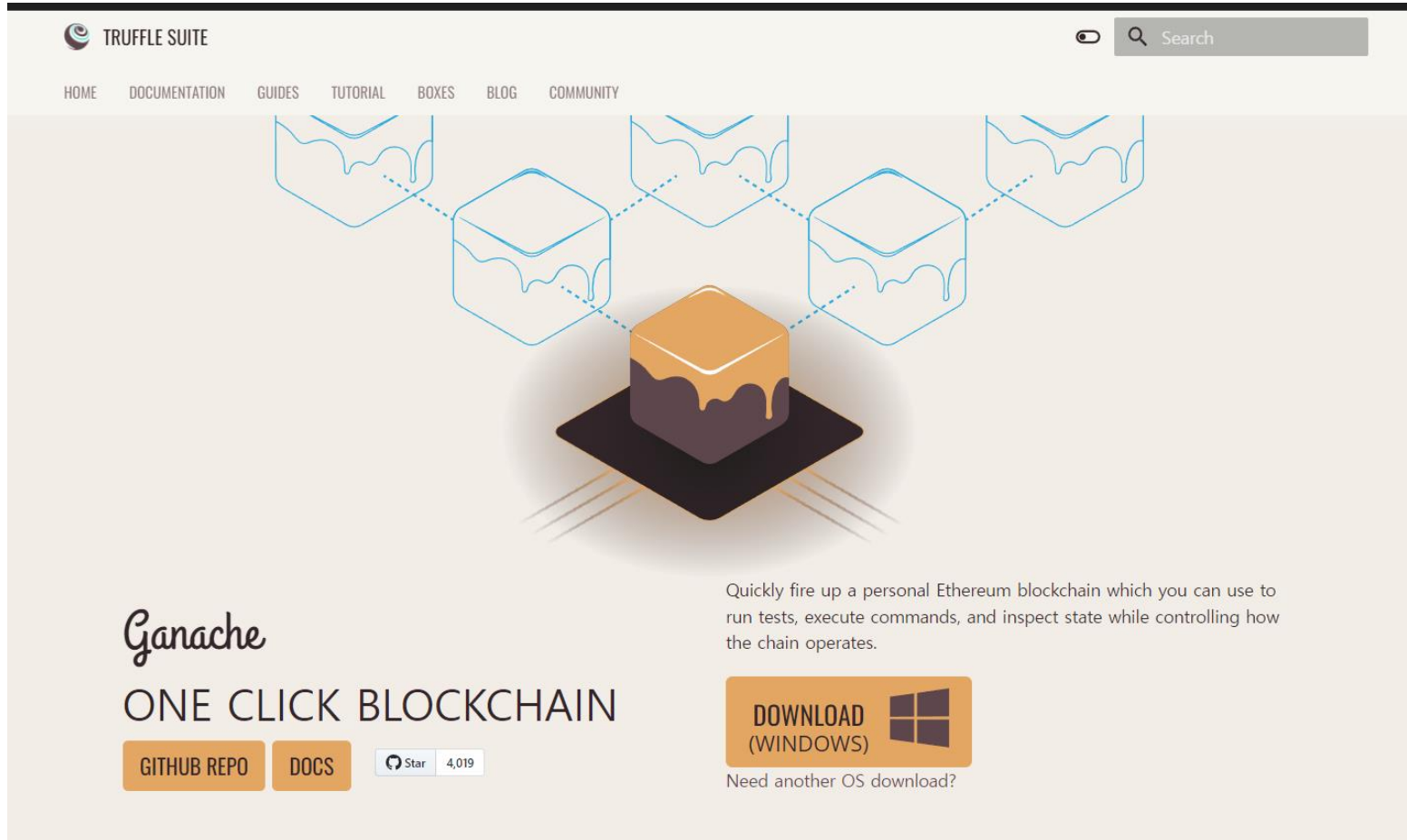


# 이더리움 프라이빗 네트워크 구축

---



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



TRUFFLE SUITE

HOME DOCUMENTATION GUIDES TUTORIAL BOXES BLOG COMMUNITY

Search

*Ganache*

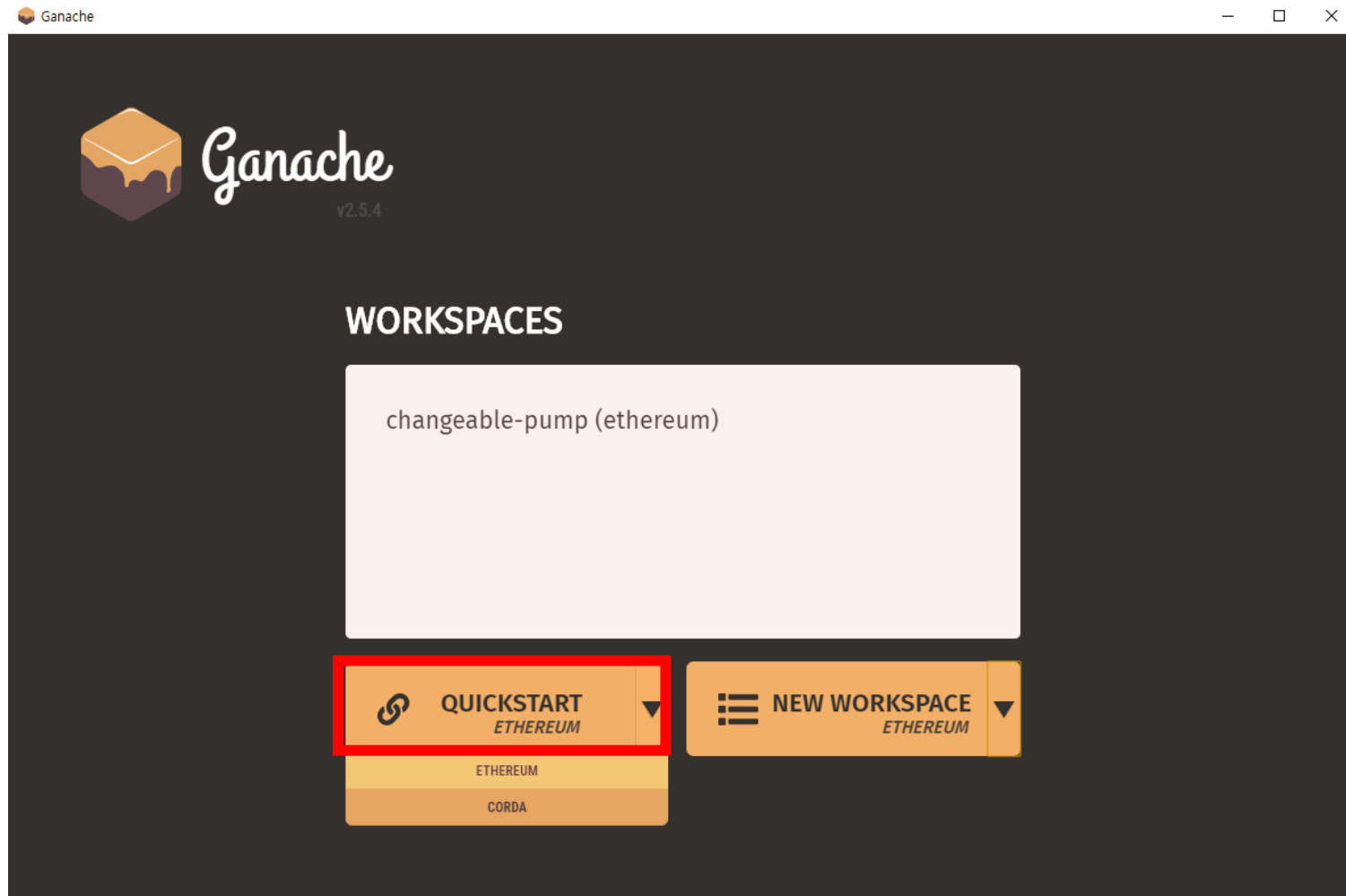
ONE CLICK BLOCKCHAIN

GITHUB REPO DOCS

Star 4,019

DOWNLOAD (WINDOWS)

Need another OS download?



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

## ACCOUNT INFORMATION

### ACCOUNT ADDRESS

0xFEdA7a2b001ccabFBc608af8969D1FF00eaf6EEa

### PRIVATE KEY

cdadd5faed5633d326c580861ee6d57b00dfa00098eed9608e26e49809a81f5c

Do not use this private key on a public blockchain; use it for development purposes only!

DONE

ACCOUNTS

BLOCKS

TRANSACTIONS

CONTRACTS

EVENTS

LOGS

SEARCH FOR BLOCK NUMBERS OR TX HASHES

CURRENT BLOCK  
0

GAS PRICE  
20000000000

GAS LIMIT  
6721975

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MINING STATUS  
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SAVE

SWITCH

MNEMONIC ?

bundle equal anchor donor meadow exist cycle knee such cargo canvas wife

HD PATH

m/44'/60'/0'/0/account\_index



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

—

□

×

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 "status" flag in the transaction receipt. Disabling this feature will make Ganache handle transaction failures like other Ethereum clients.



CHAIN FORKING


8



 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)

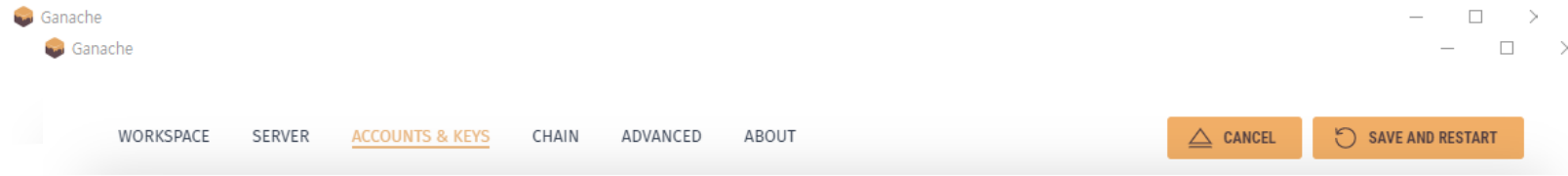
30

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.



## ACCOUNTS & KEYS

ACCOUNT DEFAULT BALANCE

The starting balance for accounts, in Ether.

TOTAL ACCOUNTS TO GENERATE

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 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

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.

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



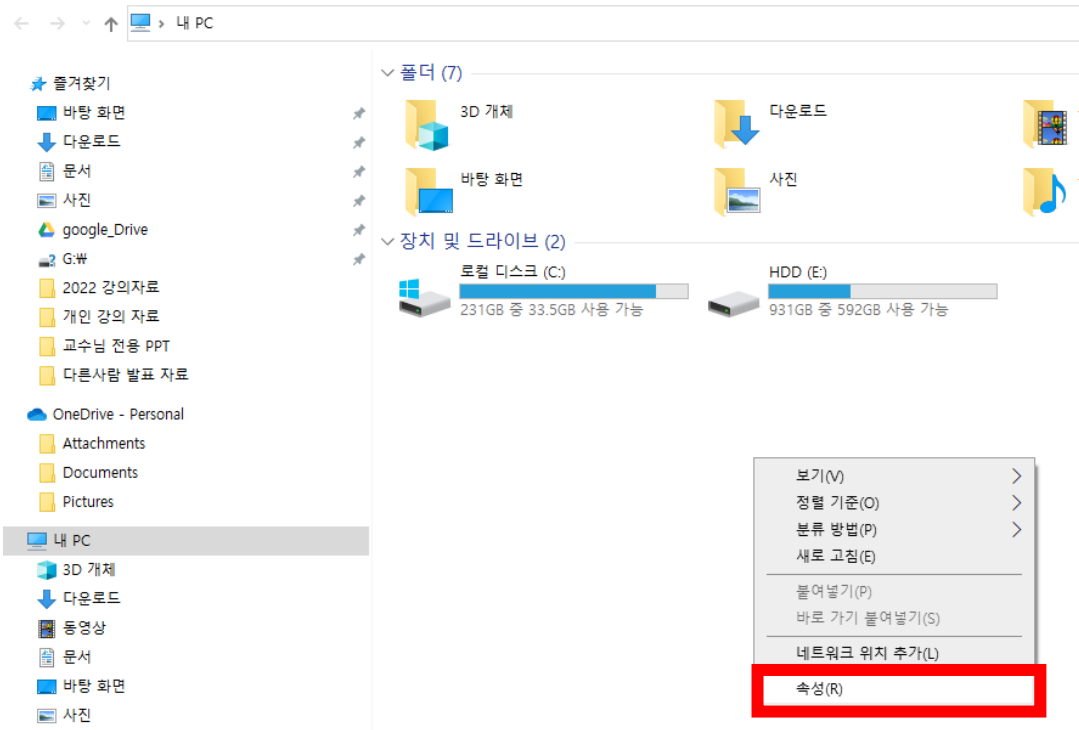
**V3 같은 안티 바이러스 프로그램에 의해서  
설치가 안될 수도 있음 잠시 꺼두고 설치 진행**

## Testnet 접속

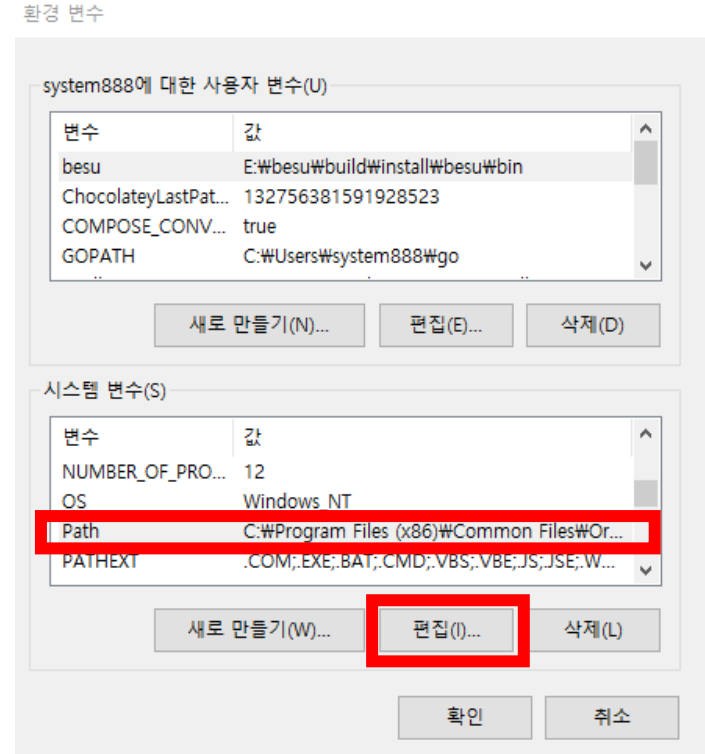
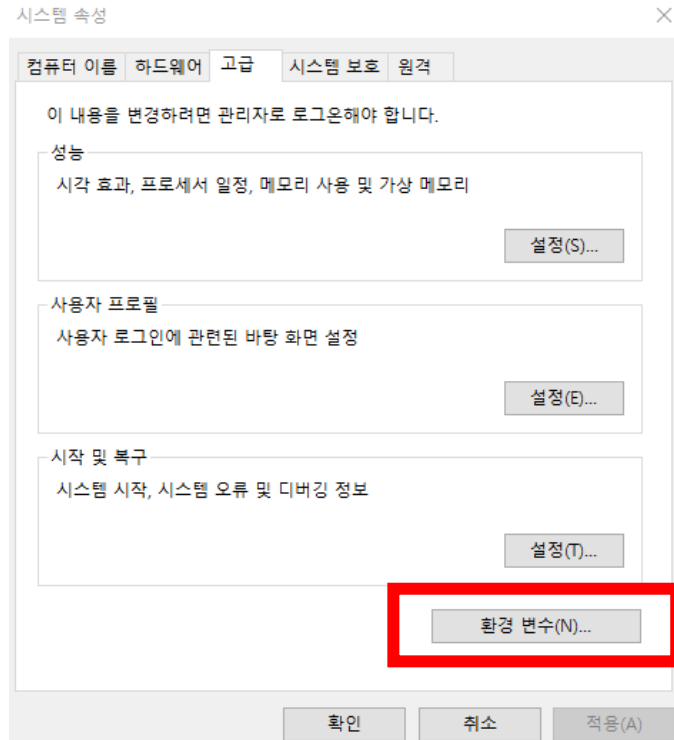
```
PS C:\WINDOWS\system32> geth
[INFO] [03-02|13:01:25.188] Starting Geth on Ethereum mainnet...
[INFO] [03-02|13:01:25.347] Bumping default cache on mainnet
[INFO] [03-02|13:01:25.351] Maximum peer count
[INFO] [03-02|13:01:25.355] Set global gas cap
[INFO] [03-02|13:01:25.357] Allocated trie memory caches
[INFO] [03-02|13:01:25.360] Allocated cache and file handles
th#chaindata cache=2.00GiB handles=8192
[INFO] [03-02|13:01:25.397] Opened ancient database
th#chaindata#ancient readonly=false
[INFO] [03-02|13:01:25.405] Initialised chain configuration
A0Support: true EIP150: 2463000 EIP155: 2675000 EIP158: 2675000 Byzantium: 4370000 Constantinople: 7280000 Petersburg: 7
2800000 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
hash count=3
[INFO] [03-02|13:01:25.426] Disk storage enabled for ethash DAGs
[INFO] [03-02|13:01:25.430] Initialising Ethereum protocol
[INFO] [03-02|13:01:25.441] Loaded most recent local header
,152 age=6y8mo5d
[INFO] [03-02|13:01:25.448] Loaded most recent local full block
age=52y11mo3d
[INFO] [03-02|13:01:25.452] Loaded most recent local fast block
,871 age=6y8mo5d
[INFO] [03-02|13:01:25.456] Loaded local transaction journal
[INFO] [03-02|13:01:25.461] Regenerated local transaction journal
[INFO] [03-02|13:01:25.464] Gasprice oracle is ignoring threshold set
[INFO] [03-02|13:01:25.468] Starting peer-to-peer node
go1.17.5
[INFO] [03-02|13:01:25.508] New local node record
30303
[INFO] [03-02|13:01:25.514] Started P2P networking
276978b91491a699e558bbea116da42cb6d22cd72f4262654c4fde6deb519773a28b5c7ae8d2edeabef85c5@127.0.0.1:30303
[INFO] [03-02|13:01:25.515] IPC endpoint opened
[INFO] [03-02|13:01:26.029] Got interrupt, shutting down...
[INFO] [03-02|13:01:26.032] IPC endpoint closed
[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
[INFO] [03-02|13:01:26.043] Persisted trie from memory database
size=0s livesize=1 livesize=0.00B
[INFO] [03-02|13:01:26.051] Writing clean trie cache to disk
riecache threads=12
[INFO] [03-02|13:01:26.070] Persisted the clean trie cache
riecache elapsed=14.637ms
[INFO] [03-02|13:01:26.075] Blockchain stopped

provided=1024 updated=4096
ETH=50 LE=0 total=50
cap=50,000,000
clean=614.00MiB dirty=1024.00MiB
database=C:\Users\system888\AppData\Local\Ethereum\geth
database=C:\Users\system888\AppData\Local\Ethereum\geth
config="{ChainID: 1 Homestead: 1150000 DAO: 1920000 D
dir=C:\Users\system888\AppData\Local\Ethereum\geth\et
dir=C:\Users\system888\AppData\Local\Ethereum\geth\et
network=1 dbversion=8
number=12096 hash=2f09b7..d71a2f tc=3,680,646,855,500
number=0 hash=d4e567..cb8fa3 tc=17,179,869,184
number=11728 hash=0c7171..7070f2 tc=3,418,697,698,712
transactions=0 dropped=0
transactions=0 accounts=0
threshold=2
instance=Geth/v1.10.16-stable-20356e57/windows-amd64/
seq=9 lc=be5075bb2754c96f lp=127.0.0.1 udp=30303 tcp=
self=enode://766d6719f7ba77901df01dbf05a4799d11ec0061
uri=\\.\pipe\geth.ipc
uri=\\.\pipe\geth.ipc
root=d7f897..0f0544
nodes=0 size=0.00B time=0s gcnodes=0 gcsizes=0.00B gct
path=C:\Users\system888\AppData\Local\Ethereum\geth\geth
path=C:\Users\system888\AppData\Local\Ethereum\geth\geth
```

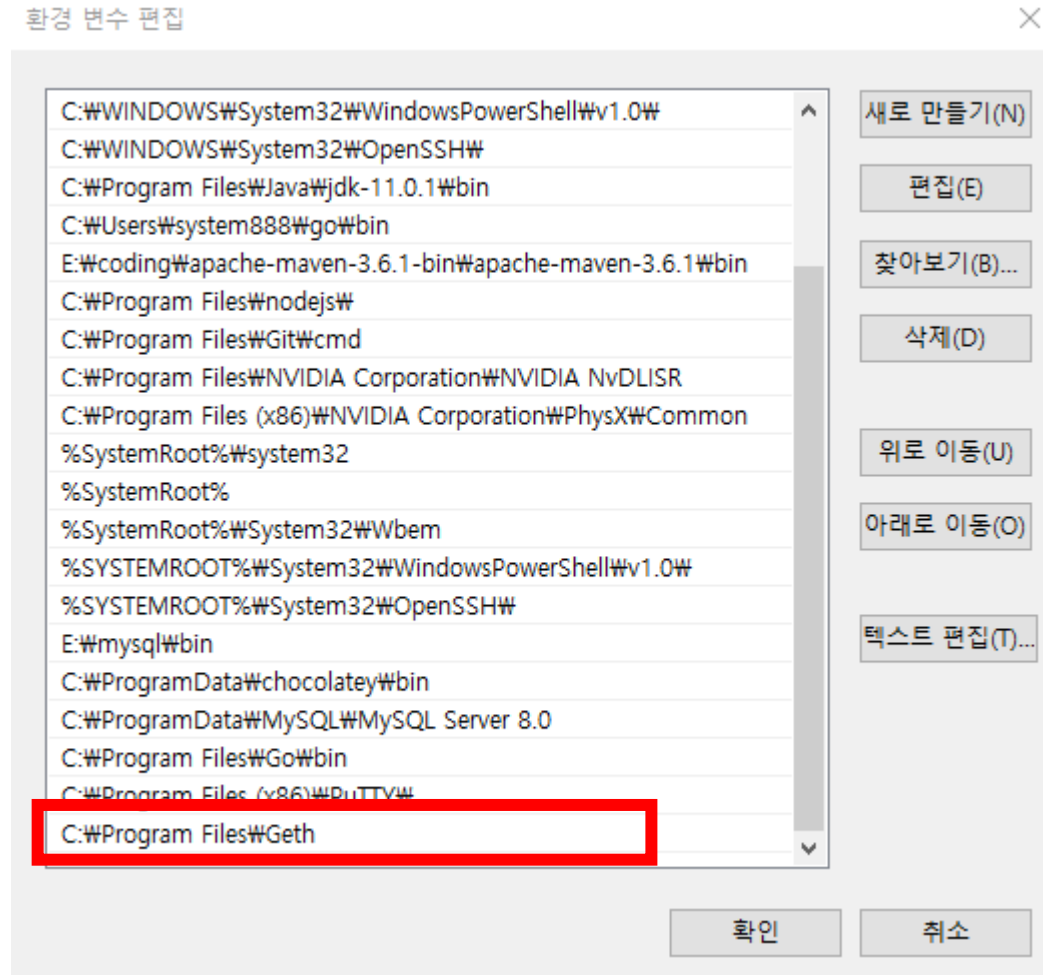
## 경로가 없다고 뜰 경우



## 경로가 없다고 뜰 경우



### 경로가 없다고 뜰 경우





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: 0xF85ceb8b153f54fc67bE2a48a662b6eDf2274B4
Path of the secret key file: datadir\keystore\UTC--2022-03-02T04-19-21.18834200Z--f85ceeb8b153f54fc67be2a48a662b6edf2274b4

- 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!
```

<https://fauceth.komputing.org/>


**FaucETH**



Please enter address or ENS name

Request funds

**FaucETH**



Ethereum Testnet Ropsten  
Görli - only for ENS domains  
Kintsugi  
Coston  
Optimistic Kovan  
Arbitrum Rinkeby  
Kovan  
Rinkeby  
Ethereum Testnet Ropsten

<https://faucet.dimensions.network/>

## Ropsten Ethereum (rETH) Faucet

Receive 1 rETH per request

Enter Your Ropsten Address

Ox.....

☐

사람입니다




hCaptcha  
개인정보 보호 - 약관


Send Ropsten ETH

2553988 ETH left in Faucet. Gas Limit 400k




## Testnet 접속

 Etherscan

Ropsten Testnet Network

All Filters ▾ Search by Address / Txn Hash / Block / Token / Ens 

Home Blockchain ▾ Tokens ▾ Misc ▾ Ropsten

 Address 0xF85ceEb8b153f54fc67bE2a48a662b6eDf2274B4  

**Overview**

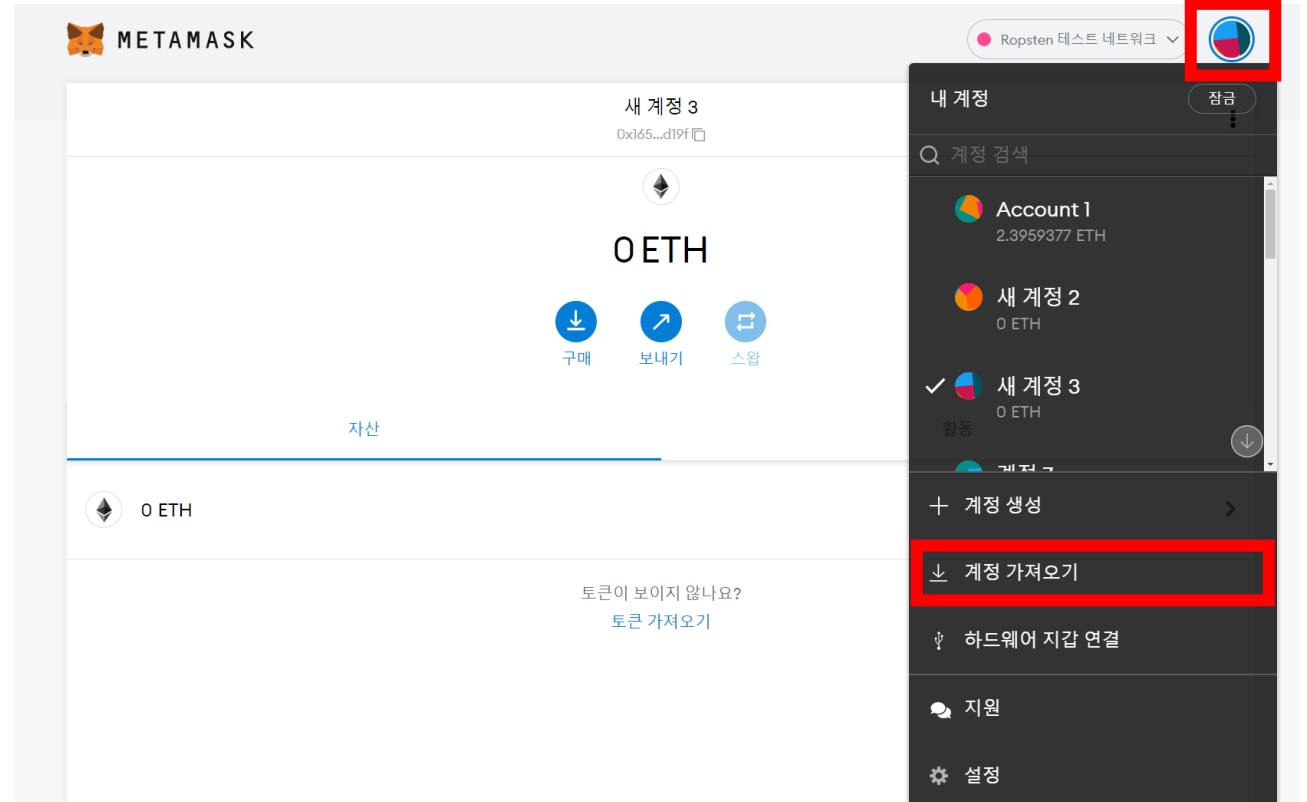
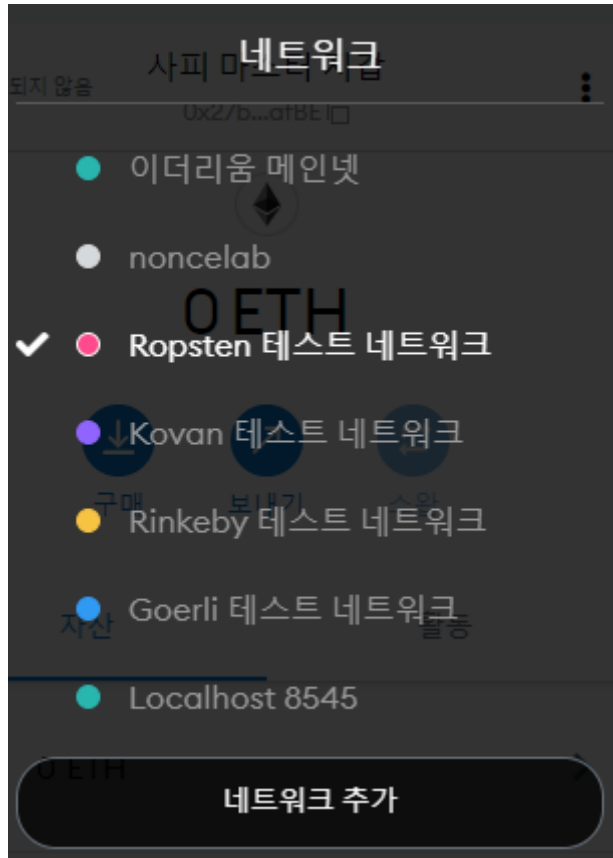
Balance: 1 Ether

**More Info** More ▾

My Name Tag: Not Available

## Testnet 접속

### 메타 마스크 설치후 접속



### 계정 가져오기

가져온 계정은 생성한 MetaMask 계정 비밀 복구 구문 원본에 연결되지 않습니다. 가져온 계정에 대해 자세히 알아보기 [여기](#)

유형 선택

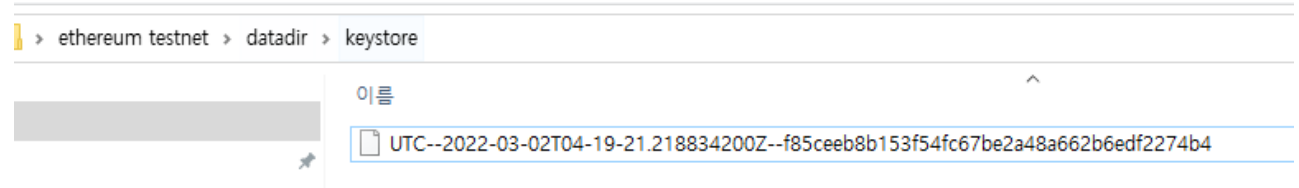
비공개 키



여기에 비공개 키 문자열을 붙여넣으세요.

취소

가져오기



str", "ciphertext": "f9d655f94ffe3a18b4bf6f1eec0e719b2a90155ae96cbe9e6a9900e194580ecc", "



Account 14

0xBA...0461



0 ETH



구매



보내기



스왑

자산

활동



0 ETH



토큰이 보이지 않나요?

토큰 가져오기

# 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



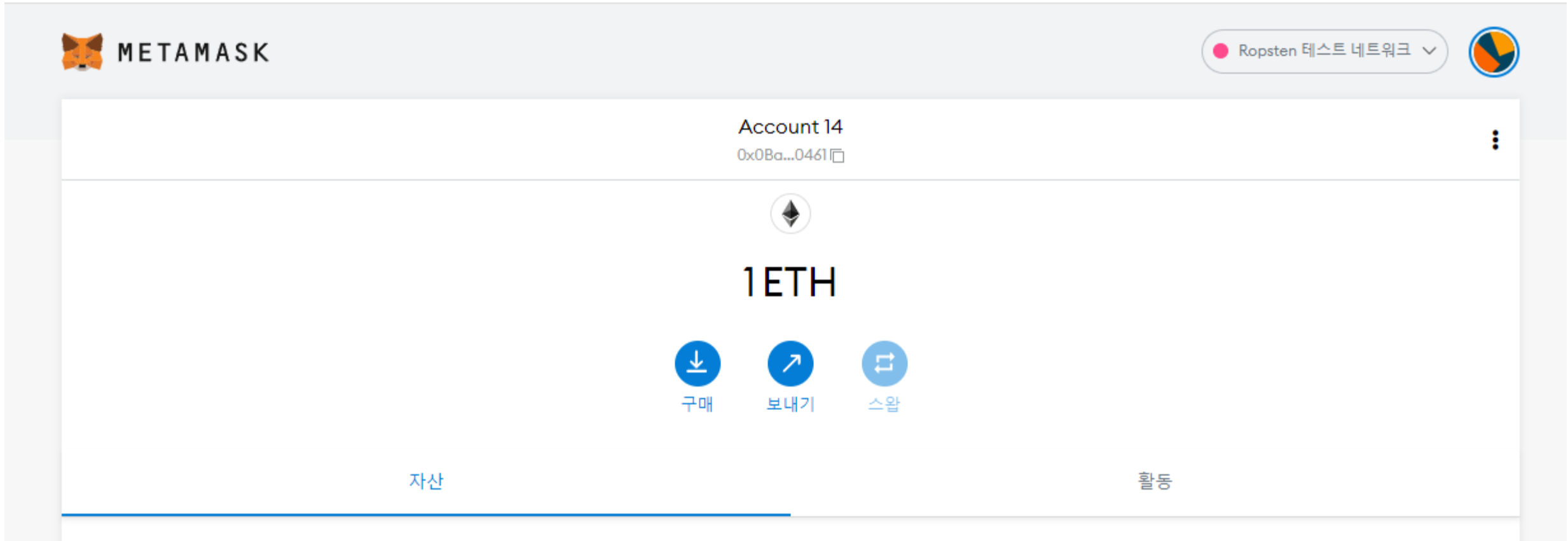
## 포시트(수도꼭지) 테스트

Ropsten용 포시트에서 Ether 얻기

Ether 얻기



## Testnet 접속



### 테스트넷 동기화

```
user@DESKTOP-1KJ5J1A MINGW64 /d/goerli_testnet
$ geth --goerli --syncmode full --datadir /d/goerli_testnet/ --http --http.addr 0.0.0.0 --http.api eth,net,web3,personal --http.corsdomain * --allow-insecure-unlock
```

## 테스트넷 동기화

```
INFO [03-02|14:27:57.171] Expired request does not exist peer=1c317a520a99bad16e611314943b4ab4eda2ab597f3df610e6a40bb5c
5cfba3
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
```

```
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=3.670ms number=12,035,801 hash=e3aea1..a25e9d
INFO [03-03|10:36:12.338] Imported new block headers count=1 el
apsed=3.580ms number=12,035,802 hash=befe87..fd11c4 age=1m10s
INFO [03-03|10:36:12.526] 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
```

### 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
}
```

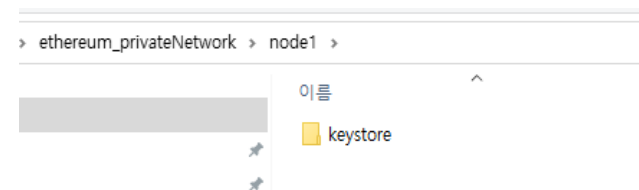
```
> net.peerCount
16
> eth.syncing.currentBlock
12035703
```

## Private Network 구축

특정 폴더를 만들고 다음과 같이 생성

```
├─keystore
├─node1
│   └─keystore
├─node2
│   └─keystore
├─node3
│   └─keystore
└─node4
    └─keystore
```

- keystore
- node1
- node2
- node3
- node4



## 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
```

- keystore
- node1
- node2
- node3
- node4

2022-03-02 오후 3:46	파일 폴더
2022-03-02 오후 3:59	파일 폴더
2022-03-02 오후 3:59	파일 폴더
2022-03-02 오후 4:00	파일 폴더
2022-03-02 오후 4:00	파일 폴더

ethereum_privateNetwork > node1 > keystore				
이름	수정한 날짜	유형	크기	
UTC--2022-03-02T06-45-30.21991190...	2022-03-02 오후 3:45	219911900Z--7A...	1KB	




Keystore에 저장되어있는 key 파일들을 하나씩  
각 노드 파일의 keystore 폴더로 복사

## Private Network 구축

### genesis.json 파일 생성

```
1  {
2    "config": {
3      "chainId": 12345,
4      "homesteadBlock": 0,
5      "eip150Block": 0,
6      "eip155Block": 0,
7      "eip158Block": 0,
8      "byzantiumBlock": 0,
9      "constantinopleBlock": 0,
10     "petersburgBlock": 0,
11     "istanbulBlock": 0,
12     "muirGlacierBlock": 0,
13     "berlinBlock": 0,
14     "londonBlock": 0,
15     "arrowGlacierBlock": 0,
16     "grayGlacierBlock": 0,
17     "ethash": {}
18   },
19   "difficulty": "1",
20   "gasLimit": "8000000000",
21   "alloc": {
22     "0A39c2Aa4d1070c3051525bD998A014d0e5e4869": { "balance": "300000" },
23     "9Dd6091C48859d0d3DBa77aab381cf388Fa5ac72": { "balance": "400000" },
24     "1d684883696899b23f2575f8a9dd6faB5e6b2446": { "balance": "500000" },
25     "52b9682652786Alb8f738273c902bd86dB116a63": { "balance": "600000" }
26   }
27 }
```

생성된 genesis.json 파일을  
각각의 노드 폴더안으로 이동

ethereum_privateNetwork > node4				
이름	수정한 날짜	유형	크기	
 0xf311b1921570be25B6F63ad6B121D...	2022-03-02 오후 4:00	파일 폴더		
 keystore	2022-03-02 오후 4:02	파일 폴더		
 genesis.json	2022-03-02 오후 4:14	JSON File	1KB	



# Private Network 구축

## genesis.json 초기화

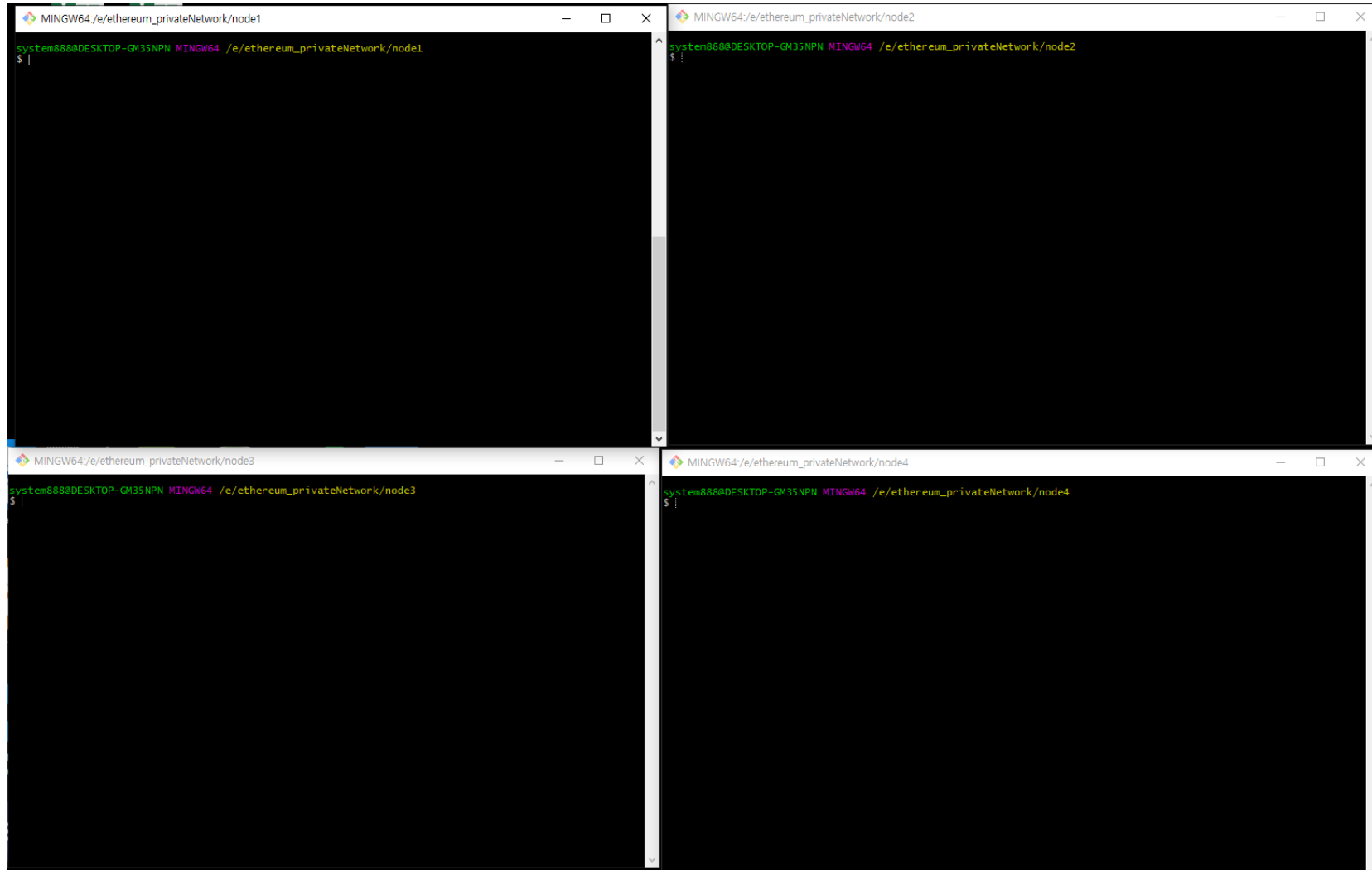
```
$ geth --datadir /e/ethereum_privateNetwork/node1 init genesis.json
INFO [03-02|16:20:35.577] Maximum peer count           ETH=50 LES=0
total=50
INFO [03-02|16:20:35.656] Set global gas cap           cap=50,000,000
INFO [03-02|16:20:35.656] Allocated cache and file handles database=E:\e
thereum_privateNetwork\node1\geth\chaindata 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 gcsz=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 gcsz=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/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:\e
thereum_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 gcsz=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:\e
thereum_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 gcsz=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
```

```
$ 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:\e
thereum_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 gcsz=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:\e
thereum_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 gcsz=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
```

```
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:\e
thereum_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 gcsz=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:\e
thereum_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 gcsz=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 12345 --datadir /c/Users/user/Desktop/eth_private/node1 --ipcdisable --http --http.addr 0.0.0.0 --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 --nat=extip:127.0.0.1 --http.corsdomain "*" --http.vhosts "*" --allow-insecure-unlock --authrpc.port 8552 console --syncmode full
```

```
geth --networkid 12345 --datadir /c/Users/user/Desktop/eth_private/node2 --ipcdisable --http --http.addr 0.0.0.0 --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 --nat=extip:127.0.0.1 --http.corsdomain "*" --http.vhosts "*" --allow-insecure-unlock --authrpc.port 8553 console --syncmode full
```

```
geth --networkid 12345 --datadir /c/Users/user/Desktop/eth_private/node3 --ipcdisable --http --http.addr 0.0.0.0 --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 --nat=extip:127.0.0.1 --http.corsdomain "*" --http.vhosts "*" --allow-insecure-unlock --authrpc.port 8554 console --syncmode full
```

```
geth --networkid 12345 --datadir /c/Users/user/Desktop/eth_private/node4 --ipcdisable --http --http.addr 0.0.0.0 --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 --nat=extip:127.0.0.1 --http.corsdomain "*" --http.vhosts "*" --allow-insecure-unlock --authrpc.port 8556 console --syncmode full
```

# Private Network 구축

```
MINGW64/e/ethereum_privateNetwork/node1
57/windows-amd64/go1.17.5
INFO [03-02|17:04:33.183] New local node record seq=1,646,207,076,723 id=d4069aefb19
c87c5 ip=127.0.0.1 udp=30304 tcp=30304
INFO [03-02|17:04:33.184] Started P2P networking self=enode://4a5b9d56aa7290ee78523a5
97e631230c90491df8ea6823b752e7060b984feb7cb7a5f37f2d06473fa98501c0232c5c65beb69fa0d75e6c98c296441ac101
758127.0.0.1:30304
INFO [03-02|17:04:33.185] Transaction pool price threshold updated price=1,000,000,000
INFO [03-02|17:04:33.185] Updated mining threads threads=0
INFO [03-02|17:04:33.185] Transaction pool price threshold updated price=1,000,000,000
INFO [03-02|17:04:33.185] Ethereum automatically configured address=0x7a8ff062901918521989e60948
8c65628b87e3e
INFO [03-02|17:04:33.186] Commit new sealing work number=1 sealhash=19d3dc..95c608 unc
les=0 txs=0 gas=0 fees=0 elapsed=470.6µs
INFO [03-02|17:04:33.186] Commit new sealing work number=1 sealhash=19d3dc..95c608 unc
les=0 txs=0 gas=0 fees=0 elapsed=999µs
Welcome to the Geth JavaScript console!

instance: Geth/v1.10.16-stable-20356e57/windows-amd64/go1.17.5
coinbase: 0x7a8ff062901918521989e609488c65628b87e3e
at block: 0 (Thu Jan 01 1970 09:00:00 GMT+0900 (KST))
datadir: E:\ethereum_privateNetwork\node1
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

To exit, press ctrl-d or type exit
> INFO [03-02|17:04:38.154] New local node record seq=1,646,207,076,724 id=d4069aefb
19c87c5 ip=163.239.201.31 udp=30304 tcp=30304
INFO [03-02|17:04:43.312] Looking for peers peercount=0 tried=95 static=0
INFO [03-02|17:04:43.312] Looking for peers peercount=0 tried=111 static=0
INFO [03-02|17:05:08.185] Looking for peers peercount=0 tried=128 static=0
INFO [03-02|17:05:18.248] Looking for peers peercount=0 tried=117 static=0
INFO [03-02|17:05:28.273] Looking for peers peercount=0 tried=60 static=0
INFO [03-02|17:05:38.580] Looking for peers peercount=0 tried=78 static=0
INFO [03-02|17:05:48.768] Looking for peers peercount=0 tried=127 static=0
INFO [03-02|17:05:59.031] Looking for peers peercount=0 tried=86 static=0
INFO [03-02|17:06:09.167] Looking for peers peercount=0 tried=124 static=0
INFO [03-02|17:06:19.198] Looking for peers peercount=0 tried=46 static=0
INFO [03-02|17:06:29.218] Looking for peers peercount=1 tried=99 static=0

MINGW64/e/ethereum_privateNetwork/node2
WARN [03-02|17:04:39.237] Unclean shutdown detected booted=2022-03-02T17:02:16+0900 age=2m23s
INFO [03-02|17:04:39.237] Starting peer-to-peer node instance=Geth/v1.10.16-stable-20356e57/windows
-amd64/go1.17.5
INFO [03-02|17:04:39.424] New local node record seq=1,646,207,982,842 id=481c14515afc7852 ip=1
27.0.0.1 udp=30314 tcp=30314
INFO [03-02|17:04:39.424] Started P2P networking self=enode://572b5d30773ed63c9388f0b52ed4fd7
fa7063687a5606c18cc49a8a6742eed7d186d6e8204f9cdbc115f04487437d8dd90ff5e3e801ebbb8b43534868127.0.0.1:30314
INFO [03-02|17:04:39.426] Transaction pool price threshold updated price=1,000,000,000
INFO [03-02|17:04:39.426] Updated mining threads threads=0
INFO [03-02|17:04:39.426] Transaction pool price threshold updated price=1,000,000,000
INFO [03-02|17:04:39.426] Ethereum automatically configured address=0xd13446791110b9831a26225f80936c43d56b
12a8
INFO [03-02|17:04:39.427] Commit new sealing work number=1 sealhash=a60fc6..bd05c5 uncles=0 txs=
0 gas=0 fees=0 elapsed=0s
INFO [03-02|17:04:39.427] Commit new sealing work number=1 sealhash=a60fc6..bd05c5 uncles=0 txs=
0 gas=0 fees=0 elapsed=0s
Welcome to the Geth JavaScript console!

instance: Geth/v1.10.16-stable-20356e57/windows-amd64/go1.17.5
coinbase: 0xd13446791110b9831a26225f80936c43d56b12a8
at block: 0 (Thu Jan 01 1970 09:00:00 GMT+0900 (KST))
datadir: E:\ethereum_privateNetwork\node2
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

To exit, press ctrl-d or type exit
> INFO [03-02|17:04:42.449] New local node record seq=1,646,207,982,843 id=481c14515afc7852 ip
=163.239.201.31 udp=30314 tcp=30314
INFO [03-02|17:04:49.535] Looking for peers peercount=0 tried=142 static=0
INFO [03-02|17:05:00.093] Looking for peers peercount=0 tried=27 static=0
INFO [03-02|17:05:10.113] Looking for peers peercount=0 tried=176 static=0
INFO [03-02|17:05:20.116] Looking for peers peercount=1 tried=98 static=0
INFO [03-02|17:05:30.125] Looking for peers peercount=0 tried=56 static=0
INFO [03-02|17:05:40.136] Looking for peers peercount=1 tried=136 static=0
INFO [03-02|17:05:50.153] Looking for peers peercount=1 tried=88 static=0
INFO [03-02|17:06:00.161] Looking for peers peercount=1 tried=151 static=0
INFO [03-02|17:06:10.189] Looking for peers peercount=0 tried=97 static=0
INFO [03-02|17:06:20.213] Looking for peers peercount=0 tried=96 static=0
INFO [03-02|17:06:30.504] Looking for peers peercount=0 tried=68 static=0

MINGW64/e/ethereum_privateNetwork/node3
7/windows-amd64/go1.17.5
INFO [03-02|17:04:46.830] New local node record seq=1,646,207,998,191 id=8008e962c29
e4f7 ip=127.0.0.1 udp=30324 tcp=30324
INFO [03-02|17:04:46.830] Started P2P networking self=enode://a452523f2749131e71cae5a
d1ed095a7809dfb6e7cc4954849ac0635963b1396bd0e46cc260c2dafac1eb04efb918c60b0cddf3c37529fcec579093c0e0f3
20127.0.0.1:30324
INFO [03-02|17:04:46.831] Transaction pool price threshold updated price=1,000,000,000
INFO [03-02|17:04:46.831] Updated mining threads threads=0
INFO [03-02|17:04:46.831] Transaction pool price threshold updated price=1,000,000,000
INFO [03-02|17:04:46.831] Ethereum automatically configured address=0xe510decE1d305803Ede8c01E17
602bcc36aCe90
INFO [03-02|17:04:46.833] Commit new sealing work number=1 sealhash=a047c5..c4484d unc
les=0 txs=0 gas=0 fees=0 elapsed=1.928ms
INFO [03-02|17:04:46.833] Commit new sealing work number=1 sealhash=a047c5..c4484d unc
les=0 txs=0 gas=0 fees=0 elapsed=1.928ms
Welcome to the Geth JavaScript console!

instance: Geth/v1.10.16-stable-20356e57/windows-amd64/go1.17.5
coinbase: 0xe510decE1d305803Ede8c01E17e602bcc36aCe90
at block: 0 (Thu Jan 01 1970 09:00:00 GMT+0900 (KST))
datadir: E:\ethereum_privateNetwork\node3
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

To exit, press ctrl-d or type exit
> INFO [03-02|17:04:51.601] New local node record seq=1,646,207,998,192 id=8008e962c
92e4f7 ip=163.239.201.31 udp=30324 tcp=30324
INFO [03-02|17:04:56.844] Looking for peers peercount=1 tried=107 static=0
INFO [03-02|17:05:06.886] Looking for peers peercount=0 tried=58 static=0
INFO [03-02|17:05:16.932] Looking for peers peercount=0 tried=133 static=0
INFO [03-02|17:05:26.964] Looking for peers peercount=0 tried=118 static=0
INFO [03-02|17:05:37.672] Looking for peers peercount=0 tried=103 static=0
INFO [03-02|17:05:47.699] Looking for peers peercount=2 tried=126 static=0
INFO [03-02|17:05:57.726] Looking for peers peercount=2 tried=105 static=0
INFO [03-02|17:06:07.891] Looking for peers peercount=0 tried=88 static=0
INFO [03-02|17:06:18.667] Looking for peers peercount=0 tried=83 static=0
INFO [03-02|17:06:28.713] Looking for peers peercount=0 tried=140 static=0

MINGW64/e/ethereum_privateNetwork/node4
7/windows-amd64/go1.17.5
INFO [03-02|17:04:52.312] Starting peer-to-peer node instance=Geth/v1.10.16-stable-20356e57/windows
-amd64/go1.17.5
INFO [03-02|17:04:52.313] New local node record seq=1,646,208,008,316 id=376748ac52858428 ip=12
7.0.0.1 udp=30334 tcp=30334
INFO [03-02|17:04:52.513] Started P2P networking self=enode://1c7e0ed0bde8d66115f581a2bc41b993ea
169b01390c38c5bfdb8b7d743a82c5ca525b240d1c671f5d010e52053b8605589ed87d19e386fd069a1c4ca2118aafc0127.0.0.1:30334
INFO [03-02|17:04:52.514] Transaction pool price threshold updated price=1,000,000,000
INFO [03-02|17:04:52.514] Updated mining threads threads=0
INFO [03-02|17:04:52.514] Transaction pool price threshold updated price=1,000,000,000
INFO [03-02|17:04:52.514] Ethereum automatically configured address=0xf311b1921570be2586f63ad68121D8A4F3CDc
35d
INFO [03-02|17:04:52.515] Commit new sealing work number=1 sealhash=1f270d..3cd1b9 uncles=0 txs=
0 gas=0 fees=0 elapsed=542.5µs
INFO [03-02|17:04:52.515] Commit new sealing work number=1 sealhash=1f270d..3cd1b9 uncles=0 txs=
0 gas=0 fees=0 elapsed=1.150ms
Welcome to the Geth JavaScript console!

instance: Geth/v1.10.16-stable-20356e57/windows-amd64/go1.17.5
coinbase: 0xf311b1921570be2586f63ad68121D8A4F3CDc35d
at block: 0 (Thu Jan 01 1970 09:00:00 GMT+0900 (KST))
datadir: E:\ethereum_privateNetwork\node4
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

To exit, press ctrl-d or type exit
> INFO [03-02|17:04:54.589] New local node record seq=1,646,208,008,317 id=376748ac52858428 ip=
163.239.201.31 udp=30334 tcp=30334
INFO [03-02|17:05:02.847] Looking for peers peercount=0 tried=111 static=0
INFO [03-02|17:05:13.854] Looking for peers peercount=0 tried=152 static=0
INFO [03-02|17:05:24.036] Looking for peers peercount=0 tried=98 static=0
ERROR [03-02|17:05:30.556] Snapshot extension registration failed peer=63cbe74f err="peer connected on snap witho
ut compatible eth support"
INFO [03-02|17:05:34.064] Looking for peers peercount=0 tried=84 static=0
INFO [03-02|17:05:44.110] Looking for peers peercount=0 tried=119 static=0
INFO [03-02|17:05:54.153] Looking for peers peercount=0 tried=124 static=0
INFO [03-02|17:06:04.645] Looking for peers peercount=0 tried=91 static=0
INFO [03-02|17:06:14.653] Looking for peers peercount=0 tried=75 static=0
INFO [03-02|17:06:24.676] Looking for peers peercount=2 tried=100 static=0
```

# Private Network 구축

## 각 터미널에서 엔터 누른후 admin 입력

```
> admin
{
  datadir: "E:\\ethereum_privateNetwork\\node1",
  enode: "enode://4a5b9d56aa7290ee78523a597e631230c90491df8ea6823b752e7060b984feb7cb7a5f37f2d06473fa88501c023c25c65beb69fa0d75e6c698c296441ac101750163.239.201.31:30304",
  enr: "enr:-K040PmDvNqYfMhF9ZRU9LmOMeS3F-kKRQIPug4wMTJDckbne2F1vHLLxds1axwOIwQYv0SWhkFCFYDIe6HV8XC6AX9JpFzngGAx9JpJ3w2V0aMfGhP1ew4ZAgm1kgnY0gm1whkPvyR-JCzVjcd11NmsxoQKkU1I-JOkTHnHK5aHR7Q1aeAnfTuMVSvEmSbJWwOx0YRzbnFwI1NOY3CCdmCddwRwgnZg",
  id: "d4069aefb19c87c57d465dcfb3bedb56658ae79eb88a63168adeba5fbd133f49",
  ip: "163.239.201.31",
  listenAddr: "[*]:30304",
  name: "Geth/v1.10.16-stable-20356e57/windows-amd64/go1.17.5",
  ports: {
    discovery: 30304,
    listener: 30304
  },
  protocols: {
    eth: {
      config: {...},
      difficulty: 1,
      genesis: "0x945154740e5ac3b66ebe8309d181cfc273948a63d4782c7bffa92d21a5f79f6d",
      head: "0x945154740e5ac3b66ebe8309d181cfc273948a63d4782c7bffa92d21a5f79f6d",
      network: 1005
    },
    snap: {}
  }
}
```

```
> admin
{
  datadir: "E:\\ethereum_privateNetwork\\node2",
  enode: "enode://572bd530773ed63cec9388f0b52ed4fd7fa70c3f87a5606c18ccc49498a6742ecd57d18de63e82034f9cdbc115f0487437dd8dd90ff5ed3e801eb8b4353486e163.239.201.31:30314",
  enr: "enr:-K040PmDvNqYfMhF9ZRU9LmOMeS3F-kKRQIPug4wMTJDckbne2F1vHLLxds1axwOIwQYv0SWhkFCFYDIe6HV8XC6AX9JpFzngGAx9JpJ3w2V0aMfGhP1ew4ZAgm1kgnY0gm1whkPvyR-JCzVjcd11NmsxoQKkU1I-JOkTHnHK5aHR7Q1aeAnfTuMVSvEmSbJWwOx0YRzbnFwI1NOY3CCdmCddwRwgnZg",
  id: "481cd14515afc7852abadd54d040ca3631838102ab1e8392df97b77441ef2d733",
  ip: "163.239.201.31",
  listenAddr: "[*]:30314",
  name: "Geth/v1.10.16-stable-20356e57/windows-amd64/go1.17.5",
  ports: {
    discovery: 30314,
    listener: 30314
  },
  protocols: {
    eth: {
      config: {...},
      difficulty: 1,
      genesis: "0x945154740e5ac3b66ebe8309d181cfc273948a63d4782c7bffa92d21a5f79f6d",
      head: "0x945154740e5ac3b66ebe8309d181cfc273948a63d4782c7bffa92d21a5f79f6d",
      network: 1005
    },
    snap: {}
  }
}
```

```
admin
{
  datadir: "E:\\ethereum_privateNetwork\\node3",
  enode: "enode://a452523f2749131e71cae5a1d1ed095a7809dfb6e7cc4954849ac0635963b1396bd0e46cc260c2daf8eb04efb918c60b0cddfc3c7529fcec579093c0e0f3520163.239.201.31:30324",
  enr: "enr:-K040PmDvNqYfMhF9ZRU9LmOMeS3F-kKRQIPug4wMTJDckbne2F1vHLLxds1axwOIwQYv0SWhkFCFYDIe6HV8XC6AX9JpFzngGAx9JpJ3w2V0aMfGhP1ew4ZAgm1kgnY0gm1whkPvyR-JCzVjcd11NmsxoQKkU1I-JOkTHnHK5aHR7Q1aeAnfTuMVSvEmSbJWwOx0YRzbnFwI1NOY3CCdmCddwRwgnZg",
  id: "8008e962c292e4f7a0213e1cc5d793fa535948ad00ec678ca42ac8ab18b38",
  ip: "163.239.201.31",
  listenAddr: "[*]:30324",
  name: "Geth/v1.10.16-stable-20356e57/windows-amd64/go1.17.5",
  ports: {
    discovery: 30324,
    listener: 30324
  },
  protocols: {
    eth: {
      config: {...},
      difficulty: 1,
      genesis: "0x945154740e5ac3b66ebe8309d181cfc273948a63d4782c7bffa92d21a5f79f6d",
      head: "0x945154740e5ac3b66ebe8309d181cfc273948a63d4782c7bffa92d21a5f79f6d",
      network: 1005
    },
    snap: {}
  }
}
```

```
> admin
{
  datadir: "E:\\ethereum_privateNetwork\\node4",
  enode: "enode://1c7e0ed0bde8d66115f581a2bc41b993ea169b01390c38c5bfd8b7d743a82c5ca525b240d1c671f5d010e205b86089ed87d19e386fd069a1c4ca2118aafc0163.239.201.31:30334",
  enr: "enr:-K040PmDvNqYfMhF9ZRU9LmOMeS3F-kKRQIPug4wMTJDckbne2F1vHLLxds1axwOIwQYv0SWhkFCFYDIe6HV8XC6AX9JpFzngGAx9JpJ3w2V0aMfGhP1ew4ZAgm1kgnY0gm1whkPvyR-JCzVjcd11NmsxoQKkU1I-JOkTHnHK5aHR7Q1aeAnfTuMVSvEmSbJWwOx0YRzbnFwI1NOY3CCdmCddwRwgnZg",
  id: "376748ac52858428aa72b24f0a28dd1b32ef34537bf0f41062f75564a032ea00",
  ip: "163.239.201.31",
  listenAddr: "[*]:30334",
  name: "Geth/v1.10.16-stable-20356e57/windows-amd64/go1.17.5",
  ports: {
    discovery: 30334,
    listener: 30334
  },
  protocols: {
    eth: {
      config: {...},
      difficulty: 1,
      genesis: "0x945154740e5ac3b66ebe8309d181cfc273948a63d4782c7bffa92d21a5f79f6d",
      head: "0x945154740e5ac3b66ebe8309d181cfc273948a63d4782c7bffa92d21a5f79f6d",
      network: 1005
    },
    snap: {}
  }
}
```

## 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"

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")
```



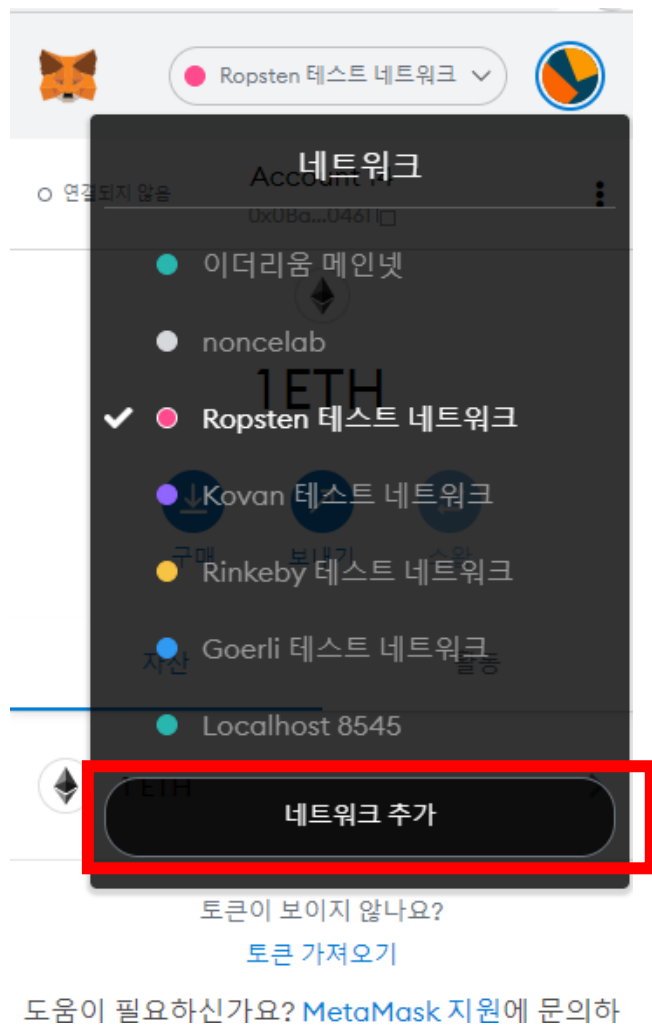
## Private Network 구축

## miner.start()

[illegible]



## 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\\Ethereum")
--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,regjournal 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 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.memprofile rate value	Turn on memory profiling with the given rate (default: 524288)
--pprof.blockprofile rate 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)
```

### COPYRIGHT:

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**Q & A**

