virtual hostnames from which to accept requests (server enforced). Accepts '*' wildcard. (default: "localhost")
  --ws                          Enable the WS-RPC server
  --ws.addr value               WS-RPC server listening interface (default: "localhost")
  --ws.port value               WS-RPC server listening port (default: 8546)
  --ws.api value                API's offered over the WS-RPC interface
  --ws.rpcprefix value          HTTP path prefix on which JSON-RPC is served. Use '/' to serve on all paths.
  --ws.origins value            Origins from which to accept websockets requests
  --graphql                     Enable GraphQL on the HTTP-RPC server. Note that GraphQL can only be started if an HTTP server is started as well.
  --graphql.corsdomain value    Comma separated list of domains from which to accept cross origin requests (browser enforced)
  --graphql.vhosts value        Comma separated list of virtual hostnames from which to accept requests (server enforced). Accepts '*' wildcard. (default: "localhost")
  --rpc.gascap value            Sets a cap on gas that can be used in eth_call/estimateGas (0=infinite) (default: 50000000)
  --rpc.evmtimeout value        Sets a timeout used for eth_call (0=infinite) (default: 5s)
  --rpc.txfeecap value          Sets a cap on transaction fee (in ether) that can be sent via the RPC APIs (0 = no cap) (default: 1)
  --rpc.allow-unprotected-txs   Allow for unprotected (non EIP155 signed) transactions to be submitted via RPC
  --jspath loadScript           JavaScript root path for loadScript (default: ".")
  --exec value                  Execute JavaScript statement
  --preload value               Comma separated list of JavaScript files to preload into the console
```

Private Network 구축

```
NETWORKING OPTIONS:
  --bootnodes value            Comma separated enode URLs for P2P discovery bootstrap
  --discovery.dns value        Sets DNS discovery entry points (use "" to disable DNS)
  --port value                 Network listening port (default: 30303)
  --maxpeers value             Maximum number of network peers (network disabled if set to 0) (default: 50)
  --maxpendpeers value         Maximum number of pending connection attempts (defaults used if set to 0) (default: 0)
  --nat value                  NAT port mapping mechanism (any|none|upnp|pmp|extip:<IP>) (default: "any")
  --nodiscover                 Disables the peer discovery mechanism (manual peer addition)
  --v5disc                     Enables the experimental RLPx V5 (Topic Discovery) mechanism
  --netrestrict value          Restricts network communication to the given IP networks (CIDR masks)
  --nodekey value              P2P node key file
  --nodekeyhex value           P2P node key as hex (for testing)

MINER OPTIONS:
  --mine                       Enable mining
  --miner.threads value        Number of CPU threads to use for mining (default: 0)
  --miner.notify value         Comma separated HTTP URL list to notify of new work packages
  --miner.notify.full          Notify with pending block headers instead of work packages
  --miner.gasprice value       Minimum gas price for mining a transaction (default: 1000000000)
  --miner.gaslimit value       Target gas ceiling for mined blocks (default: 8000000)
  --miner.etherbase value      Public address for block mining rewards (default = first account) (default: "0")
  --miner.extradata value      Block extra data set by the miner (default = client version)
  --miner.recommit value       Time interval to recreate the block being mined (default: 3s)
  --miner.noverify             Disable remote sealing verification
```

Private Network 구축

```
GAS PRICE ORACLE OPTIONS:
  --gpo.blocks value              Number of recent blocks to check for gas prices (default: 20)
  --gpo.percentile value          Suggested gas price is the given percentile of a set of recent transaction gas prices (default: 60)
  --gpo.maxprice value            Maximum transaction priority fee (or gasprice before London fork) to be recommended by gpo (default: 500000000000)
  --gpo.ignoreprice value         Gas price below which gpo will ignore transactions (default: 2)

VIRTUAL MACHINE OPTIONS:
  --vmdebug                       Record information useful for VM and contract debugging

LOGGING AND DEBUGGING OPTIONS:
  --fakepow                       Disables proof-of-work verification
  --nocompaction                  Disables db compaction after import
  --verbosity value               Logging verbosity: 0=silent, 1=error, 2=warn, 3=info, 4=debug, 5=detail (default: 3)
  --vmodule value                 Per-module verbosity: comma-separated list of <pattern>=<level> (e.g. eth/*=5,p2p=4)
  --log.json                      Format logs with JSON
  --log.backtrace value           Request a stack trace at a specific logging statement (e.g. "block.go:271")
  --log.debug                     Prepends log messages with call-site location (file and line number)
  --pprof                         Enable the pprof HTTP server
  --pprof.addr value              pprof HTTP server listening interface (default: "127.0.0.1")
  --pprof.port value              pprof HTTP server listening port (default: 6060)
  --pprof.memprofilerate value    Turn on memory profiling with the given rate (default: 524288)
  --pprof.blockprofilerate value  Turn on block profiling with the given rate (default: 0)
  --pprof.cpuprofile value        Write CPU profile to the given file
  --trace value                   Write execution trace to the given file
```

Private Network 구축

```
METRICS AND STATS OPTIONS:
  --metrics                         Enable metrics collection and reporting
  --metrics.expensive               Enable expensive metrics collection and reporting
  --metrics.addr value              Enable stand-alone metrics HTTP server listening interface (default: "127.0.0.1")
  --metrics.port value              Metrics HTTP server listening port (default: 6060)
  --metrics.influxdb                Enable metrics export/push to an external InfluxDB database
  --metrics.influxdb.endpoint value     InfluxDB API endpoint to report metrics to (default: "http://localhost:8086")
  --metrics.influxdb.database value     InfluxDB database name to push reported metrics to (default: "geth")
  --metrics.influxdb.username value     Username to authorize access to the database (default: "test")
  --metrics.influxdb.password value     Password to authorize access to the database (default: "test")
  --metrics.influxdb.tags value         Comma-separated InfluxDB tags (key/values) attached to all measurements (default: "host=localhost")
  --metrics.influxdbv2              Enable metrics export/push to an external InfluxDB v2 database
  --metrics.influxdb.token value        Token to authorize access to the database (v2 only) (default: "test")
  --metrics.influxdb.bucket value       InfluxDB bucket name to push reported metrics to (v2 only) (default: "geth")
  --metrics.influxdb.organization value  InfluxDB organization name (v2 only) (default: "geth")

ALIASED (deprecated) OPTIONS:
  --nousb                       Disables monitoring for and managing USB hardware wallets (deprecated)

MISC OPTIONS:
  --snapshot                        Enables snapshot-database mode (default = enable)
  --bloomfilter.size value              Megabytes of memory allocated to bloom-filter for pruning (default: 2048)
  --help, -h                        show help
  --override.arrowglacier value          Manually specify Arrow Glacier fork-block, overriding the bundled setting (default: 0)
  --override.terminaltotaldifficulty value  Manually specify TerminalTotalDifficulty, overriding the bundled setting (default: 0)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Q & A