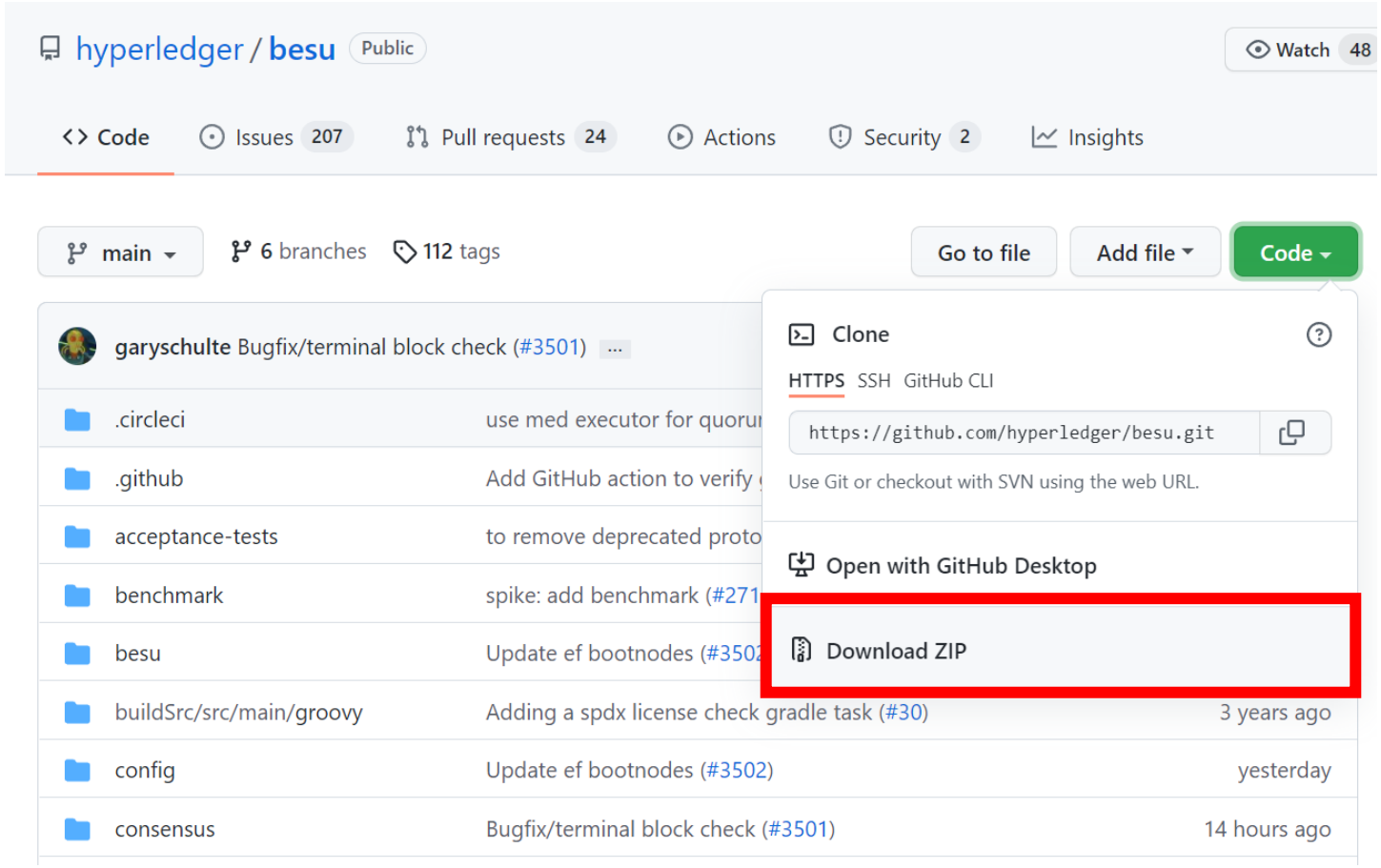
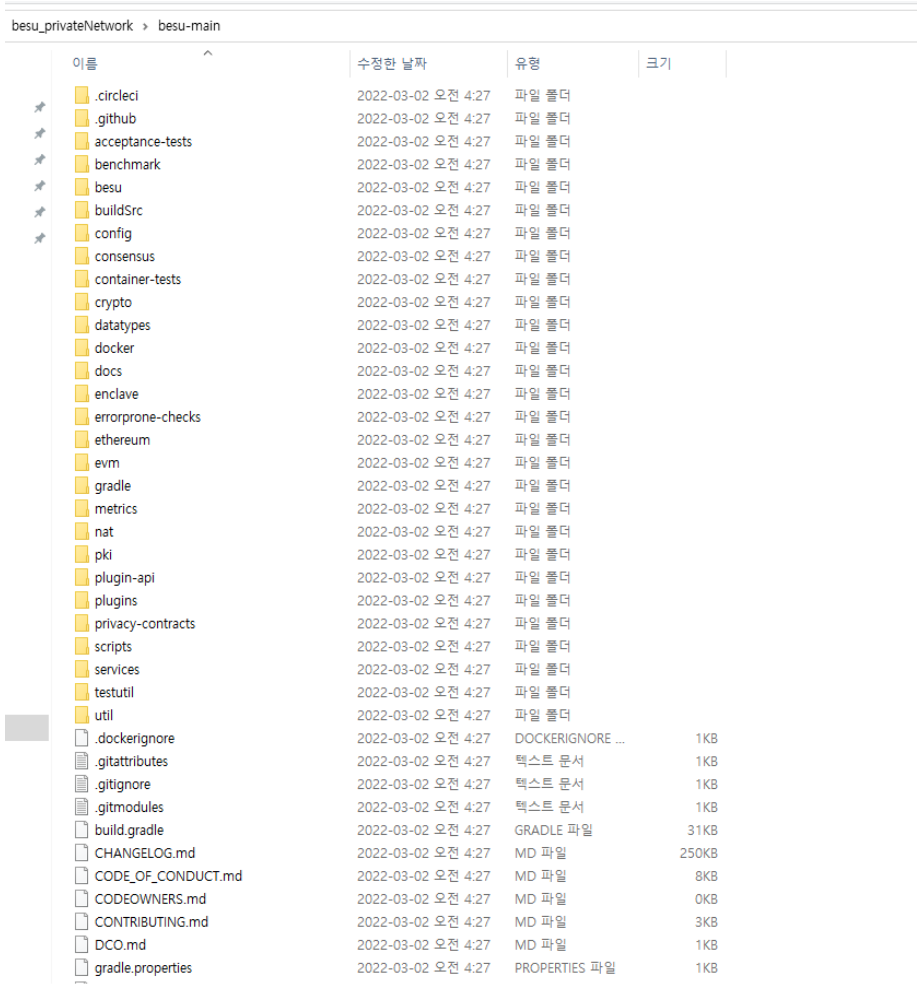
하이퍼레저 베수 네트워크 구축

프라이빗 네트워크 구축

https://github.com/hyperledger/besu



프라이빗 네트워크 구축




```
system888@DESKTOP-GM35NPN MINGW64 /e/besu_privateNetwork/besu-main
$ ls
acceptance-tests/   crypto/              gradlew.bat          PULL_REQUEST_TEMPLATE.md
benchmark/          datatypes/           ISSUE_TEMPLATE.md    README.md
besu/               DCO.md               KNOWN_ISSUES.md      scripts/
build.gradle        docker/              LICENSE              SECURITY.md
buildSrc/           docs/                MAINTAINERS.md       services/
CHANGELOG.md        enclave/             metrics/             settings.gradle
CODE_OF_CONDUCT.md  errorprone-checks/   nat/                 SUPPORT.md
CODEOWNERS.md       ethereum/            NOTICE.md            testutil/
config/             evm/                 pki/                 util/
consensus/          gradle/              plugin-api/
container-tests/    gradle.properties    plugins/
CONTRIBUTING.md     gradlew*             privacy-contracts/
```

OS 상관없이 주의해야 할 것은

경로에서의

/ \

PPT 및 실습 환경

https://gitforwindows.org/

Git Bash terminal로 진행

프라이빗 네트워크 구축

./gradlew installDist

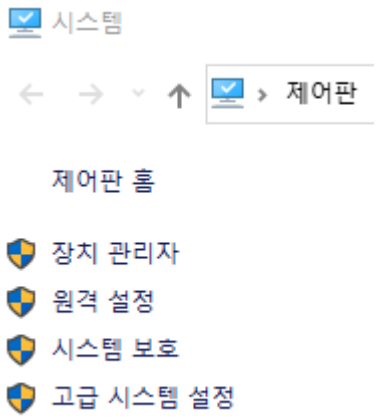
```
system888@DESKTOP-GM35NPN MINGW64 /e/besu_privateNetwork/besu-main
$ ./gradlew installDist
Downloading https://services.gradle.org/distributions/gradle-7.3.3-bin.zip
..........10%..........20%..........30%..........40%..........50%..........60%..........70%
..........80%..........90%..........100%
```

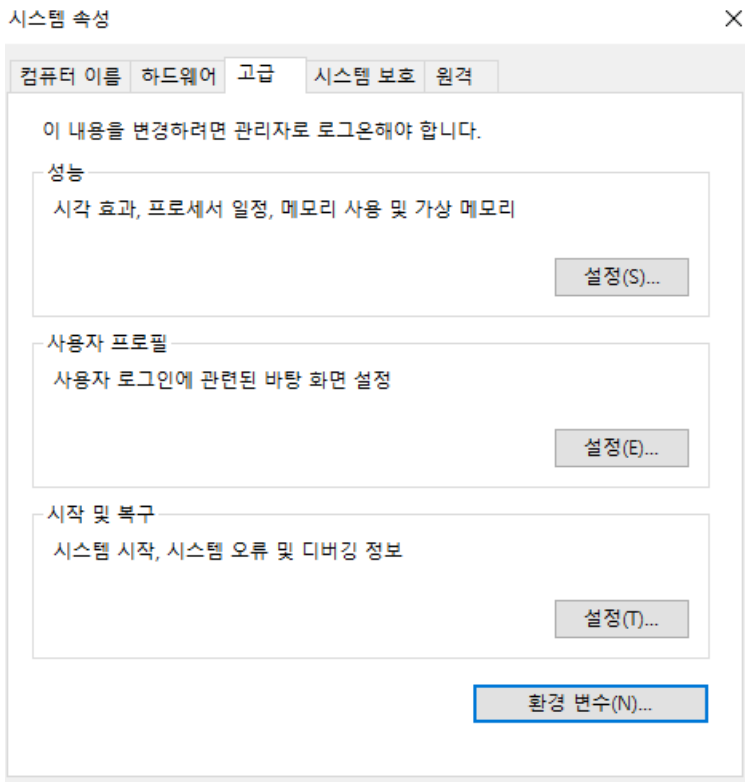
프라이빗 네트워크 구축

```
> Task :ethereum:core:compileTestSupportJava
Note: E:\besu_privateNetwork\besu-main\ethereum\core\src\test-support\java\org\hyperledger\besu\et
hereum\core\InMemoryPrivacyStorageProvider.java uses or overrides a deprecated API.
Note: Recompile with -Xlint:deprecation for details.

> Task :ethereum:evmtool:compileJava
Note: Some input files use or override a deprecated API.
Note: Recompile with -Xlint:deprecation for details.

Deprecated Gradle features were used in this build, making it incompatible with Gradle 8.0.

You can use '--warning-mode all' to show the individual deprecation warnings and determine if they
 come from your own scripts or plugins.

See https://docs.gradle.org/7.3.3/userguide/command_line_interface.html#sec:command_line_warnings

BUILD SUCCESSFUL in 1m 35s
89 actionable tasks: 50 executed, 39 up-to-date
```

프라이빗 네트워크 구축

내PC -> 속성 -> 고급 시스템 설정 -> 환경변수

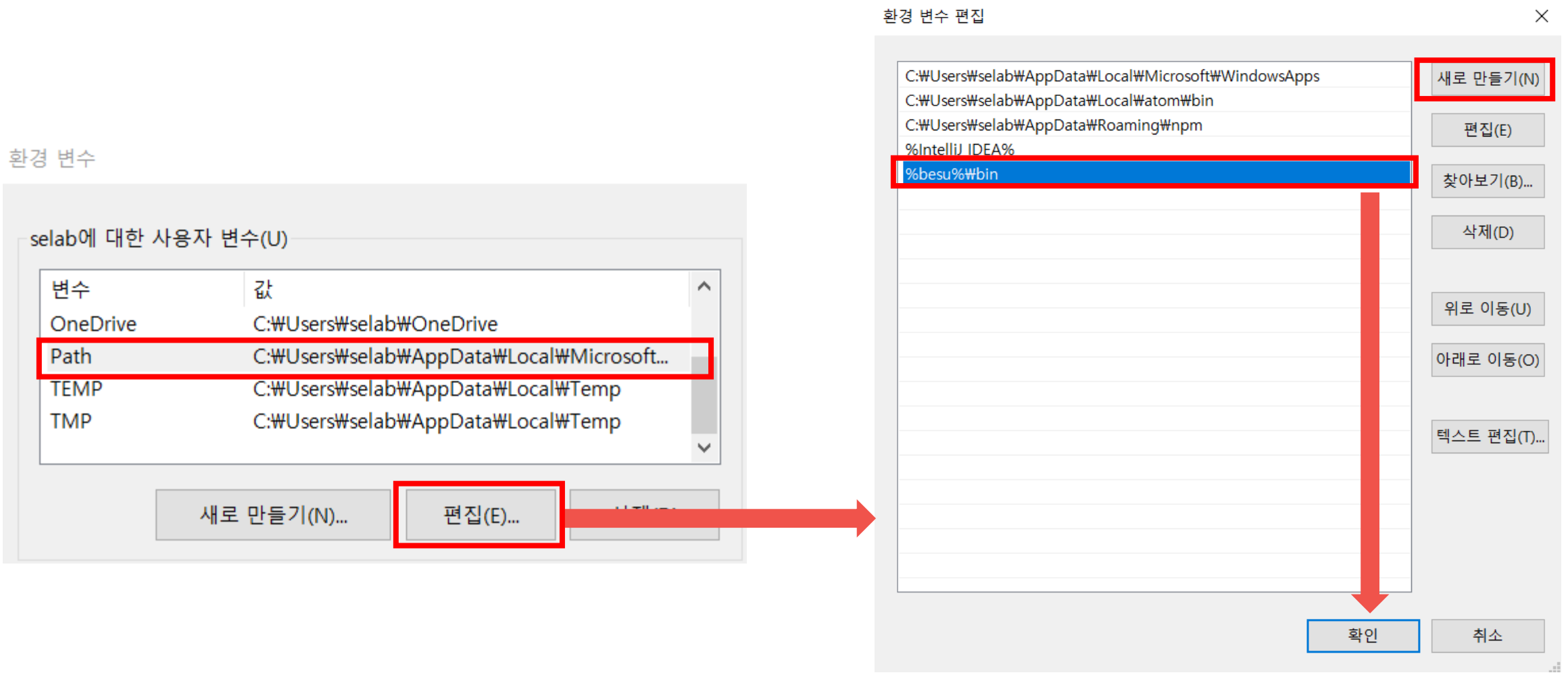




프라이빗 네트워크 구축

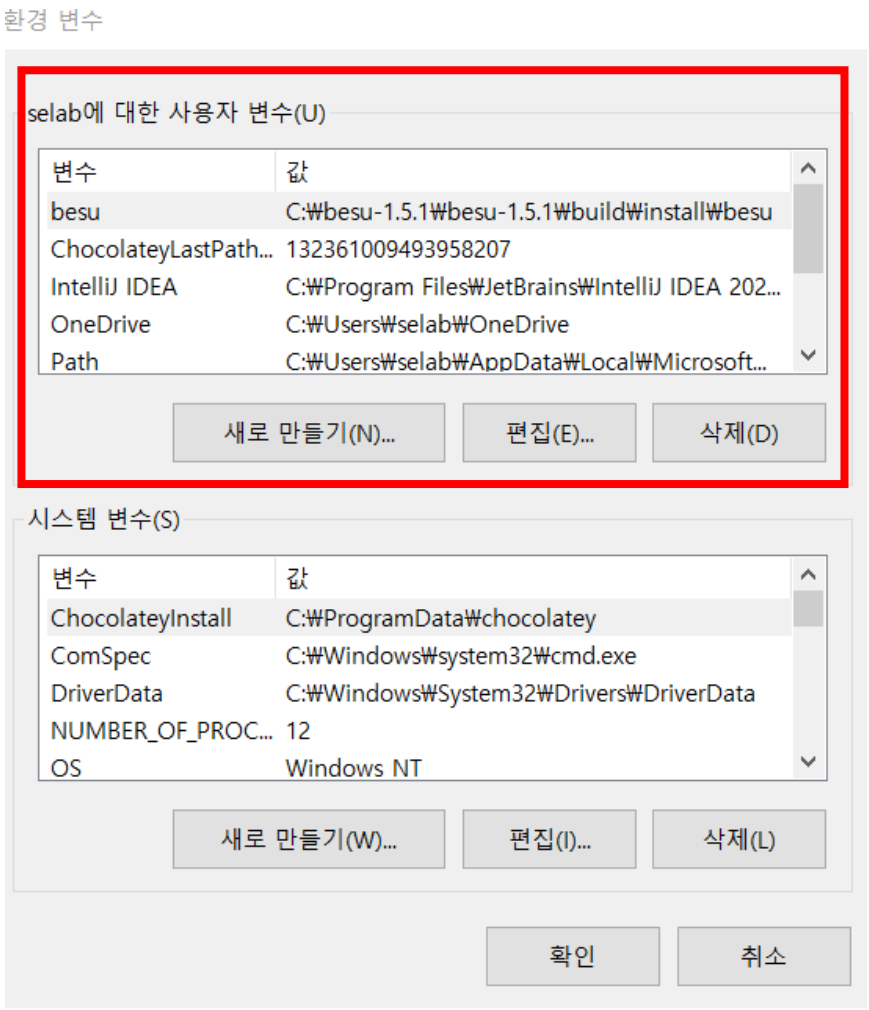
환경 변수
selab에 대한 사용자 변수(U)
변수
값
besu
C:₩besu-1.5.1₩besu-1.5.1₩build₩install₩besu
ChocolateyLastPath...
132361009493958207
IntelliJ IDEA
C:₩Program Files₩JetBrains₩IntelliJ IDEA 202...
OneDrive
C:₩Users₩selab₩OneDrive
Path
C:₩Users₩selab₩AppData₩Local₩Microsoft...
새로 만들기(N)...
시스템 변수(S)
변수
값
ChocolateyInstall
C:₩ProgramData₩chocolatey
ComSpec
C:₩Windows₩system32₩cmd.exe
DriverData
C:₩Windows₩System32₩Drivers₩DriverData
NUMBER_OF_PROC...
12
OS
Windows NT
새로 만들기(W)...
편집(I)...
삭제(L)
확인
취소
사용자 변수 편집
변수 이름(N):
besu
변수 값(V):
C:₩besu-1.5.1₩besu-1.5.1₩build₩install₩besu
디렉터리 찾아보기(D)...
확인
취소
본인이 압축 해제한 위치

프라이빗 네트워크 구축


환경 변수
selab에 대한 사용자 변수(U)
변수
값
OneDrive
C:₩Users₩selab₩OneDrive
Path
C:₩Users₩selab₩AppData₩Local₩Microsoft...
TEMP
C:₩Users₩selab₩AppData₩Local₩Temp
TMP
C:₩Users₩selab₩AppData₩Local₩Temp
새로 만들기(N)...
편집(E)...
환경 변수 편집
C:₩Users₩selab₩AppData₩Local₩Microsoft₩WindowsApps
C:₩Users₩selab₩AppData₩Local₩atom₩bin
C:₩Users₩selab₩AppData₩Roaming₩npm
%IntelliJ IDEA%
%besu%₩bin
새로 만들기(N)
편집(E)
찾아보기(B)...
삭제(D)
위로 이동(U)
아래로 이동(O)
텍스트 편집(T)...
확인
취소

프라이빗 네트워크 구축

해당 방법으로 besu를 못 읽을 경우 사용자 변수 path에 직접 등록

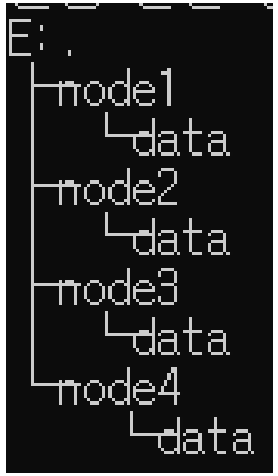


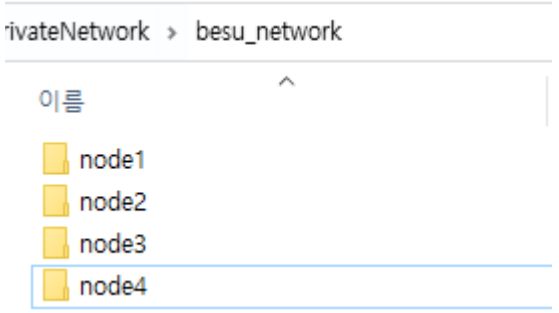
해당 방법으로 besu를 못 읽을 경우 사용자 변수 path에 직접 등록

```
PS C:\Users\system888> besu --version
besu/v22.1.2-dev-xxxxxxxx/windows-x86_64/oracle-java-11
```

프라이빗 네트워크 구축

프라이빗 네트워크 데이터 저장을 위한 폴더 생성





프라이빗 네트워크 구축

Ethereum Account 생성

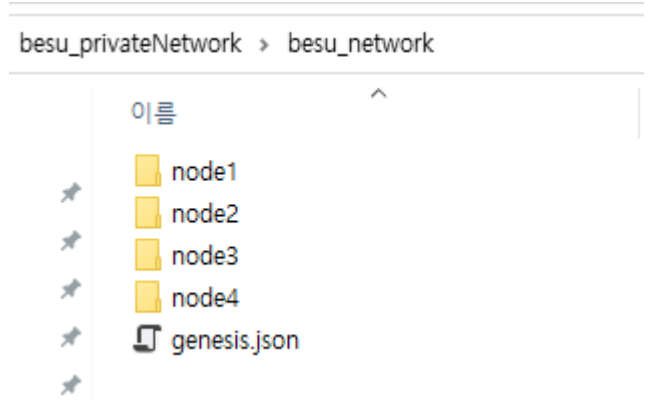
https://vanity-eth.tk/

Address, Private key 따로 저장

프라이빗 네트워크 구축

Genesis.json 파일 생성

```
{
 "genesis": {
   "config": {
     "chainId": 1337,
     "muirglacierblock": 0,
     "ibft2": {
       "blockperiodseconds": 2,
       "epochlength": 30000,
       "requesttimeoutseconds": 4
     }
   },
   "nonce": "0x0",
   "timestamp": "0x58ee40ba",
   "gasLimit": "0x47b760",
   "difficulty": "0x1",
   "mixHash": "0x63746963616c2062797a616e74696e65206661756c7420746f6c6572616e6365",
   "coinbase": "0x0000000000000000000000000000000000000000",
   "alloc": {
     "9D9a133eFE458949E30F6D4B184eD0CE11D02325": {
       "privateKey": "b628eda31d34b136633ff9d2b5177824569966560084768e0722df1e497ff773",
       "balance": "0xad78ebc5ac6200000"
     },
     "40c91d1d7669873486ea79Ec338C8F96eEEDca32": {
       "privateKey": "4bea1b5d3309bda0785608d4c2deaea6216b26d07fafd1030a0d243f0006aa1c",
       "balance": "0xad78ebc5ac6200000"
     },
     "bDa6cE3177682C39fF36Ab76692e094e30848024": {
       "privateKey": "4db07403ed6a33c4cf395781ab07a564ea0954d1a274e01163eb7e4a8b0512ae",
       "balance": "90000000000000000000000"
     },
     "3493100b7d85A40450D38819Fa242728BdEd4887": {
       "privateKey": "689030691365c657e31bf348f4c08cf647a9c5f9fc62089ad71c77832ce224ed",
       "balance": "90000000000000000000000"
     }
   }
 },
 "blockchain": {
   "nodes": {
     "generate": true,
     "count": 4
   }
 }
}
```



생성한 Address 랑 Private key 작성

프라이빗 네트워크 구축

Genesis.json 파일 기반 Key 파일 생성

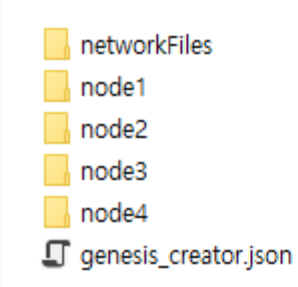
생성한 genesis.json 파일의 위치에서 Console창 접속

```
$ besu operator generate-blockchain-config --config-file=genesis.json --to=networkFiles --private-key-file-name=key
2022-03-03 11:20:40.009+09:00 | main | INFO  | GenerateBlockchainConfig | Generating 4 nodes keys.
2022-03-03 11:20:40.013+09:00 | main | INFO  | GenerateBlockchainConfig | Generating keypair for node 0.
2022-03-03 11:20:40.860+09:00 | main | INFO  | GenerateBlockchainConfig | Generating keypair for node 1.
2022-03-03 11:20:40.864+09:00 | main | INFO  | GenerateBlockchainConfig | Generating keypair for node 2.
2022-03-03 11:20:40.867+09:00 | main | INFO  | GenerateBlockchainConfig | Generating keypair for node 3.
2022-03-03 11:20:40.871+09:00 | main | INFO  | GenerateBlockchainConfig | Generating IBFT extra data.
2022-03-03 11:20:40.873+09:00 | main | INFO  | GenerateBlockchainConfig | Writing genesis file.
```

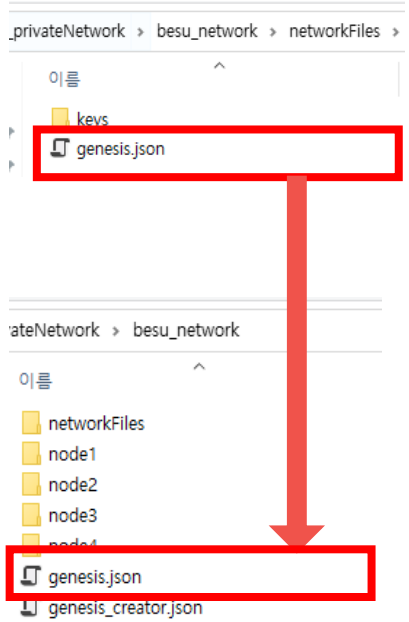
$ besu operator generate-blockchain-config --config-file=genesis.json --to=networkFiles --private-key-file-name=key

프라이빗 네트워크 구축

파일 위치 조정

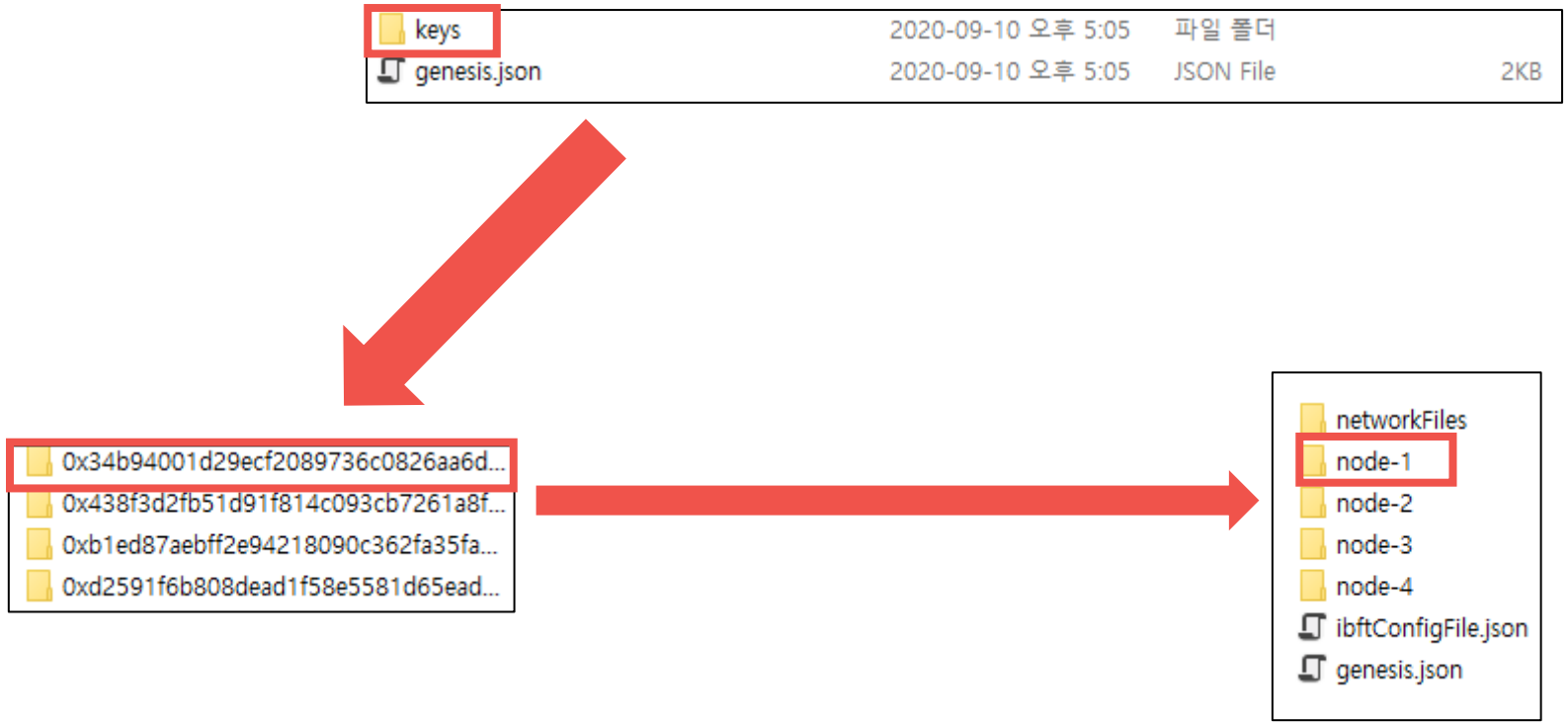


기존 genesis.json 파일 이름을 genesis_creator.json으로 변경



프라이빗 네트워크 구축

파일 위치 조정



각각 폴더 안에 있는
Key, key.pub 파일을 각 노드의 폴더의 data 폴더 안에 이동

프라이빗 네트워크 구축

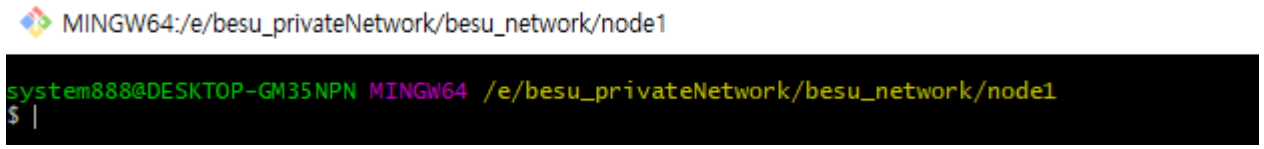
파일 위치 조정

```
IBFT-Network/
├── genesis.json
├── Node-1
│   ├── data
│   │   ├── key
│   │   ├── key.pub
├── Node-2
│   ├── data
│   │   ├── key
│   │   ├── key.pub
├── Node-3
│   ├── data
│   │   ├── key
│   │   ├── key.pub
├── Node-4
│   ├── data
│   │   ├── key
│   │   ├── key.pub
```

그림과 같은 형태로 파일 위치 조정

프라이빗 네트워크 구축

Console 창 활용해서 node1 폴더로 이동




```
system888@DESKTOP-GM35NPN MINGW64 /e/besu_privateNetwork/besu_network/node1
$ besu --data-path=data --genesis-file=../genesis.json --rpc-http-enabled --rpc-http-api=ETH,NET,IBFT --host-allowlist="*" --rpc-http-cors-origins="all"
2022-03-03 11:33:44.058+09:00 | main | INFO  | AltBN128PairingPrecompiledContract | Native alt bn128 requested but not available
2022-03-03 11:33:44.539+09:00 | main | INFO  | SECP256K1 | Native secp256k1 requested but not available
2022-03-03 11:33:44.543+09:00 | main | INFO  | Besu | Starting Besu version: besu/v1.5.0-RC4-dev-xxxxxxxx/windows-x86_64/oracle-java-11
2022-03-03 11:33:44.845+09:00 | main | INFO  | StaticNodesParser | StaticNodes file E:\besu_privateNetwork\besu_network\node1\data\static-nodes.json does not exist, no static connections will be created.
2022-03-03 11:33:44.846+09:00 | main | INFO  | Besu | Connecting to 0 static nodes.
2022-03-03 11:33:44.848+09:00 | main | INFO  | Besu | Security Module: localfile
2022-03-03 11:33:44.882+09:00 | main | INFO  | KeyPairUtil | Loaded public key 0xe8f3977e2d2922cbe18117a4439daee5cb816d755ec2033fcfaedcddc33924033b138af9a94bfe3df8d4cd2fa39398cfbbb6275670f5b2b7e7fc873a5790cfdf from E:\besu_privateNetwork\besu_network\
node1\data\key
2022-03-03 11:33:44.921+09:00 | main | INFO  | RocksDBKeyValueStorageFactory | No existing database detected at E:\besu_privateNetwork\besu_network\node1\data. Using version 1
2022-03-03 11:33:46.186+09:00 | main | INFO  | ProtocolScheduleBuilder | Protocol schedule created with milestones: [MuirGlacier: 0]
2022-03-03 11:33:46.276+09:00 | main | INFO  | RunnerBuilder | Detecting NAT service.
2022-03-03 11:33:46.366+09:00 | main | INFO  | Runner | Starting Ethereum main loop ...
2022-03-03 11:33:46.366+09:00 | main | INFO  | NatService | No NAT environment detected so no service could be started
2022-03-03 11:33:46.366+09:00 | main | INFO  | NetworkRunner | Starting Network.
2022-03-03 11:33:46.913+09:00 | nioEventLoopGroup-2-1 | INFO  | RlpxAgent | P2P RLPx agent started and listening on /0:0:0:0:0:0:0:0:30303.
2022-03-03 11:33:46.914+09:00 | main | INFO  | PeerDiscoveryAgent | Starting peer discovery agent on host=0.0.0.0, port=30303
2022-03-03 11:33:47.423+09:00 | vert.x-eventloop-thread-1 | INFO  | VertxPeerDiscoveryAgent | Started peer discovery agent successfully, on effective host=0:0:0:0:0:0:0:0 and port=30303
2022-03-03 11:33:47.426+09:00 | vert.x-eventloop-thread-1 | INFO  | PeerDiscoveryAgent | P2P peer discovery agent started and listening on /0:0:0:0:0:0:0:0:30303
2022-03-03 11:33:47.451+09:00 | main | INFO  | DefaultP2PNetwork | Enode URL enode://e8f3977e2d2922cbe18117a4439daee5cb816d755ec2033fcfaedcddc33924033b138af9a94bfe3df8d4cd2fa39398cfbbb6275670f5b2b7e7fc873a5790cfdf@127.0.0.1:30303
2022-03-03 11:33:47.452+09:00 | main | INFO  | DefaultP2PNetwork | Node address 0x7a7dcddfe6b203df14360fa09e63ddea61110fea
2022-03-03 11:33:47.454+09:00 | main | INFO  | DefaultSynchronizer | Starting synchronizer.
2022-03-03 11:33:47.455+09:00 | main | INFO  | FullSyncDownloader | Starting full sync.
2022-03-03 11:33:47.456+09:00 | main | INFO  | FullSyncTargetManager | No sync target, waiting for peers: 0
2022-03-03 11:33:47.487+09:00 | main | INFO  | JsonRpcHttpService | Starting JsonRPC service on 127.0.0.1:8545
2022-03-03 11:33:47.528+09:00 | vert.x-eventloop-thread-5 | INFO  | JsonRpcHttpService | JsonRPC service started and listening on 127.0.0.1:8545
2022-03-03 11:33:47.531+09:00 | main | INFO  | Runner | Ethereum main loop is up.
2022-03-03 11:33:47.542+09:00 | main | INFO  | AutoTransactionLogBloomCachingService | Starting auto transaction log bloom caching service.
2022-03-03 11:33:52.470+09:00 | EthScheduler-Timer-0 | INFO  | FullSyncTargetManager | No sync target, waiting for peers: 0
2022-03-03 11:33:57.471+09:00 | EthScheduler-Timer-0 | INFO  | FullSyncTargetManager | No sync target, waiting for peers: 0
```

besu --data-path=data --genesis-file=../genesis.json --rpc-http-enabled --rpc-http-api=ETH,NET,IBFT --host-allowlist="*" --rpc-http-cors-origins="all"

프라이빗 네트워크 구축

Encode 정보 복사

```
system8880DESKTOP-GM35NPN MINGW64 /e/besu_privateNetwork/besu_network/node1
$ besu --data-path=data --genesis-file=../genesis.json --rpc-http-enabled --rpc-http-api=ETH,NET,IBFT --host-allowlist="*" --rpc-http-cors-origins="all"
2022-03-03 11:33:44.058+09:00 | main | INFO  | AltBN128PairingPrecompiledContract | Native alt bn128 requested but not available
2022-03-03 11:33:44.539+09:00 | main | INFO  | SECP256K1 | Native secp256k1 requested but not available
2022-03-03 11:33:44.543+09:00 | main | INFO  | Besu | Starting Besu version: besu/v1.5.0-RC4-dev-xxxxxxxx/windows-x86_64/oracle-java-11
2022-03-03 11:33:44.845+09:00 | main | INFO  | StaticNodesParser | StaticNodes file E:\besu_privateNetwork\besu_network\node1\data\static-nodes.json does not exist, no static connections will be created.
2022-03-03 11:33:44.846+09:00 | main | INFO  | Besu | Connecting to 0 static nodes.
2022-03-03 11:33:44.848+09:00 | main | INFO  | Besu | Security Module: localfile
2022-03-03 11:33:44.882+09:00 | main | INFO  | KeyPairUtil | Loaded public key 0xe8f3977e2d2922cbe18117a4439daee5cb816d755ec2033fcfaedcddc33924033b138af9a94bfe3df8d4cd2fa39398cfbbb6275670f5b2b7e7fc873a5790cfdf from E:\besu_privateNetwork\besu_network\
node1\data\key
2022-03-03 11:33:44.921+09:00 | main | INFO  | RocksDBKeyValueStorageFactory | No existing database detected at E:\besu_privateNetwork\besu_network\node1\data. Using version 1
2022-03-03 11:33:46.186+09:00 | main | INFO  | ProtocolScheduleBuilder | Protocol schedule created with milestones: [MuirGlacier: 0]
2022-03-03 11:33:46.276+09:00 | main | INFO  | RunnerBuilder | Detecting NAT service.
2022-03-03 11:33:46.366+09:00 | main | INFO  | Runner | Starting Ethereum main loop ...
2022-03-03 11:33:46.366+09:00 | main | INFO  | NatService | No NAT environment detected so no service could be started
2022-03-03 11:33:46.366+09:00 | main | INFO  | NetworkRunner | Starting Network.
2022-03-03 11:33:46.913+09:00 | nioEventLoopGroup-2-1 | INFO  | RlpxAgent | P2P RLPx agent started and listening on /0:0:0:0:0:0:0:0:30303.
2022-03-03 11:33:46.914+09:00 | main | INFO  | PeerDiscoveryAgent | Starting peer discovery agent on host=0.0.0.0, port=30303
2022-03-03 11:33:47.423+09:00 | vert.x-eventloop-thread-1 | INFO  | VertxPeerDiscoveryAgent | Started peer discovery agent successfully, on effective host=0:0:0:0:0:0:0:0 and port=30303
2022-03-03 11:33:47.426+09:00 | vert.x-eventloop-thread-1 | INFO  | PeerDiscoveryAgent | P2P peer discovery agent started and listening on /0:0:0:0:0:0:0:0:30303
2022-03-03 11:33:47.451+09:00 | main | INFO  | DefaultP2PNetwork | Enode URL enode://e8f3977e2d2922cbe18117a4439daee5cb816d755ec2033fcfaedcddc33924033b138af9a94bfe3df8d4cd2fa39398cfbbb6275670f5b2b7e7fc873a5790cfdf@127.0.0.1:30303
2022-03-03 11:33:47.452+09:00 | main | INFO  | DefaultP2PNetwork | Node address 0x7a7dcddfe6b203df14360fa09e63ddea61110fea
2022-03-03 11:33:47.454+09:00 | main | INFO  | DefaultSynchronizer | Starting synchronizer.
2022-03-03 11:33:47.455+09:00 | main | INFO  | FullSyncDownloader | Starting full sync.
2022-03-03 11:33:47.456+09:00 | main | INFO  | FullSyncTargetManager | No sync target, waiting for peers: 0
2022-03-03 11:33:47.487+09:00 | main | INFO  | JsonRpcHttpService | Starting JsonRPC service on 127.0.0.1:8545
2022-03-03 11:33:47.528+09:00 | vert.x-eventloop-thread-5 | INFO  | JsonRpcHttpService | JsonRPC service started and listening on 127.0.0.1:8545
2022-03-03 11:33:47.531+09:00 | main | INFO  | Runner | Ethereum main loop is up.
2022-03-03 11:33:47.542+09:00 | main | INFO  | AutoTransactionLogBloomCachingService | Starting auto transaction log bloom caching service.
2022-03-03 11:33:52.470+09:00 | EthScheduler-Timer-0 | INFO  | FullSyncTargetManager | No sync target, waiting for peers: 0
2022-03-03 11:33:57.471+09:00 | EthScheduler-Timer-0 | INFO  | FullSyncTargetManager | No sync target, waiting for peers: 0
```

```
2022-03-03 11:36:22.514+09:00 | EthScheduler-Timer-0 | INFO  | FullSyncTargetManager | No sync target, waiting for peers: 0
2022-03-03 11:36:27.515+09:00 | EthScheduler-Timer-0 | INFO  | FullSyncTargetManager | No sync target, waiting for peers: 0
2022-03-03 11:36:32.517+09:00 | EthScheduler-Timer-0 | INFO  | FullSyncTargetManager | No sync target, waiting for peers: 0
2022-03-03 11:36:37.519+09:00 | EthScheduler-Timer-0 | INFO  | FullSyncTargetManager | No sync target, waiting for peers: 0
2022-03-03 11:36:42.521+09:00 | EthScheduler-Timer-0 | INFO  | FullSyncTargetManager | No sync target, waiting for peers: 0
2022-03-03 11:36:47.525+09:00 | EthScheduler-Timer-0 | INFO  | FullSyncTargetManager | No sync target, waiting for peers: 0
2022-03-03 11:36:52.528+09:00 | EthScheduler-Timer-0 | INFO  | FullSyncTargetManager | No sync target, waiting for peers: 0
2022-03-03 11:36:57.530+09:00 | EthScheduler-Timer-0 | INFO  | FullSyncTargetManager | No sync target, waiting for peers: 0
2022-03-03 11:37:02.531+09:00 | EthScheduler-Timer-0 | INFO  | FullSyncTargetManager | No sync target, waiting for peers: 0
2022-03-03 11:37:07.533+09:00 | EthScheduler-Timer-0 | INFO  | FullSyncTargetManager | No sync target, waiting for peers: 0
2022-03-03 11:37:12.534+09:00 | EthScheduler-Timer-0 | INFO  | FullSyncTargetManager | No sync target, waiting for peers: 0
2022-03-03 11:37:17.536+09:00 | EthScheduler-Timer-0 | INFO  | FullSyncTargetManager | No sync target, waiting for peers: 0
2022-03-03 11:37:22.537+09:00 | EthScheduler-Timer-0 | INFO  | FullSyncTargetManager | No sync target, waiting for peers: 0
2022-03-03 11:37:27.539+09:00 | EthScheduler-Timer-0 | INFO  | FullSyncTargetManager | No sync target, waiting for peers: 0
2022-03-03 11:37:32.540+09:00 | EthScheduler-Timer-0 | INFO  | FullSyncTargetManager | No sync target, waiting for peers: 0
2022-03-03 11:37:37.541+09:00 | EthScheduler-Timer-0 | INFO  | FullSyncTargetManager | No sync target, waiting for peers: 0
2022-03-03 11:37:42.543+09:00 | EthScheduler-Timer-0 | INFO  | FullSyncTargetManager | No sync target, waiting for peers: 0
2022-03-03 11:37:47.545+09:00 | EthScheduler-Timer-0 | INFO  | FullSyncTargetManager | No sync target, waiting for peers: 0
2022-03-03 11:37:52.547+09:00 | EthScheduler-Timer-0 | INFO  | FullSyncTargetManager | No sync target, waiting for peers: 0
2022-03-03 11:37:57.549+09:00 | EthScheduler-Timer-0 | INFO  | FullSyncTargetManager | No sync target, waiting for peers: 0
2022-03-03 11:38:02.550+09:00 | EthScheduler-Timer-0 | INFO  | FullSyncTargetManager | No sync target, waiting for peers: 0
```

프라이빗 네트워크 구축

노드 실행 명령어 만들기

Node-1

besu --data-path=data --genesis-file=../genesis.json --rpc-http-enabled --rpc-http-api=ETH,NET,IBFT --host-allowlist="*" --rpc-http-cors-origins="all“

Node-2

besu --data-path=data --genesis-file=../genesis.json --bootnodes=<Node-1 Enode URL> --p2p-port=30304 --rpc-http-enabled --rpc-http-api=ETH,NET,IBFT --host-allowlist="*" --rpc-http-cors-origins="all" --rpc-http-port=8546

Node-3

besu --data-path=data --genesis-file=../genesis.json --bootnodes=<Node-1 Enode URL> --p2p-port=30305 --rpc-http-enabled --rpc-http-api=ETH,NET,IBFT --host-allowlist="*" --rpc-http-cors-origins="all" --rpc-http-port=8547

Node-4

besu --data-path=data --genesis-file=../genesis.json --bootnodes=<Node-1 Enode URL> --p2p-port=30306 --rpc-http-enabled --rpc-http-api=ETH,NET,IBFT --host-allowlist="*" --rpc-http-cors-origins="all" --rpc-http-port=8548

프라이빗 네트워크 구축

노드 실행 명령어 만들기2

Node-1

besu --data-path=data --genesis-file=../genesis.json --rpc-http-enabled --rpc-http-api=ETH,NET,IBFT --host-allowlist="*" --rpc-http-cors-origins="all“

Node-2

besu --data-path=data --genesis-file=../genesis.json --bootnodes=<Node-1 Enode URL> --p2p-port=30304 --rpc-ws-enabled --rpc-ws-api=ETH,NET,IBFT --host-allowlist="*" --rpc-http-cors-origins="all" --rpc-ws-port=8546

Node-3

besu --data-path=data --genesis-file=../genesis.json --bootnodes=<Node-1 Enode URL> --p2p-port=30305 --rpc-ws-enabled --rpc-ws-api=ETH,NET,IBFT --host-allowlist="*" --rpc-http-cors-origins="all" --rpc-ws-port=8547

Node-4

besu --data-path=data --genesis-file=../genesis.json --bootnodes=<Node-1 Enode URL> --p2p-port=30306 --rpc-ws-enabled --rpc-ws-api=ETH,NET,IBFT --host-allowlist="*" --rpc-http-cors-origins="all" --rpc-ws-port=8548

프라이빗 네트워크 구축

노드 실행 명령어 만들기

Enode URL

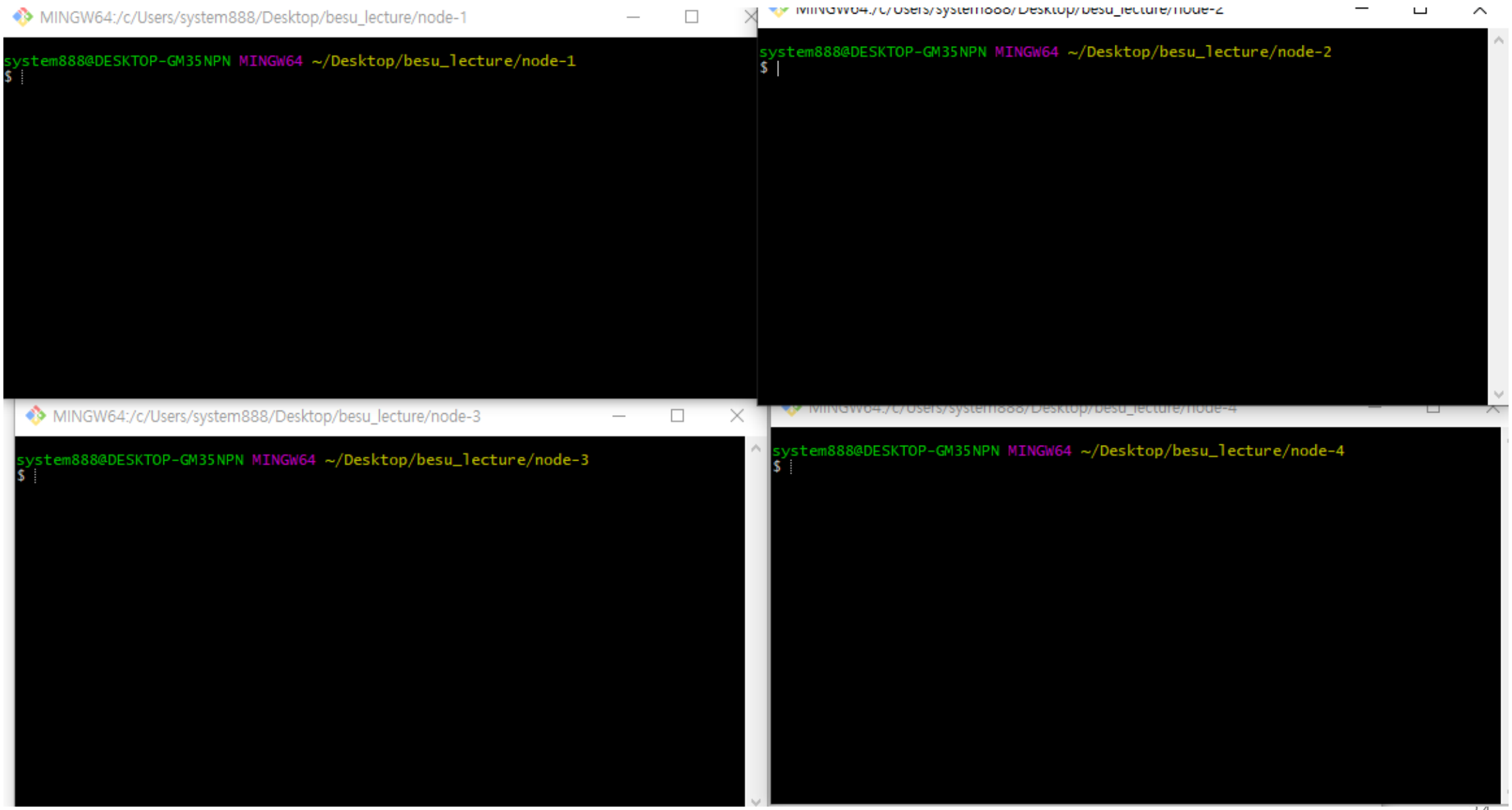
enode://ae5d71cefa32190dd20d298f9d9d58ee435429244892868426126c7d160b734d04d930a9f4fb139889e99e0c7d91e263167992615d91c1e0ea59d74d277b2437@127.0.0.1:30303

```
besu --data-path=data --genesis-file=../genesis.json --bootnodes=enode://ae5d71cefa32190dd20d298f9d9d58ee435429244892868426126c7d160b734d04d930a9f4fb139889e99e0c7d91e263167992615d91c1e0ea59d74d277b2437@127.0.0.1:30303 --p2p-port=30304 --rpc-http-enabled --rpc-http-api=ETH,NET,IBFT --host-allowlist="*" --rpc-http-cors-origins="all" --rpc-http-port=8546
```

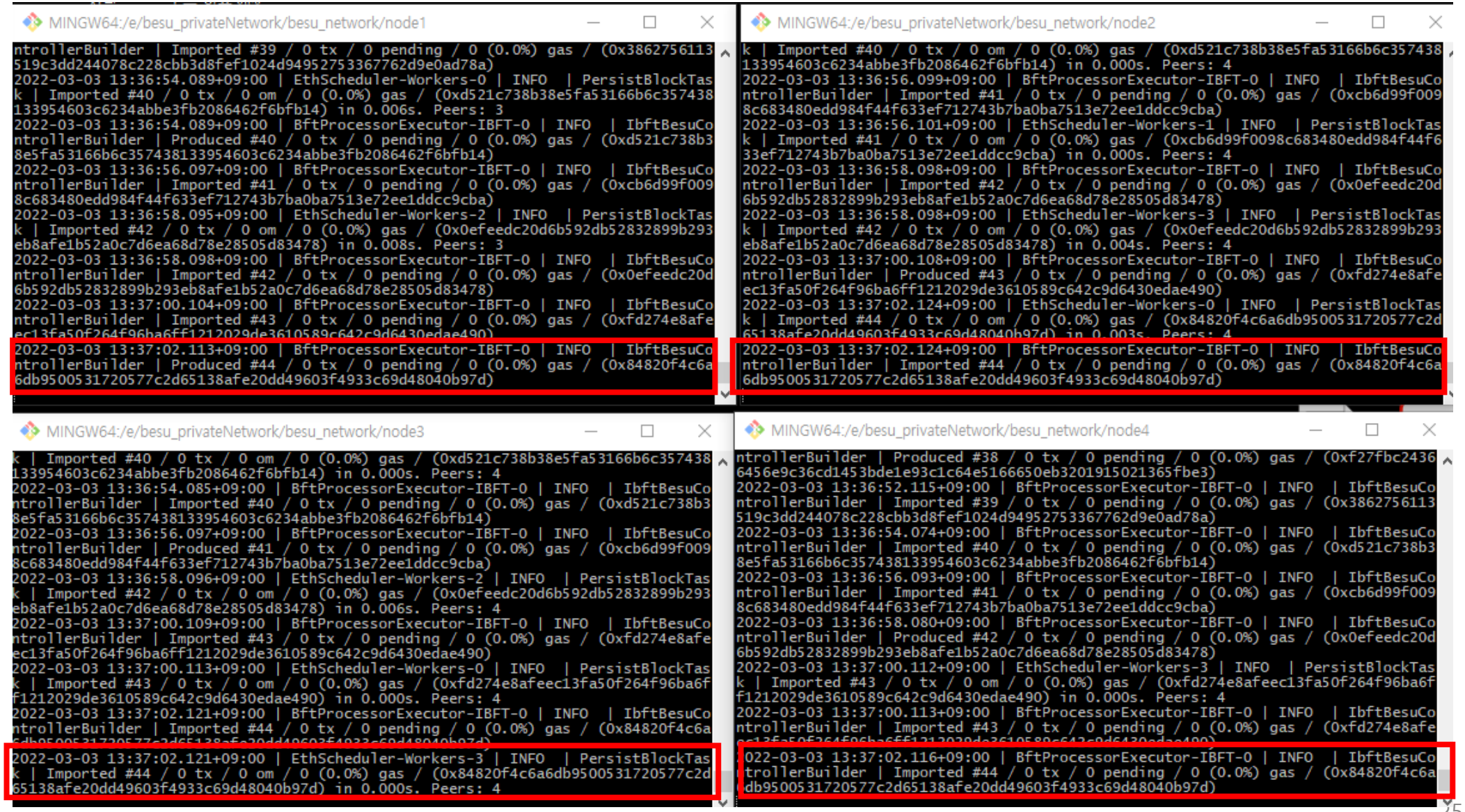
```
besu --data-path=data --genesis-file=../genesis.json --bootnodes=enode://ae5d71cefa32190dd20d298f9d9d58ee435429244892868426126c7d160b734d04d930a9f4fb139889e99e0c7d91e263167992615d91c1e0ea59d74d277b2437@127.0.0.1:30303 --p2p-port=30305 --rpc-http-enabled --rpc-http-api=ETH,NET,IBFT --host-allowlist="*" --rpc-http-cors-origins="all" --rpc-http-port=8547
```

```
besu --data-path=data --genesis-file=../genesis.json --bootnodes=enode://ae5d71cefa32190dd20d298f9d9d58ee435429244892868426126c7d160b734d04d930a9f4fb139889e99e0c7d91e263167992615d91c1e0ea59d74d277b2437@127.0.0.1:30303 --p2p-port=30306 --rpc-http-enabled --rpc-http-api=ETH,NET,IBFT --host-allowlist="*" --rpc-http-cors-origins="all" --rpc-http-port=8548
```

프라이빗 네트워크 구축


MINGW64:/c/Users/system888/Desktop/besu_lecture/node-1
system888@DESKTOP-GM35NPN MINGW64 ~/Desktop/besu_lecture/node-1
$
system888@DESKTOP-GM35NPN MINGW64 ~/Desktop/besu_lecture/node-2
$
MINGW64:/c/Users/system888/Desktop/besu_lecture/node-3
system888@DESKTOP-GM35NPN MINGW64 ~/Desktop/besu_lecture/node-3
$
system888@DESKTOP-GM35NPN MINGW64 ~/Desktop/besu_lecture/node-4
$

프라이빗 네트워크 구축


MINGW64:/e/besu_privateNetwork/besu_network/node1
ntrollerBuilder | Imported #39 / 0 tx / 0 pending / 0 (0.0%) gas / (0x3862756113519c3dd244078c228cbb3d8fef1024d94952753367762d9e0ad78a)
2022-03-03 13:36:54.089+09:00 | EthScheduler-Workers-0 | INFO | PersistBlockTask | Imported #40 / 0 tx / 0 om / 0 (0.0%) gas / (0xd521c738b38e5fa53166b6c357438133954603c6234abbe3fb2086462f6bfb14) in 0.006s. Peers: 3
2022-03-03 13:36:54.089+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbftBesuControllerBuilder | Produced #40 / 0 tx / 0 pending / 0 (0.0%) gas / (0xd521c738b38e5fa53166b6c357438133954603c6234abbe3fb2086462f6bfb14)
2022-03-03 13:36:56.097+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbftBesuControllerBuilder | Imported #41 / 0 tx / 0 pending / 0 (0.0%) gas / (0xcb6d99f0098c683480edd984f44f633ef712743b7ba0ba7513e72ee1ddcc9cba)
2022-03-03 13:36:58.095+09:00 | EthScheduler-Workers-2 | INFO | PersistBlockTask | Imported #42 / 0 tx / 0 om / 0 (0.0%) gas / (0x0efeedc20d6b592db52832899b293eb8afe1b52a0c7d6ea68d78e28505d83478) in 0.008s. Peers: 3
2022-03-03 13:36:58.098+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbftBesuControllerBuilder | Imported #42 / 0 tx / 0 pending / 0 (0.0%) gas / (0x0efeedc20d6b592db52832899b293eb8afe1b52a0c7d6ea68d78e28505d83478)
2022-03-03 13:37:00.104+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbftBesuControllerBuilder | Imported #43 / 0 tx / 0 pending / 0 (0.0%) gas / (0xfd274e8afeec13fa50f264f96ba6ff1212029de3610589c642c9d6430edae490)
2022-03-03 13:37:02.113+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbftBesuControllerBuilder | Produced #44 / 0 tx / 0 pending / 0 (0.0%) gas / (0x84820f4c6a6db9500531720577c2d65138afe20dd49603f4933c69d48040b97d)
MINGW64:/e/besu_privateNetwork/besu_network/node2
k | Imported #40 / 0 tx / 0 om / 0 (0.0%) gas / (0xd521c738b38e5fa53166b6c357438133954603c6234abbe3fb2086462f6bfb14) in 0.000s. Peers: 4
2022-03-03 13:36:56.099+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbftBesuControllerBuilder | Imported #41 / 0 tx / 0 pending / 0 (0.0%) gas / (0xcb6d99f0098c683480edd984f44f633ef712743b7ba0ba7513e72ee1ddcc9cba)
2022-03-03 13:36:56.101+09:00 | EthScheduler-Workers-1 | INFO | PersistBlockTask | Imported #41 / 0 tx / 0 om / 0 (0.0%) gas / (0xcb6d99f0098c683480edd984f44f633ef712743b7ba0ba7513e72ee1ddcc9cba) in 0.000s. Peers: 4
2022-03-03 13:36:58.098+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbftBesuControllerBuilder | Imported #42 / 0 tx / 0 pending / 0 (0.0%) gas / (0x0efeedc20d6b592db52832899b293eb8afe1b52a0c7d6ea68d78e28505d83478)
2022-03-03 13:36:58.098+09:00 | EthScheduler-Workers-3 | INFO | PersistBlockTask | Imported #42 / 0 tx / 0 om / 0 (0.0%) gas / (0x0efeedc20d6b592db52832899b293eb8afe1b52a0c7d6ea68d78e28505d83478) in 0.004s. Peers: 4
2022-03-03 13:37:00.108+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbftBesuControllerBuilder | Produced #43 / 0 tx / 0 pending / 0 (0.0%) gas / (0xfd274e8afeec13fa50f264f96ba6ff1212029de3610589c642c9d6430edae490)
2022-03-03 13:37:02.124+09:00 | EthScheduler-Workers-0 | INFO | PersistBlockTask | Imported #44 / 0 tx / 0 om / 0 (0.0%) gas / (0x84820f4c6a6db9500531720577c2d65138afe20dd49603f4933c69d48040b97d)
2022-03-03 13:37:02.124+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbftBesuControllerBuilder | Imported #44 / 0 tx / 0 pending / 0 (0.0%) gas / (0x84820f4c6a6db9500531720577c2d65138afe20dd49603f4933c69d48040b97d)
MINGW64:/e/besu_privateNetwork/besu_network/node3
k | Imported #40 / 0 tx / 0 om / 0 (0.0%) gas / (0xd521c738b38e5fa53166b6c357438133954603c6234abbe3fb2086462f6bfb14) in 0.000s. Peers: 4
2022-03-03 13:36:54.085+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbftBesuControllerBuilder | Imported #40 / 0 tx / 0 pending / 0 (0.0%) gas / (0xd521c738b38e5fa53166b6c357438133954603c6234abbe3fb2086462f6bfb14)
2022-03-03 13:36:56.097+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbftBesuControllerBuilder | Produced #41 / 0 tx / 0 pending / 0 (0.0%) gas / (0xcb6d99f0098c683480edd984f44f633ef712743b7ba0ba7513e72ee1ddcc9cba)
2022-03-03 13:36:58.096+09:00 | EthScheduler-Workers-2 | INFO | PersistBlockTask | Imported #42 / 0 tx / 0 om / 0 (0.0%) gas / (0x0efeedc20d6b592db52832899b293eb8afe1b52a0c7d6ea68d78e28505d83478) in 0.006s. Peers: 4
2022-03-03 13:37:00.109+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbftBesuControllerBuilder | Imported #43 / 0 tx / 0 pending / 0 (0.0%) gas / (0xfd274e8afeec13fa50f264f96ba6ff1212029de3610589c642c9d6430edae490)
2022-03-03 13:37:00.113+09:00 | EthScheduler-Workers-0 | INFO | PersistBlockTask | Imported #43 / 0 tx / 0 om / 0 (0.0%) gas / (0xfd274e8afeec13fa50f264f96ba6ff1212029de3610589c642c9d6430edae490) in 0.000s. Peers: 4
2022-03-03 13:37:02.121+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbftBesuControllerBuilder | Imported #44 / 0 tx / 0 pending / 0 (0.0%) gas / (0x84820f4c6a6db9500531720577c2d65138afe20dd49603f4933c69d48040b97d)
2022-03-03 13:37:02.121+09:00 | EthScheduler-Workers-3 | INFO | PersistBlockTask | Imported #44 / 0 tx / 0 om / 0 (0.0%) gas / (0x84820f4c6a6db9500531720577c2d65138afe20dd49603f4933c69d48040b97d) in 0.000s. Peers: 4
MINGW64:/e/besu_privateNetwork/besu_network/node4
ntrollerBuilder | Produced #38 / 0 tx / 0 pending / 0 (0.0%) gas / (0xf27fbc24366456e9c36cd1453bde1e93c1c64e5166650eb3201915021365fbe3)
2022-03-03 13:36:52.115+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbftBesuControllerBuilder | Imported #39 / 0 tx / 0 pending / 0 (0.0%) gas / (0x3862756113519c3dd244078c228cbb3d8fef1024d94952753367762d9e0ad78a)
2022-03-03 13:36:54.074+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbftBesuControllerBuilder | Imported #40 / 0 tx / 0 pending / 0 (0.0%) gas / (0xd521c738b38e5fa53166b6c357438133954603c6234abbe3fb2086462f6bfb14)
2022-03-03 13:36:56.093+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbftBesuControllerBuilder | Imported #41 / 0 tx / 0 pending / 0 (0.0%) gas / (0xcb6d99f0098c683480edd984f44f633ef712743b7ba0ba7513e72ee1ddcc9cba)
2022-03-03 13:36:58.080+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbftBesuControllerBuilder | Produced #42 / 0 tx / 0 pending / 0 (0.0%) gas / (0x0efeedc20d6b592db52832899b293eb8afe1b52a0c7d6ea68d78e28505d83478)
2022-03-03 13:37:00.112+09:00 | EthScheduler-Workers-3 | INFO | PersistBlockTask | Imported #43 / 0 tx / 0 om / 0 (0.0%) gas / (0xfd274e8afeec13fa50f264f96ba6ff1212029de3610589c642c9d6430edae490) in 0.000s. Peers: 4
2022-03-03 13:37:00.113+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbftBesuControllerBuilder | Imported #43 / 0 tx / 0 pending / 0 (0.0%) gas / (0xfd274e8afe
022-03-03 13:37:02.116+09:00 | BftProcessorExecutor-IBFT-0 | INFO | IbftBesuControllerBuilder | Imported #44 / 0 tx / 0 pending / 0 (0.0%) gas / (0x84820f4c6adb9500531720577c2d65138afe20dd49603f4933c69d48040b97d)

https://besu.hyperledger.org/en/stable/HowTo/Interact/APIs/Using-JSON-RPC-API/

Updated on August 13, 2020

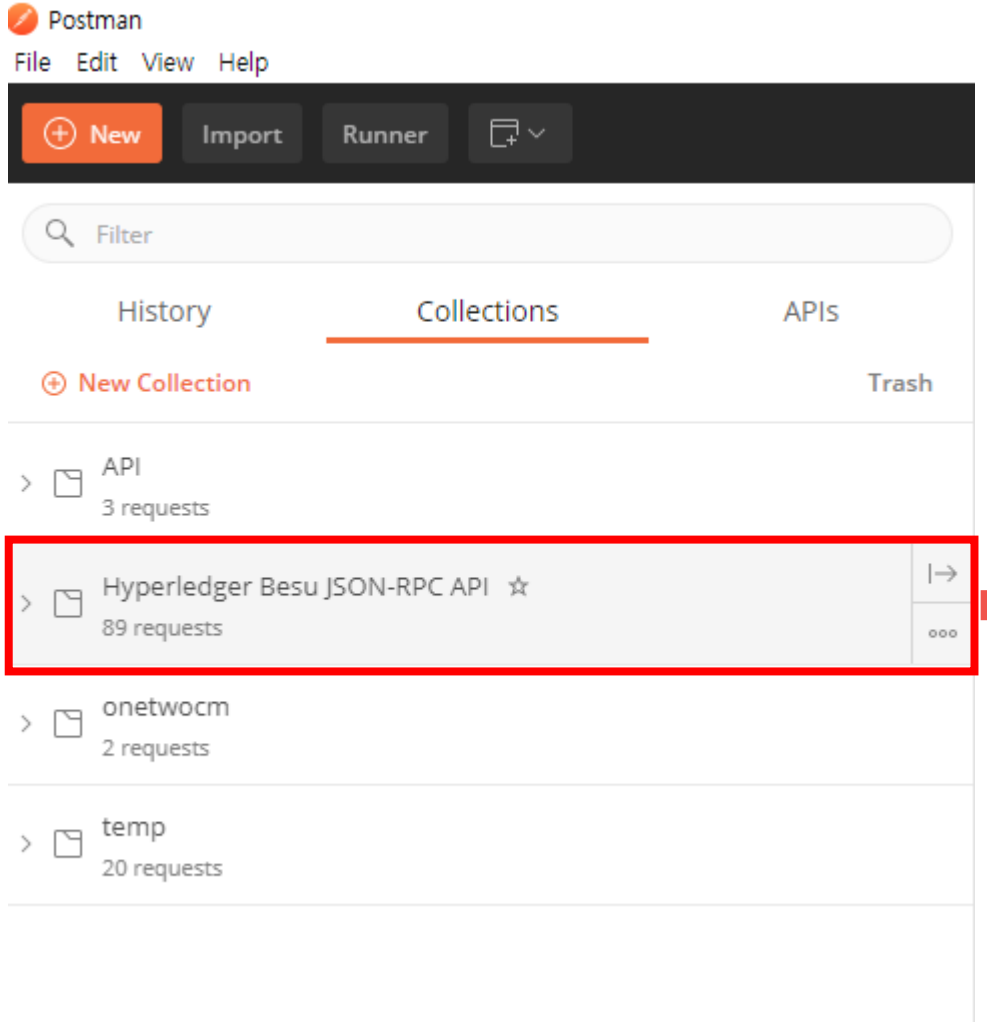
JSON-RPC over HTTP and WebSockets

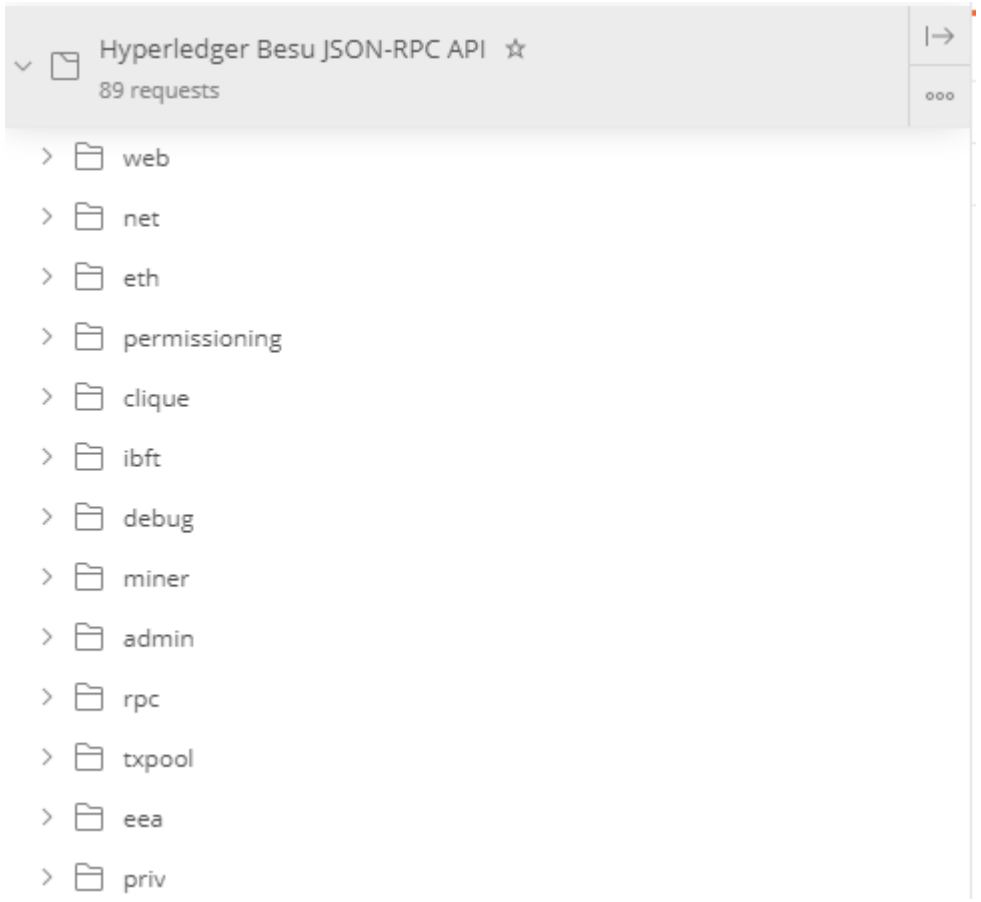
To enable JSON-RPC over HTTP or WebSockets, use the `--rpc-http-enabled` and `--rpc-ws-enabled` options.

Click the button to import our collection of API examples to Postman.

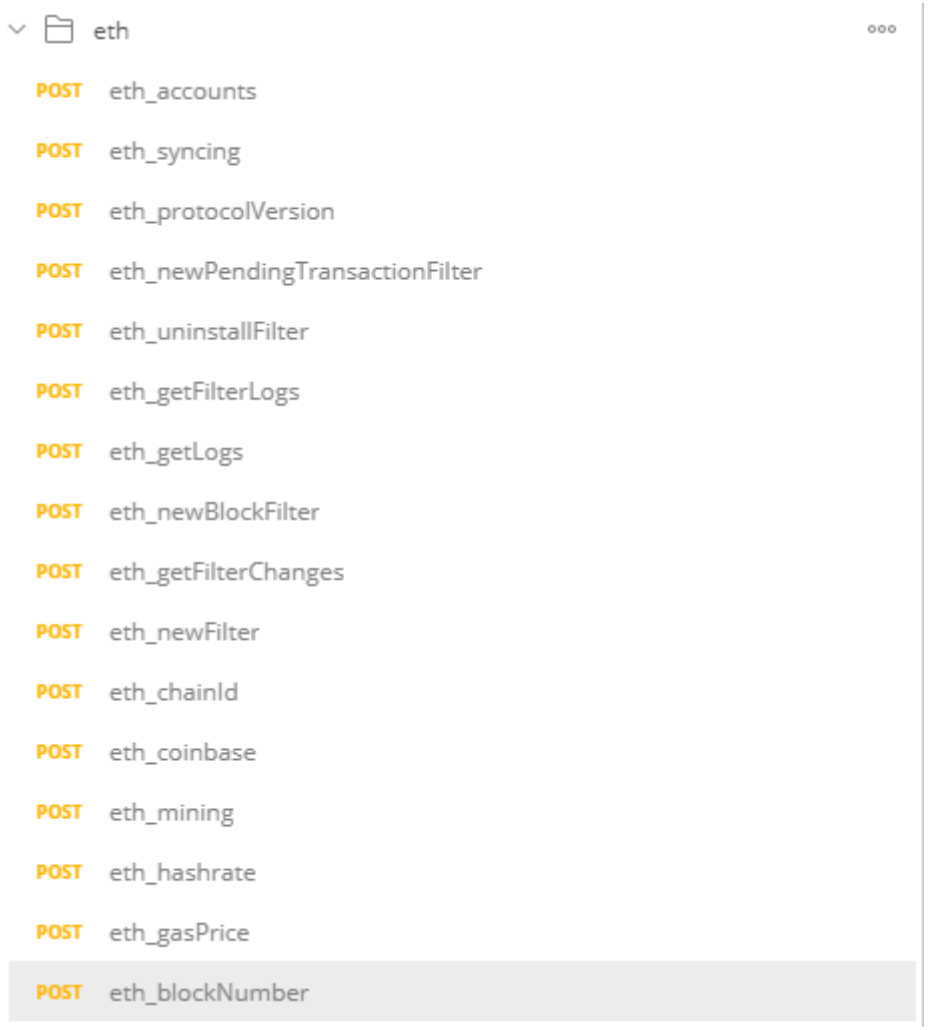
or download the raw JSON collection file.

프라이빗 네트워크 구축

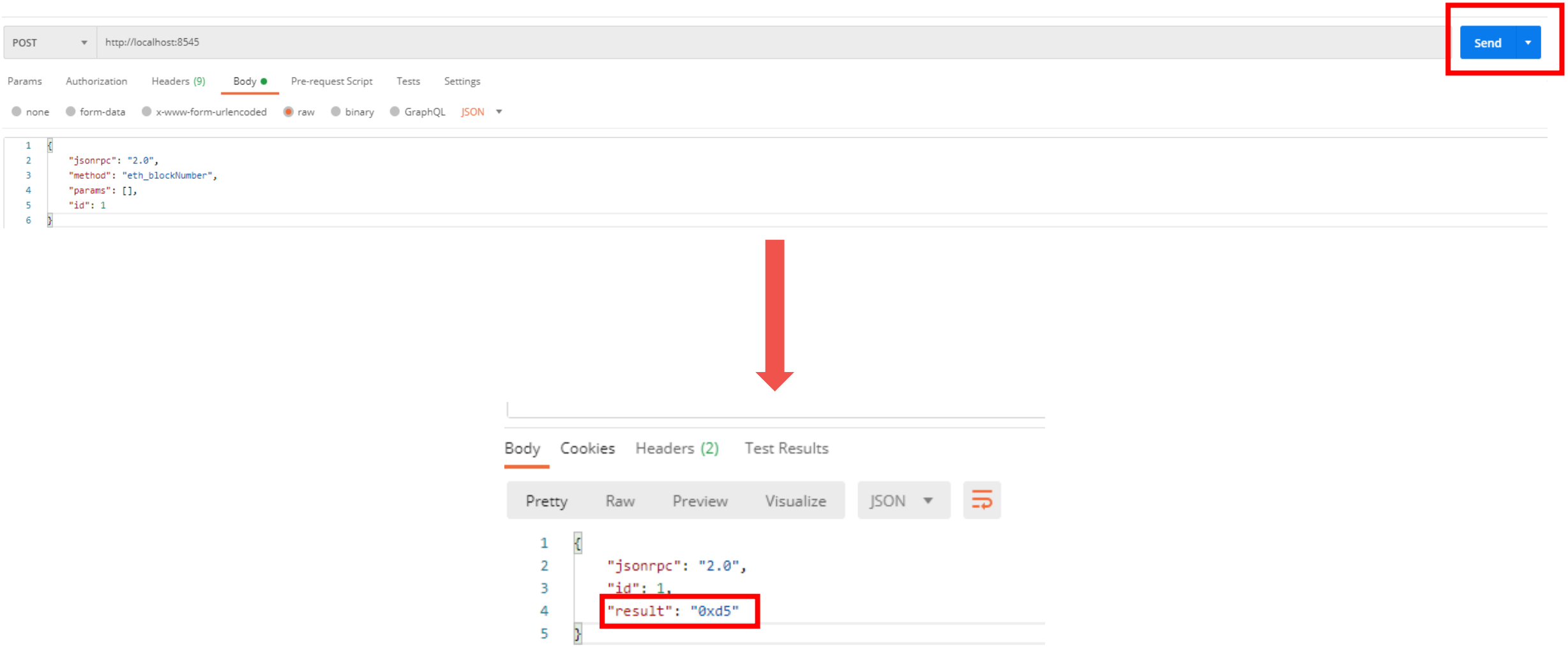

Postman
File Edit View Help
New
Import
Runner
Filter
History
Collections
APIs
New Collection
Trash
API
3 requests
Hyperledger Besu JSON-RPC API
89 requests
onetwocm
2 requests
temp
20 requests


Hyperledger Besu JSON-RPC API
89 requests
web
net
eth
permissioning
clique
ibft
debug
miner
admin
rpc
txpool
eea
priv

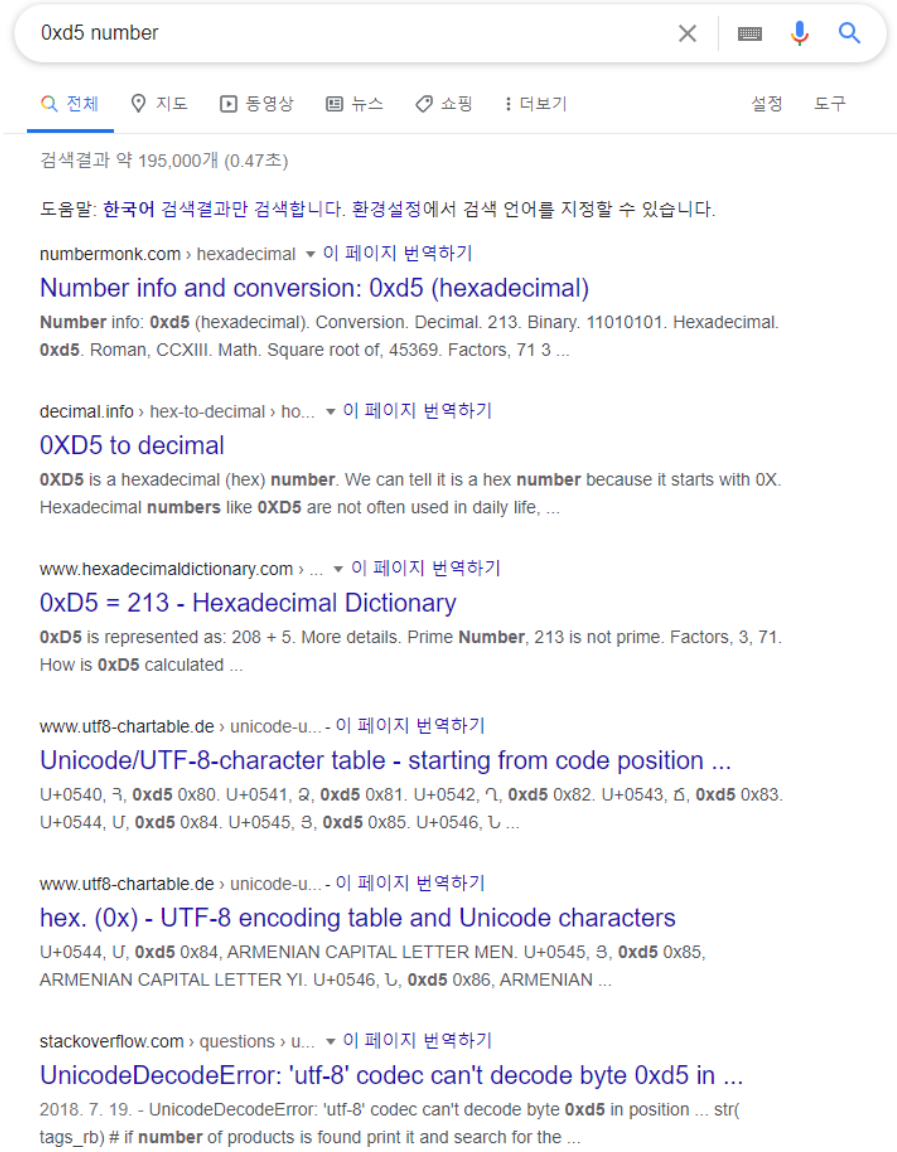
프라이빗 네트워크 구축


eth
POST eth_accounts
POST eth_syncing
POST eth_protocolVersion
POST eth_newPendingTransactionFilter
POST eth_uninstallFilter
POST eth_getFilterLogs
POST eth_getLogs
POST eth_newBlockFilter
POST eth_getFilterChanges
POST eth_newFilter
POST eth_chainId
POST eth_coinbase
POST eth_mining
POST eth_hashrate
POST eth_gasPrice
POST eth_blockNumber

프라이빗 네트워크 구축


POST
http://localhost:8545
Send
Params
Authorization
Headers (9)
Body
Pre-request Script
Tests
Settings
none
form-data
x-www-form-urlencoded
raw
binary
GraphQL
JSON
{
"jsonrpc": "2.0",
"method": "eth_blockNumber",
"params": [],
"id": 1
}
Body
Cookies
Headers (2)
Test Results
Pretty
Raw
Preview
Visualize
JSON
{
"jsonrpc": "2.0",
"id": 1,
"result": "0xd5"
}

프라이빗 네트워크 구축

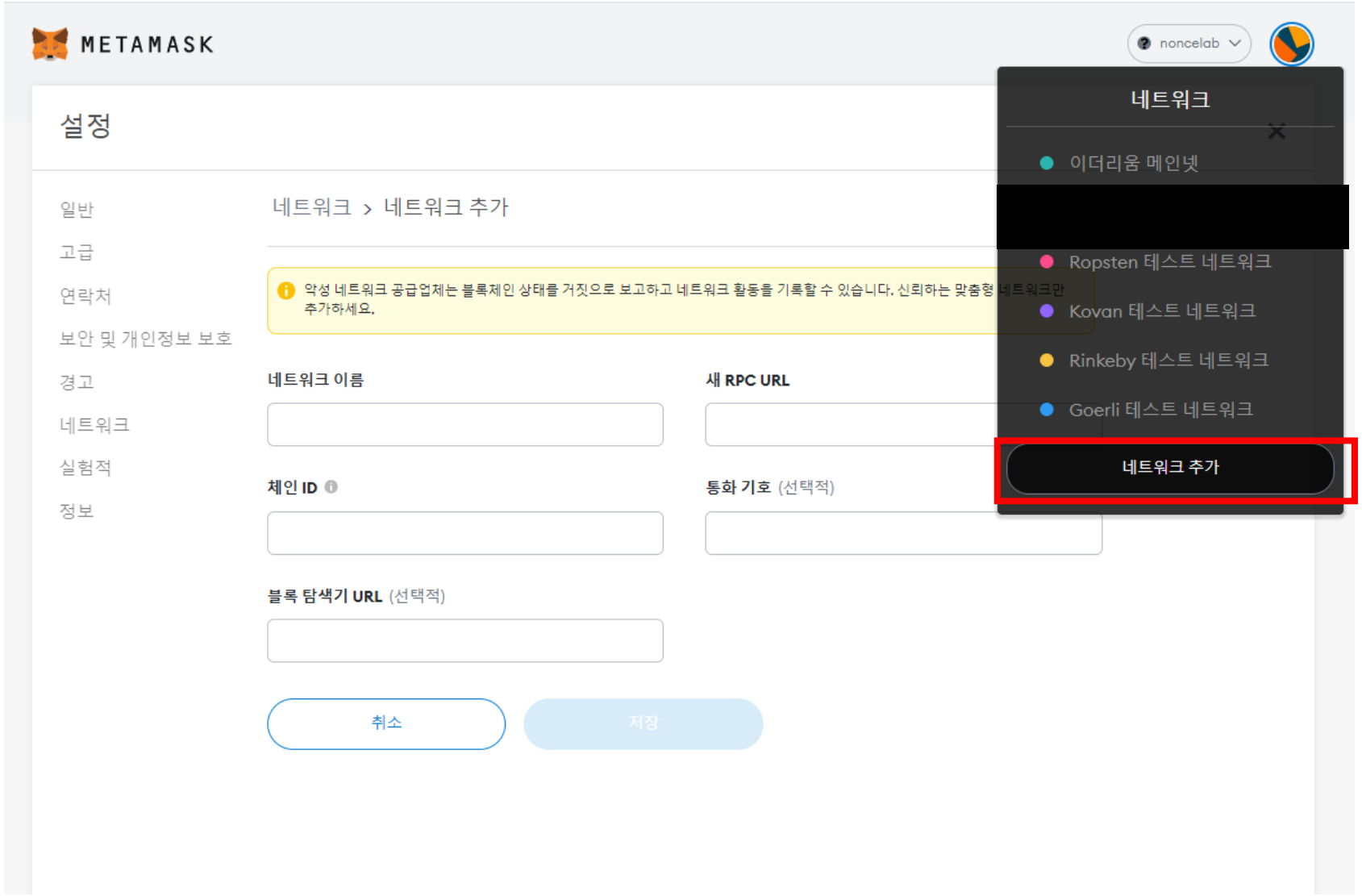


Number info: 0xd5 (hexadecimal)

Conversion

Decimal	213
Binary	11010101
Hexadecimal	0xd5
Roman	CCXIII

프라이빗 네트워크 구축


METAMASK
noncelab
설정
일반
고급
연락처
보안 및 개인정보 보호
경고
네트워크
실험적
정보
네트워크 > 네트워크 추가
악성 네트워크 공급업체는 블록체인 상태를 거짓으로 보고하고 네트워크 활동을 기록할 수 있습니다. 신뢰하는 맞춤형 네트워크만 추가하세요.
네트워크 이름
새 RPC URL
체인 ID
통화 기호 (선택적)
블록 탐색기 URL (선택적)
취소
저장
네트워크
이더리움 메인넷
Ropsten 테스트 네트워크
Kovan 테스트 네트워크
Rinkeby 테스트 네트워크
Goerli 테스트 네트워크
네트워크 추가

프라이빗 네트워크 구축

네트워크 이름

Test_network

새 RPC URL

http://localhost:8545

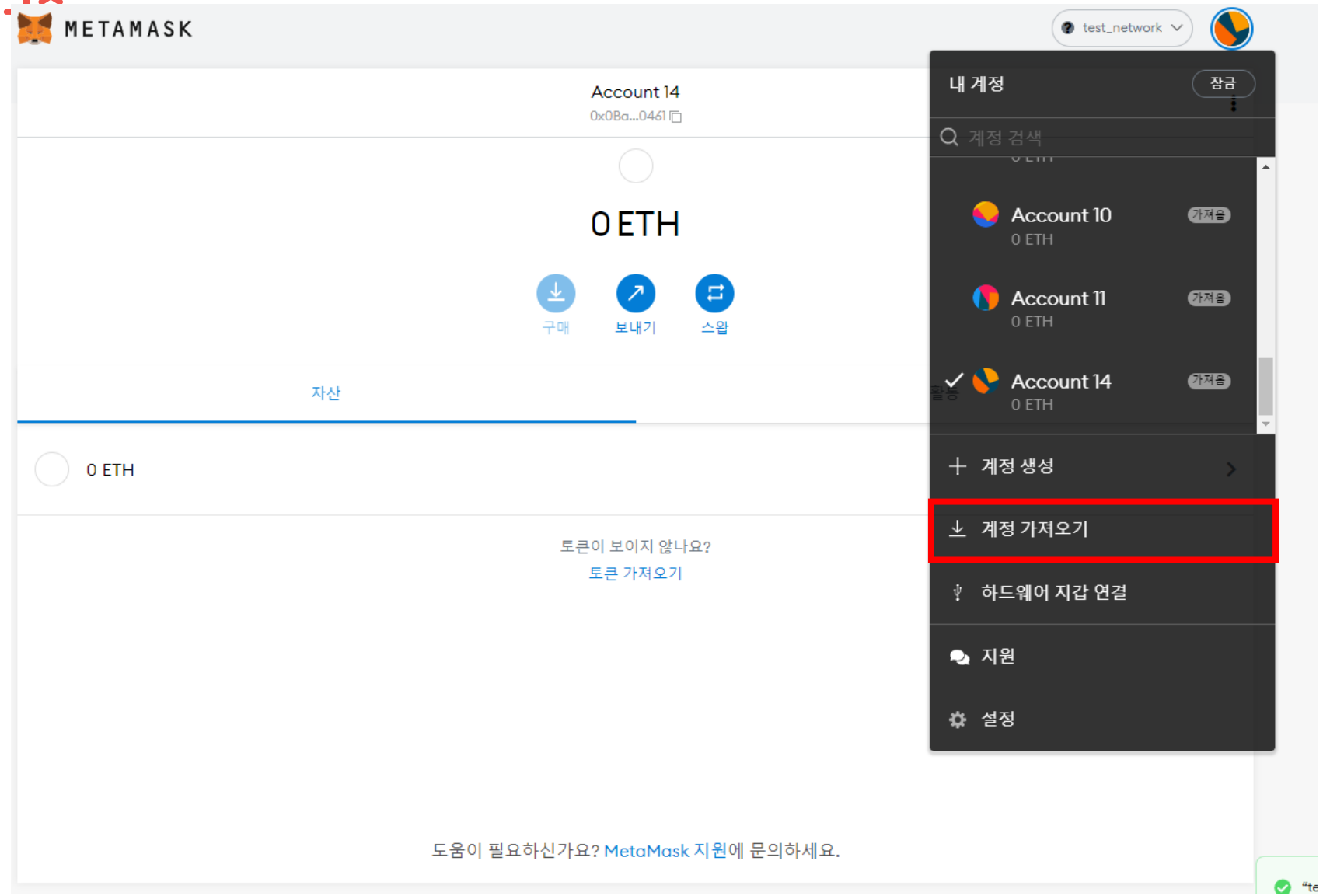
체인 ID

1337 (genesis block 에 기록되어있음)

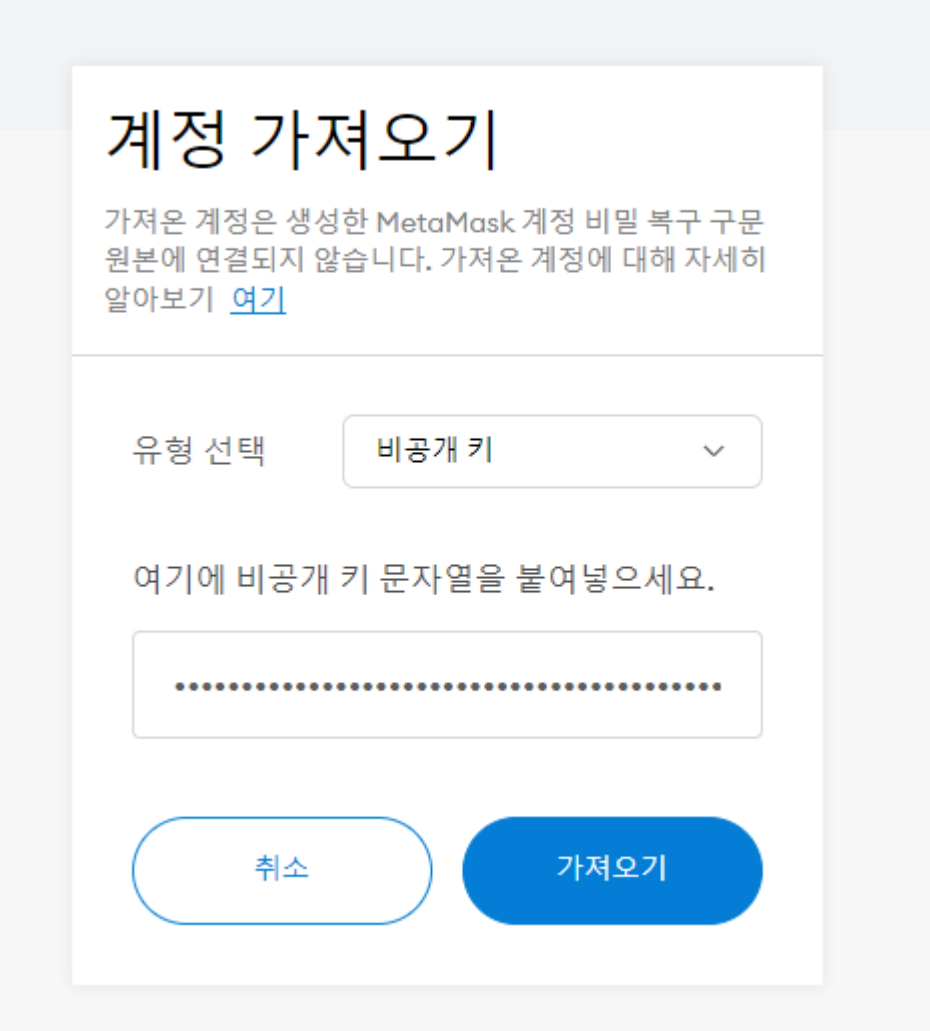
통화 기호 (선택적)

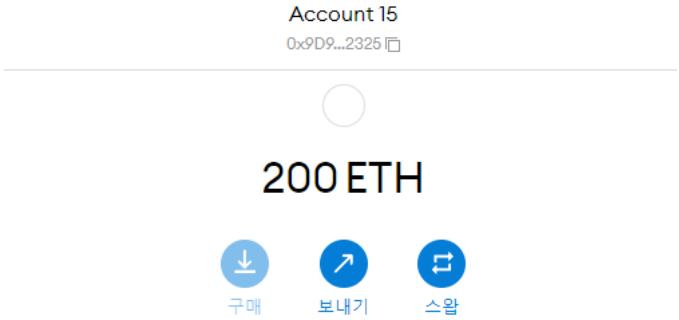
블록 탐색기 URL (선택적)

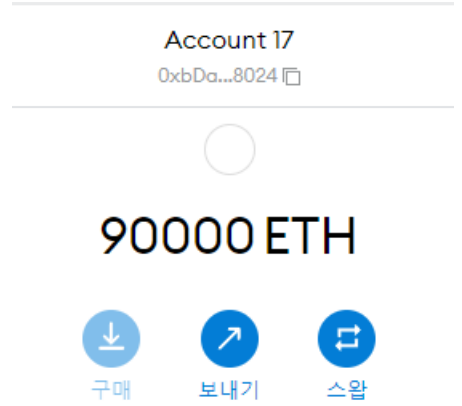
프라이빗 네트워크 구축

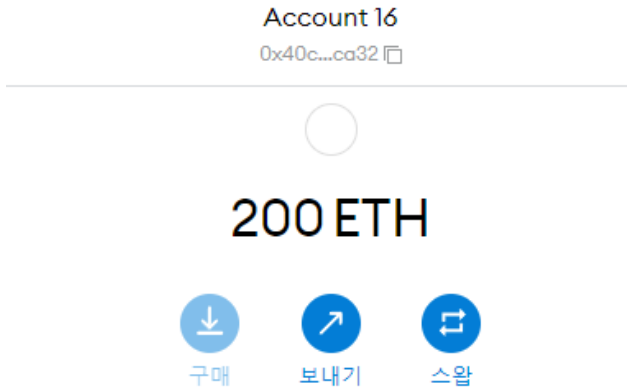

METAMASK
test_network
Account 14
0x0Ba...0461
0 ETH
구매
보내기
스왑
자산
0 ETH
토큰이 보이지 않나요?
토큰 가져오기
도움이 필요하신가요? MetaMask 지원에 문의하세요.
내 계정
잠금
계정 검색
Account 10
0 ETH
가져옴
Account 11
0 ETH
가져옴
Account 14
0 ETH
가져옴
계정 생성
계정 가져오기
하드웨어 지갑 연결
지원
설정

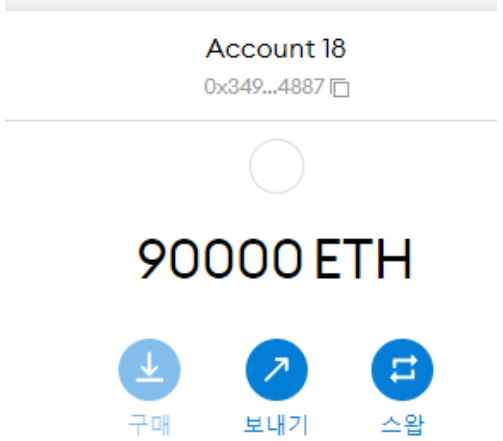
프라이빗 네트워크 구축


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

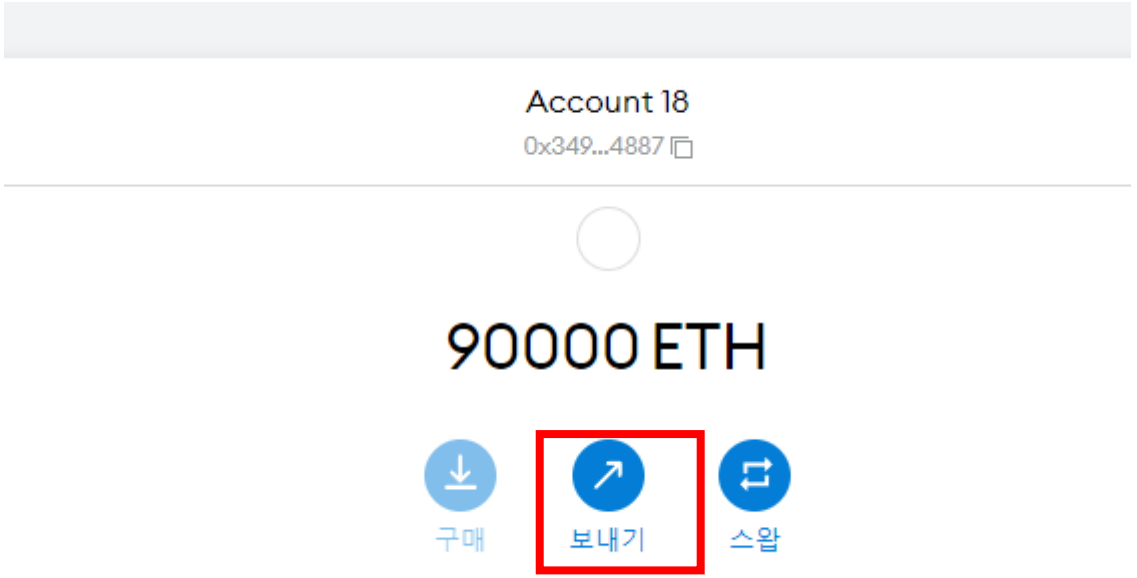

Account 15
0x9D9...2325
200 ETH
구매
보내기
스왑

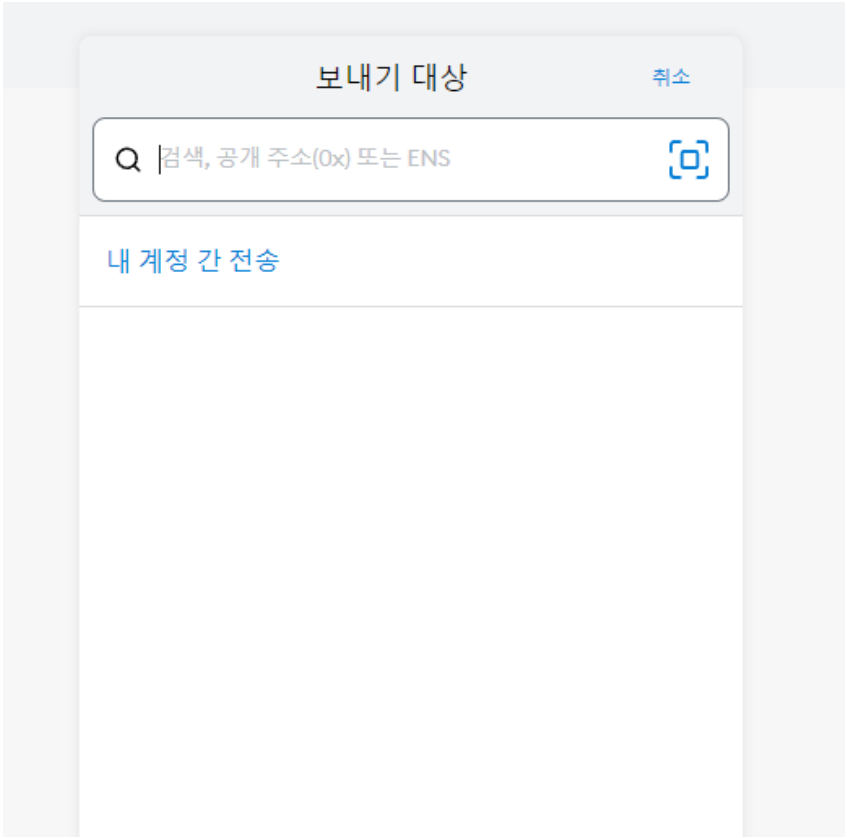

Account 17
0xbDa...8024
90000 ETH
구매
보내기
스왑


Account 16
0x40c...ca32
200 ETH
구매
보내기
스왑

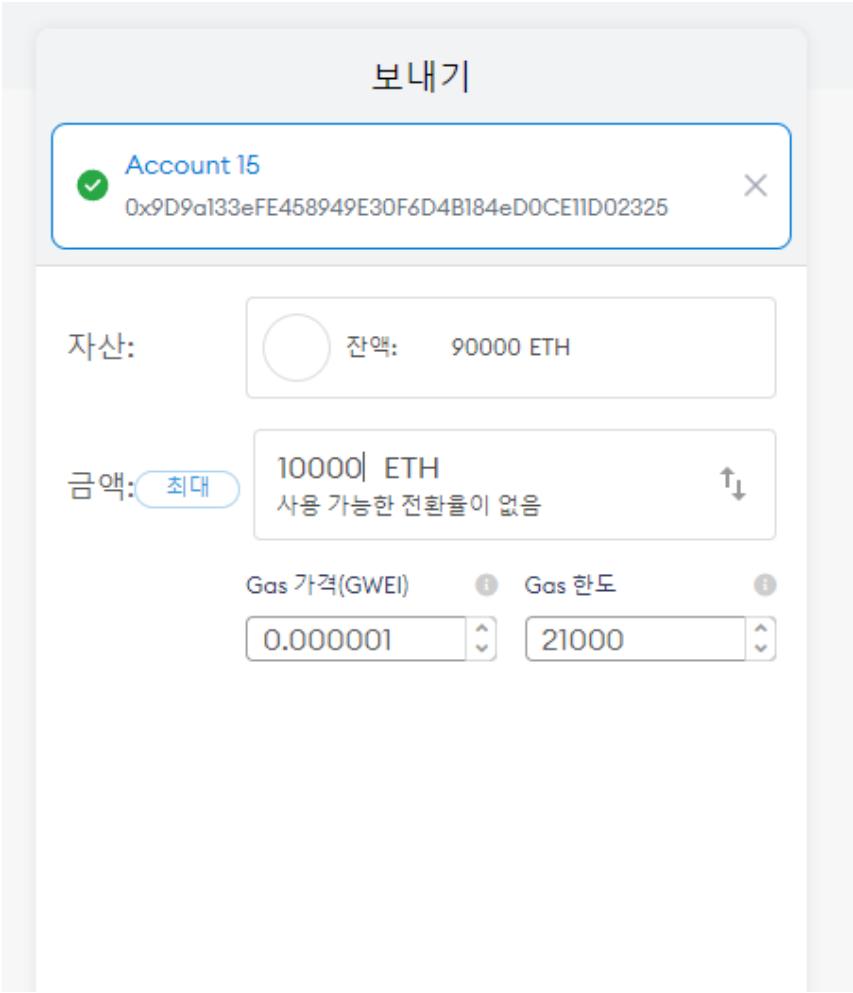

Account 18
0x349...4887
90000 ETH
구매
보내기
스왑

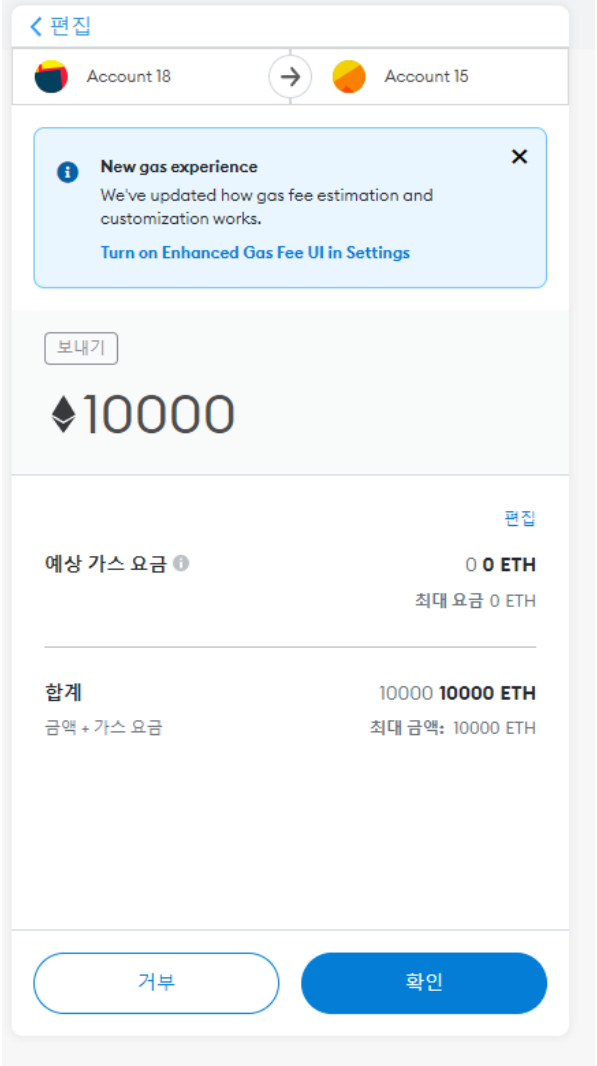
프라이빗 네트워크 구축


Account 18
0x349...4887
90000 ETH
구매
보내기
스왑

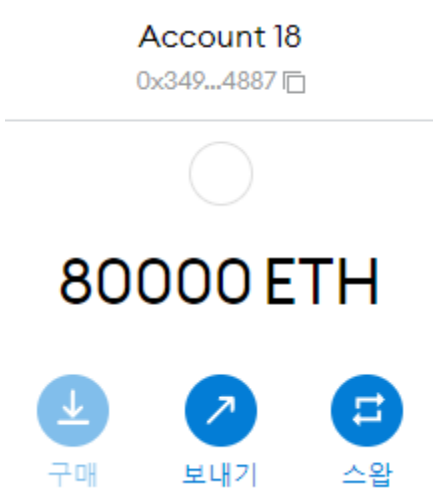

보내기 대상
취소
검색, 공개 주소(0x) 또는 ENS
내 계정 간 전송

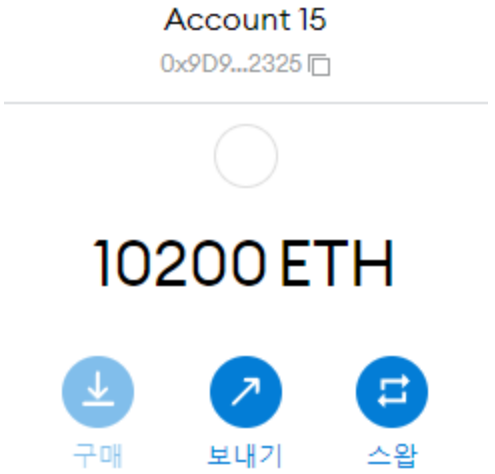
프라이빗 네트워크 구축


보내기
Account 15
0x9D9a133eFE458949E30F6D4B184eD0CE11D02325
자산:
잔액: 90000 ETH
금액: 최대
10000이 ETH
사용 가능한 전환율이 없음
Gas 가격(GWEI)
Gas 한도
0.000001
21000


편집
Account 18
Account 15
New gas experience
We've updated how gas fee estimation and customization works.
Turn on Enhanced Gas Fee UI in Settings
보내기
10000
편집
예상 가스 요금
0 0 ETH
최대 요금 0 ETH
합계
10000 10000 ETH
금액 + 가스 요금
최대 금액: 10000 ETH
거부
확인

프라이빗 네트워크 구축


Account 18
0x349...4887
80000 ETH
구매
보내기
스왑


Account 15
0x9D9...2325
10200 ETH
구매
보내기
스왑

Q & A