

# БЛОКЧЕЙН ТА ДЕЦЕНТРАЛІЗОВАНІ СИСТЕМИ

## Лабораторна робота №1

### “Розгортання систем Ethereum та криптовалют”

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## 1 Мета роботи

Отримання навичок налаштування платформ виконання смарт-контрактів та криптовалют

Для другого типу лабораторних робіт

Провести налаштування обраної системи та виконати тестові операції в системі.

ВАРІАНТ 1 Система Ethereum.

## 2 Хід роботи

Лабораторна робота виконувалась на Ubuntu. Розгортання виконувалось за інструкцією з сайту Geth

Спочатку необхідно встановити Geth

```
m@DESKTOP-L6L3EBV:~$ sudo add-apt-repository -y ppa:ethereum/ethereum
[sudo] password for m:
Repository: 'Types: deb
URIs: https://ppa.launchpadcontent.net/ethereum/ethereum/ubuntu/
Suites: noble
Components: main
'
More info: https://launchpad.net/~ethereum/+archive/ubuntu/ethereum
Adding repository.
Get:1 http://security.ubuntu.com/ubuntu noble-security InRelease [126 kB]
Hit:2 http://archive.ubuntu.com/ubuntu noble InRelease
Get:3 http://archive.ubuntu.com/ubuntu noble-updates InRelease [126 kB]
Get:4 http://security.ubuntu.com/ubuntu noble-security/main amd64 Packages [864 kB]
Get:5 https://ppa.launchpadcontent.net/ethereum/ethereum/ubuntu noble InRelease [18.1 kB]
Get:6 http://archive.ubuntu.com/ubuntu noble-backports InRelease [126 kB]
Get:7 https://ppa.launchpadcontent.net/ethereum/ethereum/ubuntu noble/main amd64 Packages [2584 B]
Get:8 http://archive.ubuntu.com/ubuntu noble-updates/main amd64 Packages [1107 kB]
Get:9 https://ppa.launchpadcontent.net/ethereum/ethereum/ubuntu noble/main Translation-en [772 B]
Get:10 http://security.ubuntu.com/ubuntu noble-security/main Translation-en [159 kB]
Get:11 http://security.ubuntu.com/ubuntu noble-security/main amd64 Components [21.6 kB]
Get:12 http://security.ubuntu.com/ubuntu noble-security/universe amd64 Packages [845 kB]
Get:13 http://archive.ubuntu.com/ubuntu noble-updates/main Translation-en [235 kB]
Get:14 http://security.ubuntu.com/ubuntu noble-security/universe Translation-en [185 kB]
Get:15 http://archive.ubuntu.com/ubuntu noble-updates/main amd64 Components [162 kB]
Get:16 http://archive.ubuntu.com/ubuntu noble-updates/universe amd64 Packages [1068 kB]
Get:17 http://security.ubuntu.com/ubuntu noble-security/universe amd64 Components [52.3 kB]
Get:18 http://security.ubuntu.com/ubuntu noble-security/restricted amd64 Components [212 B]
Get:19 http://security.ubuntu.com/ubuntu noble-security/multiverse amd64 Components [212 B]
Get:20 http://archive.ubuntu.com/ubuntu noble-updates/universe Translation-en [271 kB]
Get:21 http://archive.ubuntu.com/ubuntu noble-updates/universe amd64 Components [376 kB]
Get:22 http://archive.ubuntu.com/ubuntu noble-updates/restricted amd64 Components [212 B]
Get:23 http://archive.ubuntu.com/ubuntu noble-updates/multiverse amd64 Components [940 B]
Get:24 http://archive.ubuntu.com/ubuntu noble-backports/main amd64 Components [7076 B]
Get:25 http://archive.ubuntu.com/ubuntu noble-backports/universe amd64 Components [16.4 kB]
Get:26 http://archive.ubuntu.com/ubuntu noble-backports/restricted amd64 Components [216 B]
Get:27 http://archive.ubuntu.com/ubuntu noble-backports/multiverse amd64 Components [212 B]
Fetched 5771 kB in 1s (6268 kB/s)
Reading package lists... Done
```

```

#@DESKTOP-L6L3EBV:~$ sudo apt-get install ethereum
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  abigen clef evm geth rlpdump
The following NEW packages will be installed:
  abigen clef ethereum evm geth rlpdump
0 upgraded, 6 newly installed, 0 to remove and 52 not upgraded.
Need to get 48.5 MB of archives.
After this operation, 149 MB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 https://ppa.launchpadcontent.net/ethereum/ethereum/ubuntu noble/main amd64 abigen amd64 1.15.11+build31083+noble [8389 kB]
Get:2 https://ppa.launchpadcontent.net/ethereum/ethereum/ubuntu noble/main amd64 clef amd64 1.15.11+build31083+noble [13.2 MB]
Get:3 https://ppa.launchpadcontent.net/ethereum/ethereum/ubuntu noble/main amd64 evm amd64 1.15.11+build31083+noble [11.1 MB]
Get:4 https://ppa.launchpadcontent.net/ethereum/ethereum/ubuntu noble/main amd64 geth amd64 1.15.11+build31083+noble [15.0 MB]
Get:5 https://ppa.launchpadcontent.net/ethereum/ethereum/ubuntu noble/main amd64 rlpdump amd64 1.15.11+build31083+noble [873 kB]
Get:6 https://ppa.launchpadcontent.net/ethereum/ethereum/ubuntu noble/main amd64 ethereum amd64 1.15.11+build31083+noble [1446 B]
Fetched 48.5 MB in 2s (28.3 MB/s)
Selecting previously unselected package abigen.
(Reading database ... 40769 files and directories currently installed.)
Preparing to unpack .../0-abigen_1.15.11+build31083+noble_amd64.deb ...
Unpacking abigen (1.15.11+build31083+noble) ...
Selecting previously unselected package clef.
Preparing to unpack .../1-clef_1.15.11+build31083+noble_amd64.deb ...
Unpacking clef (1.15.11+build31083+noble) ...
Selecting previously unselected package evm.
Preparing to unpack .../2-evm_1.15.11+build31083+noble_amd64.deb ...
Unpacking evm (1.15.11+build31083+noble) ...
Selecting previously unselected package geth.
Preparing to unpack .../3-geth_1.15.11+build31083+noble_amd64.deb ...
Unpacking geth (1.15.11+build31083+noble) ...
Selecting previously unselected package rlpdump.
Preparing to unpack .../4-rlpdump_1.15.11+build31083+noble_amd64.deb ...
Unpacking rlpdump (1.15.11+build31083+noble) ...
Selecting previously unselected package ethereum.
Preparing to unpack .../5-ethereum_1.15.11+build31083+noble_amd64.deb ...
Unpacking ethereum (1.15.11+build31083+noble) ...
Setting up rlpdump (1.15.11+build31083+noble) ...
Setting up clef (1.15.11+build31083+noble) ...
Setting up geth (1.15.11+build31083+noble) ...
Setting up evm (1.15.11+build31083+noble) ...
Setting up abigen (1.15.11+build31083+noble) ...
Setting up ethereum (1.15.11+build31083+noble) ...

```

За допомогою цих команд було встановлено ядро програми Geth та наступні інструменти для розробки:

- clef
- devp2p
- abigen
- bootnode
- evm
- rlpdump

Для виконання лабораторної нам потрібен сам Geth та Clef.

Geth – клієнт Ethereum, який перетворює комп'ютер у вузол Ethereum при використанні.

Детальніший опис: [посилання](#)

Clef використовується для контролю акаунтів і тепер є стандартним рішенням для цього використання у комбінації з Geth.

Тепер створимо акаунт у Clef для виконання операцій над ним.

```

#@DESKTOP-L6L3EBV:~$ clef newaccount --keystore lab1
WARNING!
Clef is an account management tool. It may, like any software, contain bugs.

Please take care to
- backup your keystore files,
- verify that the keystore(s) can be opened with your password.

Clef is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY;
without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR
PURPOSE. See the GNU General Public License for more details.

Enter 'ok' to proceed:
> ok

## New account password

Please enter a password for the new account to be created (attempt 0 of 3)
>
-----
[INFO [05-29|20:56:37.800] Your new key was generated          address=0xb1bfdf18aA3250071461A37cFC3FE6aeD7Ca8b8c
[WARN [05-29|20:56:37.800] Please backup your key file!      path=/home/m/lab1/UTC--2025-05-29T20-56-36.898806024Z--b1bfdf18aa3250071461a37cfc3fe6aed7ca8b8c
[WARN [05-29|20:56:37.800] Please remember your password!
Generated account 0xb1bfdf18aA3250071461A37cFC3FE6aeD7Ca8b8c

```

Для наступного кроку необхідно запустити Clef на тестовій мережі Sepolia через chainID 11155111 у окремому вікні, де він буде виконувати роль менеджера нашого приватного ключа.

```
m@DESKTOP-L6L3EBV:~$ clef --keystore lab1 --configdir lab1_conf --chainid 11155111

WARNING!

Clef is an account management tool. It may, like any software, contain bugs.

Please take care to
- backup your keystore files,
- verify that the keystore(s) can be opened with your password.

Clef is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY;
without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR
PURPOSE. See the GNU General Public License for more details.

Enter 'ok' to proceed:
> ok

INFO [05-29|21:30:23.665] Using CLI as UI-channel
INFO [05-29|21:30:23.781] Loaded abey database
WARN [05-29|21:30:23.781] Failed to open master, rules disabled
INFO [05-29|21:30:23.781] Starting signer
INFO [05-29|21:30:23.783] Smartcard socket file missing, disabling
INFO [05-29|21:30:23.784] Audit logs configured
INFO [05-29|21:30:23.784] IPC endpoint opened

----- Signer info -----
* extapi_http : n/a
* extapi_ipc : lab1_conf/clef.ipc
* intapi_version : 7.0.1
* extapi_version : 6.1.0

----- Available accounts -----
0. 0xb1bdf18a3250071461A37cF3F6aeD7Ca8b8c at keystore:///home/n/lab1/UTC--2025-05-29T20-56-36.898806024Z--b1bdf18a3250071461a37cfc3fe6aed7ca8b8c

embeds=268,621 locals=0 local=,./4byte-custon.json
err="failed stat on lab1_conf/masterseed.json: stat lab1_conf/masterseed.json: no such fi
le or directory"
chainId=11155,111 keystore=lab1 light-kdf=false advanced=false
err="stat /run/pcscd/pcscd.comm: no such file or directory"
file=audit.log
url=lab1_conf/clef.ipc
```

Далі у третьому терміналі запускаємо Geth у тестовій мережі Sepolia, де нема ризику втрачі персональних даних чи коштів.

```
m@DESKTOP-L6L3EBV:~$ geth --sepolia --datadir lab1 --authrpc.addr localhost --authrpc.port 8551 --authrpc.whosts localhost --authrpc.jwtsecret lab1/jwtsecret --http --http.api eth,net --signer=lab1_conf/clef.ipc --http
INFO [05-29|21:30:29.500] Starting Geth on sepolia testnet...
INFO [05-29|21:30:29.513] Maximum peer count
INFO [05-29|21:30:29.514] Smartcard socket not found, disabling
INFO [05-29|21:30:29.515] Using external signer
INFO [05-29|21:30:29.517] Set global gas cap
INFO [05-29|21:30:29.518] Initializing the RKG library
INFO [05-29|21:30:29.521] Allocated trie memory caches
INFO [05-29|21:30:29.521] Using pebble as the backing database
INFO [05-29|21:30:29.521] Allocated cache and file handles
INFO [05-29|21:30:29.583] Opened ancient database
INFO [05-29|21:30:29.584] State scheme set to already existing
INFO [05-29|21:30:29.584] Initializing Ethereum protocol
INFO [05-29|21:30:29.587] Opened ancient database
INFO [05-29|21:30:29.587] Initialized path database
INFO [05-29|21:30:29.590] Chain ID: 11155111 (sepolia)
INFO [05-29|21:30:29.590] Consensus: Beacon (proof-of-stake), merged from Ethash (proof-of-work)
INFO [05-29|21:30:29.590] Pre-Merge hard forks (block based):
INFO [05-29|21:30:29.590] - Homestead: #0 (https://github.com/ethereum/execution-specs/blob/master/network-upgrades/mainnet-upgrades/homestead.md)
INFO [05-29|21:30:29.590] - Tangerine Whistle (EIP 150): #0 (https://github.com/ethereum/execution-specs/blob/master/network-upgrades/mainnet-upgrades/tangerine-whistle.md)
INFO [05-29|21:30:29.590] - Spurious Dragon 1 (EIP 158): #0 (https://github.com/ethereum/execution-specs/blob/master/network-upgrades/mainnet-upgrades/spurious-dragon.md)
INFO [05-29|21:30:29.590] - Spurious Dragon 2 (EIP 158): #0 (https://github.com/ethereum/execution-specs/blob/master/network-upgrades/mainnet-upgrades/spurious-dragon.md)
INFO [05-29|21:30:29.590] - Byzantium: #0 (https://github.com/ethereum/execution-specs/blob/master/network-upgrades/mainnet-upgrades/byzantium.md)
INFO [05-29|21:30:29.590] - Constantinople: #0 (https://github.com/ethereum/execution-specs/blob/master/network-upgrades/mainnet-upgrades/constantinople.md)
INFO [05-29|21:30:29.590] - Petersburg: #0 (https://github.com/ethereum/execution-specs/blob/master/network-upgrades/mainnet-upgrades/petersburg.md)
INFO [05-29|21:30:29.590] - Istanbul: #0 (https://github.com/ethereum/execution-specs/blob/master/network-upgrades/mainnet-upgrades/istanbul.md)
INFO [05-29|21:30:29.590] - Muir Glacier: #0 (https://github.com/ethereum/execution-specs/blob/master/network-upgrades/mainnet-upgrades/muir-glacier.md)
INFO [05-29|21:30:29.590] - Berlin: #0 (https://github.com/ethereum/execution-specs/blob/master/network-upgrades/mainnet-upgrades/berlin.md)
INFO [05-29|21:30:29.590] - London: #0 (https://github.com/ethereum/execution-specs/blob/master/network-upgrades/mainnet-upgrades/london.md)
INFO [05-29|21:30:29.590] Merge configured:
INFO [05-29|21:30:29.590] - Hard-fork specification: https://github.com/ethereum/execution-specs/blob/master/network-upgrades/mainnet-upgrades/paris.md
INFO [05-29|21:30:29.590] - Network known to be merged: 17800000000000000000
INFO [05-29|21:30:29.590] - Total terminal difficulty: #1735371
INFO [05-29|21:30:29.590] - Merge netsplit block: #1735371
INFO [05-29|21:30:29.590] Post-Merge hard forks (timestamp based):
INFO [05-29|21:30:29.590] - Shanghai: #1677557888 (https://github.com/ethereum/execution-specs/blob/master/network-upgrades/mainnet-upgrades/shanghai.md)
INFO [05-29|21:30:29.590] - Cancun: #1706655872 (https://github.com/ethereum/execution-specs/blob/master/network-upgrades/mainnet-upgrades/cancun.md)
INFO [05-29|21:30:29.590] - Prague: #1741159776
INFO [05-29|21:30:29.590] Loaded most recent local block
INFO [05-29|21:30:29.590] Initialized transaction indexer
WARN [05-29|21:30:29.590] Invalid log index database version; resetting log index
INFO [05-29|21:30:29.612] Enabled snap sync
INFO [05-29|21:30:29.612] Gethcore oracle is ignoring threshold set to 0
WARN [05-29|21:30:29.617] Unclean shutdown detected
WARN [05-29|21:30:29.618] Engine API enabled
INFO [05-29|21:30:29.618] Starting peer-to-peer node
INFO [05-29|21:30:29.671] New local node record
INFO [05-29|21:30:29.671] Started P2P networking
INFO [05-29|21:30:29.680] IPC endpoint opened
INFO [05-29|21:30:29.680] Loaded JWT secret file
INFO [05-29|21:30:29.680] HTTP server started
INFO [05-29|21:30:29.680] Websocket: enabled
INFO [05-29|21:30:29.680] Started log indexer
WARN [05-29|21:30:29.680] Failed to open wallet
INFO [05-29|21:30:29.680] New local node record
WARN [05-29|21:31:05.051] Post-merge network, but no beacon client seen. Please launch one to follow the chain!

number=0 hash=25a5cc..3e6dd9 age=3y8m2w
range="last 2350000 blocks"
head=0 hash=25a5cc..3e6dd9
booter=2025-05-29T21:23:49+0000 age=6m40s
protocol=eth
instance=Geth/v1.15.11-stable-3622371c/linux-amd64/go1.24.2
seq=1,748,553,181,897 len=38a2d996ac6b4be0 len=127.0.0.1 uid=30303
id=anode/1d08a12d4a90ec58510899e74c4a59a6b18549a0eed11f0190eb75b0cfe810bc5d13574dcaca89cbe121adca78ca89f4fe9c6094377037b2291407035a07127.0.0.1:30303
url=/home/n/lab1/geth.ipc
path=lab1/jwtsecret prefix=0xb5a2e8c
endpoint=127.0.0.1:8545 min=false prefix core=whosts=localhost
url=ws://127.0.0.1:8551
endpoint=127.0.0.1:8551 auth=true prefix core=localhost whosts=localhost
url=extapi://lab1_conf/clef.ipc err="operation not supported on external signers"
seq=1,748,553,181,898 len=38a2d996ac6b4be0 len=127.0.0.1 uid=32515 len=30303
```

Тепер цей термінал працює як Geth клієнт, який буде приймати від нас вказівки і вести спілкування з Clef та виконувати операції.

Заходимо у інтерфейс взаємодії з Geth

```
m@DESKTOP-L6L3EBV:~$ geth attach http://127.0.0.1:8545
Welcome to the Geth JavaScript console!

modules: eth:1.0 net:1.0 rpc:1.0

To exit, press ctrl-d or type exit
```

Перевіримо існуючі акаунти

```
> eth.accounts;
```

Термінал очікує підтвердження від Clef

```
----- List Account request-----  
A request has been made to list all accounts.  
You can select which accounts the caller can see  
[x] 0xb1bdf18aa3250071461a37cfc3fe6aed7ca8b8c  
    URL: keystore:///home/m/lab1/UTC--2025-05-29T20-56-36.898806024Z--b1bdf18aa3250071461a37cfc3fe6aed7ca8b8c  
-----  
Request context:  
    NA -> ipc -> NA  
  
Additional HTTP header data, provided by the external caller:  
    User-Agent: ""  
    Origin: ""  
Approve? [y/N]:  
> y
```

```
> eth.accounts;  
["0xb1bdf18aa3250071461a37cfc3fe6aed7ca8b8c"]
```

Після цього я додав ще один акаунт для тестування транзакцій, повторивши запит на створення акаунту з тим же шляхом для збереження ключа

```
> eth.accounts;  
["0xb1bdf18aa3250071461a37cfc3fe6aed7ca8b8c", "0xe0cbe2779384a806f4bc65d0ed747f29133db135"]
```

Далі я отримав 0.05ETH з faucet Google Cloud Web3

Отримані кошти з faucet:

Транзакція

Баланс:

Сайт для перевірки балансу

Номер гаманця 0xb1bdf18aa3250071461a37cfc3fe6aed7ca8b8c

Після встановлення Lighthouse і синхронізації beacon з Geth я нарешті зможу бути частиною блокчейну

5



```
WARN [05-29 23:03:24.744] Ignoring payload while snap syncing number=8,435,031 hash=130a38..4d2085 reason="forced head needed for startup"
WARN [05-29 23:03:24.767] Ignoring payload while snap syncing number=8,435,032 hash=c81221..d2a4be reason="forced head needed for startup"
WARN [05-29 23:03:24.788] Ignoring payload while snap syncing number=8,435,033 hash=982085..f023b0 reason="forced head needed for startup"
WARN [05-29 23:03:24.808] Ignoring payload while snap syncing number=8,435,034 hash=3a4381..f96667 reason="forced head needed for startup"
WARN [05-29 23:03:24.828] Ignoring payload while snap syncing number=8,435,035 hash=4777af..2fcb37 reason="forced head needed for startup"
WARN [05-29 23:03:24.847] Ignoring payload while snap syncing number=8,435,036 hash=95886b..146727 reason="forced head needed for startup"
WARN [05-29 23:03:24.867] Ignoring payload while snap syncing number=8,435,037 hash=30771d..2b2c5c reason="forced head needed for startup"
WARN [05-29 23:03:24.885] Ignoring payload while snap syncing number=8,435,038 hash=74be77..f96b0b reason="forced head needed for startup"
WARN [05-29 23:03:24.907] Ignoring payload while snap syncing number=8,435,039 hash=we1de7..458a52 reason="forced head needed for startup"
WARN [05-29 23:03:24.924] Ignoring payload while snap syncing number=8,435,040 hash=270a1a..aa8ab2b reason="forced head needed for startup"
WARN [05-29 23:03:24.943] Ignoring payload while snap syncing number=8,435,041 hash=eb8b11..77efb1f reason="forced head needed for startup"
WARN [05-29 23:03:24.962] Ignoring payload while snap syncing number=8,435,042 hash=6583b5..4730eb reason="forced head needed for startup"
WARN [05-29 23:03:24.979] Ignoring payload while snap syncing number=8,435,043 hash=2434a2..b54675 reason="forced head needed for startup"
WARN [05-29 23:03:24.999] Ignoring payload while snap syncing number=8,435,044 hash=dc1d62..6792f4 reason="forced head needed for startup"
WARN [05-29 23:03:25.015] Ignoring payload while snap syncing number=8,435,045 hash=ad6268..02704f reason="forced head needed for startup"
WARN [05-29 23:03:25.037] Ignoring payload while snap syncing number=8,435,046 hash=d88f9f..bbd28d reason="forced head needed for startup"
WARN [05-29 23:03:25.052] Ignoring payload while snap syncing number=8,435,047 hash=c21805..63114a reason="forced head needed for startup"
WARN [05-29 23:03:25.075] Ignoring payload while snap syncing number=8,435,048 hash=d0e660..8e1f50 reason="forced head needed for startup"
WARN [05-29 23:03:25.090] Ignoring payload while snap syncing number=8,435,049 hash=ff8edf..4f5d4c reason="forced head needed for startup"
WARN [05-29 23:03:25.112] Ignoring payload while snap syncing number=8,435,050 hash=845aa0..7aa5b8 reason="forced head needed for startup"
WARN [05-29 23:03:25.135] Ignoring payload while snap syncing number=8,435,051 hash=b2ab82..0ff60b reason="forced head needed for startup"
WARN [05-29 23:03:25.155] Ignoring payload while snap syncing number=8,435,052 hash=386afd..7c4f4e reason="forced head needed for startup"
WARN [05-29 23:03:25.170] Ignoring payload while snap syncing number=8,435,053 hash=59ec54..88599e reason="forced head needed for startup"
WARN [05-29 23:03:25.191] Ignoring payload while snap syncing number=8,435,054 hash=ecfbf7..ede713 reason="forced head needed for startup"
INFO [05-29 23:03:25.193] Forkchoice requested sync to new head number=8,435,054 hash=ecfbf7..ede713 finalized=unknown
INFO [05-29 23:03:26.148] Forkchoice requested sync to new head number=8,435,055 hash=ad7bae..9d3074 finalized=unknown
INFO [05-29 23:03:27.034] Forkchoice requested sync to new head number=8,435,116 hash=b54eeb..aca6cd finalized=unknown
INFO [05-29 23:03:27.579] Syncing beacon headers download=2048 left=8,433,095 eta=2h3m35.344s
INFO [05-29 23:03:27.581] Syncing beacon headers download=344,576 left=8,430,477 eta=1m14.543s
INFO [05-29 23:03:43.936] Forkchoice requested sync to new head number=8,435,117 hash=8cee12..ace917 finalized=unknown
INFO [05-29 23:03:45.837] Syncing beacon headers download=761,856 left=7,673,197 eta=3m14.613s
INFO [05-29 23:03:49.282] Forkchoice requested sync to new head number=8,435,118 hash=ac9aa7..0b2725 finalized=unknown
INFO [05-29 23:03:54.249] Syncing beacon headers download=1,179,136 left=7,255,917 eta=2m50.668s
INFO [05-29 23:03:59.502] Forkchoice requested sync to new head number=8,435,118 hash=ac9aa7..0b2725 finalized=8,435,055
INFO [05-29 23:04:02.597] Syncing beacon headers download=1,638,720 left=6,804,333 eta=2m30.562s
INFO [05-29 23:04:12.053] Syncing beacon headers download=2,115,072 left=6,319,901 eta=2m12.558s
INFO [05-29 23:04:20.806] Syncing beacon headers download=2,607,104 left=5,827,949 eta=1m57.126s
INFO [05-29 23:04:28.442] Syncing beacon headers download=3,125,248 left=5,309,805 eta=1m43.217s
INFO [05-29 23:04:34.290] Forkchoice requested sync to new head number=8,435,119 hash=62d718..6c5a57 finalized=8,435,055
INFO [05-29 23:04:35.419] Forkchoice requested sync to new head number=8,435,120 hash=15b70b..7a1013 finalized=8,435,055
INFO [05-29 23:04:35.451] Forkchoice requested sync to new head number=8,435,121 hash=1fd26b..5af730 finalized=8,435,055
INFO [05-29 23:04:36.532] Syncing beacon headers download=3,628,032 left=4,807,021 eta=1m31.212s
INFO [05-29 23:04:40.130] Forkchoice requested sync to new head number=8,435,122 hash=420824..92db18 finalized=8,435,055
INFO [05-29 23:04:47.282] Syncing beacon headers download=4,151,296 left=4,283,757 eta=1m20.871s
INFO [05-29 23:04:48.368] Forkchoice requested sync to new head number=8,435,123 hash=eac2cd..948d1c finalized=8,435,055
INFO [05-29 23:04:55.526] Syncing beacon headers download=4,537,344 left=3,897,709 eta=1m14.404s
WARN [05-29 23:05:00.187] Served web3_clientVersion error: the method web3_clientVersion does not exist/is not available"
INFO [05-29 23:05:02.735] Forkchoice requested sync to new head number=8,435,124 hash=5ccb8e..b48b71 finalized=8,435,055
INFO [05-29 23:05:04.162] Syncing beacon headers download=5,125,120 left=3,389,933 eta=1m1.515s
INFO [05-29 23:05:13.498] Syncing beacon headers download=5,677,056 left=2,757,997 eta=50.212s
INFO [05-29 23:05:21.582] Syncing beacon headers download=6,330,848 left=2,097,805 eta=36.074s
INFO [05-29 23:05:30.867] Syncing beacon headers download=7,043,072 left=1,391,981 eta=23.703s
INFO [05-29 23:05:35.205] Forkchoice requested sync to new head number=8,435,125 hash=d0bb94..02ce40 finalized=8,435,055
INFO [05-29 23:05:35.236] Forkchoice requested sync to new head number=8,435,126 hash=ade517..c30009 finalized=8,435,055
INFO [05-29 23:05:38.102] Syncing beacon headers download=7,719,936 left=715,117 eta=11.854s
INFO [05-29 23:05:39.049] Forkchoice requested sync to new head number=8,435,127 hash=a0d129..2b36f3 finalized=8,435,055
INFO [05-29 23:05:47.393] Syncing beacon headers download=8,387,584 left=47469 eta=769.790ms
INFO [05-29 23:05:48.184] Syncing beacon headers download=8,435,053 left=0 eta=0s
ERRR [05-29 23:05:48.184] Latest filled block is not available
INFO [05-29 23:05:48.185] Block synchronisation started
INFO [05-29 23:05:48.187] Disabled trie database due to state sync
INFO [05-29 23:05:48.255] Wrote genesis to ancients
INFO [05-29 23:05:48.317] Syncing: chain download in progress
INFO [05-29 23:05:56.297] Syncing: state download in progress
INFO [05-29 23:05:56.420] Syncing: chain download in progress
INFO [05-29 23:06:02.366] Forkchoice requested sync to new head number=8,435,128 hash=84bab8..324d59 finalized=8,435,055
INFO [05-29 23:06:02.361] Forkchoice requested sync to new head number=8,435,129 hash=41858b..1d3a7c finalized=8,435,055
INFO [05-29 23:06:04.319] Syncing: state download in progress sync=1.70% chain=0.50MiB headers=143,460037.0MiB bodies=143,46001.25MiB receipts=143,46001.25MiB eta=7m55.212s
INFO [05-29 23:06:04.447] Syncing: chain download in progress sync=2.43% chain=60.26MiB headers=204,601054.25MiB bodies=204,60104.76MiB eta=10m53.390s
INFO [05-29 23:06:12.316] Forkchoice requested sync to new head number=8,435,130 hash=0dc9d2..a527f0 finalized=8,435,055
INFO [05-29 23:06:12.321] Syncing: state download in progress sync=1.19% state=1.35GiB accounts=587,1180130.74MiB slots=4,252,3710922.02MiB codes=762300330.50MiB eta=32m11.557s
INFO [05-29 23:06:12.632] Syncing: chain download in progress sync=2.90% chain=74.24MiB headers=249,737060.50MiB bodies=249,73705.10MiB receipts=249,73702.15MiB eta=13m20.017s
```

Сама синхронізація займає тривалий час

```
rodes@ntp-l6l3ebv:~$ curl -X POST http://127.0.0.1:8545 -H "Content-Type: application/json" --data '{"jsonrpc":"2.0","method":"eth_syncing","params":[], "id":1}'
{"jsonrpc":"2.0","id":1,"result":{"currentBlock":"0x1d25dd","healedBytecodeBytes":"0x0","healedBytecodes":"0x0","healedTrieNodeBytes":"0x0","healedTrieNodes":"0x0","healingBytecode":"0x0","healingTrieNodes":"0x0","highestBlock":"0x80b5c4","startingBlock":"0xc51fd","syncedAccountBytes":"0x44347339","syncedAccounts":"0x4ac599","syncedBytecodeBytes":"0x39320416","syncedBytecodes":"0x3032e","syncedStorage":"0x2d88724","syncedStorageBytes":"0x28267ee74","txIndexFinishedBlocks":"0x0","txIndexRemainingBlocks":"0x1"}}
```

currentBlock":"0x1d25dd"

"highestBlock":"0x80b5c4"

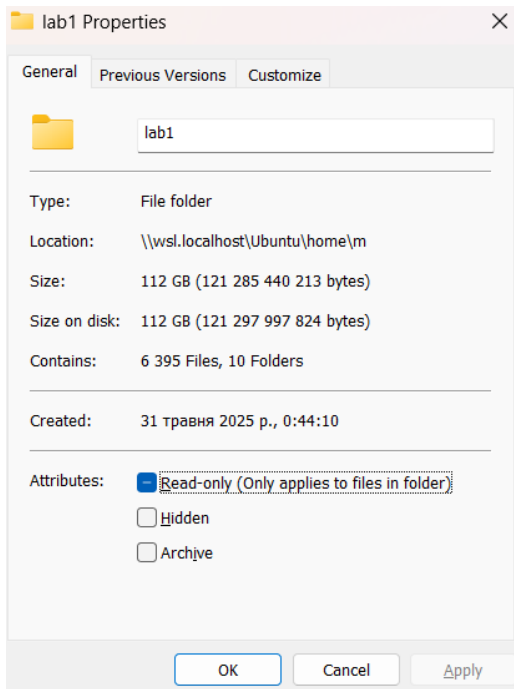
"currentBlock":"0x3b5eb6"

"highestBlock":"0x80b5c4"

Десь в районі "currentBlock":"0x400000", тобто десь в околі блоку під номером 4 194 304 мій Ubuntu

автоматично вбиває процес і весь термінал оскільки розмір блокчейну виходить за усі можливі рамки виділеної на віртуалку пам'яті, як оперативної, так і диску.

```
[process exited with code 1 (0x00000001)]
You can now close this terminal with Ctrl+D, or press Enter to restart.
```



Тому навіть з отриманими 0.05 Sepolia ЕТН я не зможу виконати транзакції, бо баланс не підтягується до повної синхронізації.

Після чергового перезапуску (бо я різними шляхами намагався змусити працювати синхронізацію) маємо стандартний вид для помилок під час спроб виконати транзакцію.

```
> web3.fromWei(eth.getBalance('0xb1bdf18aA3250071461A37cFC3FE6aeD7Ca8b8c'), 'ether');
Error: missing trie node 5eb6e371a698b8d68f665192350ffcceb322916f4b51bd79bb6887da3f494 (path ) state 0x5eb6e371a698b8d68f665192350ffcceb322916f4b51bd79bb6887da3f494 is not available
    at web3.js:6386:9(39)
    at send (web3.js:5115:62(29))
    at <eval>:1:28(5)
```

Переведення коштів вимагає підтвердження з Clef.

```
----- List Account request-----
A request has been made to list all accounts.
You can select which accounts the caller can see
[x] 0xb1bdf18aA3250071461A37cFC3FE6aeD7Ca8b8c
    URL: keystore:///home/m/lab1/UTC--2025-05-29T20-56-36.898806024Z--b1bdf18aA3250071461a37cfc3fe6aed7ca8b8c
[x] 0xE0Cbe2779384A806f4BC65D0ed747f29133DB135
    URL: keystore:///home/m/lab1/UTC--2025-05-29T21-46-12.290419099Z--e0cbe2779384A806f4bc65d0ed747f29133db135
-----
Request context:
NA -> ipc -> NA

Additional HTTP header data, provided by the external caller:
User-Agent: ""
Origin: ""
Approve? [y/N]:
> y
```

```
> eth.sendTransaction({
..... from: '0xb1bdf18aA3250071461A37cfc3fe6aed7ca8b8c',
..... to: '0xE0Cbe2779384A806f4bc65d0ed747f29133DB135',
..... value: web3.toWei(0.001, 'ether')
..... });
Error: missing trie node 5eb6e371a698b8d68f665192350ffcceb322916f4b51bd79bb6887da3f494 (path ) state 0x5eb6e371a698b8d68f665192350ffcceb322916f4b51bd79bb6887da3f494 is not available
    at web3.js:6386:9(39)
    at send (web3.js:5115:62(29))
    at <eval>:1:20(13)
```

### 3 Висновки

З використанням Geth та Clef, було розгорнуто тестовий Ethereum-клієнт за допомогою Ubuntu. Було виконано тестові операції, такі, як керування акаунтом та підпис транзакцій, які завершилися невдало, не дивлячись на правильне налаштування консенсус-клієнту Lighthouse.

По результатам цієї лабораторної роботи, можна йти перевстановлювати WSL, щоб звільнити місце на диску.