Bhartiya Vidya Bhavan's
Sardar Patel Institute of Technology, Mumbai-400058
Department of Electronics and Telecommunication Engineering
IT424:Blockchain Technology and Applications

Lab-6: Ethereum Blockchain Part-I
Setup an Ethereum Private Blockchain

Objective: Setup an Ethereum Blockchain
Outcomes: After successful completion of lab students should be able to

1. Implement an Ethereum private blockchain
2. Create the genesis block
3. Start the Ethereum blockchain
4. Create an account on the blockchain
5. Transact Ethers on blockchain
6. Query the blockchain using Geth- Geth console, Geth attach, Geth JSON RPC
7. Use Eth and Web3 interface over RPC

System Requirements:
PC (C2D, 4GB RAM, 100GB HDD space and NIC),Ubuntu Linux 14.04/20.04
Internet connectivity,Python Cryptography and Pycrypto,REST API,Go Language
Go Ethereum

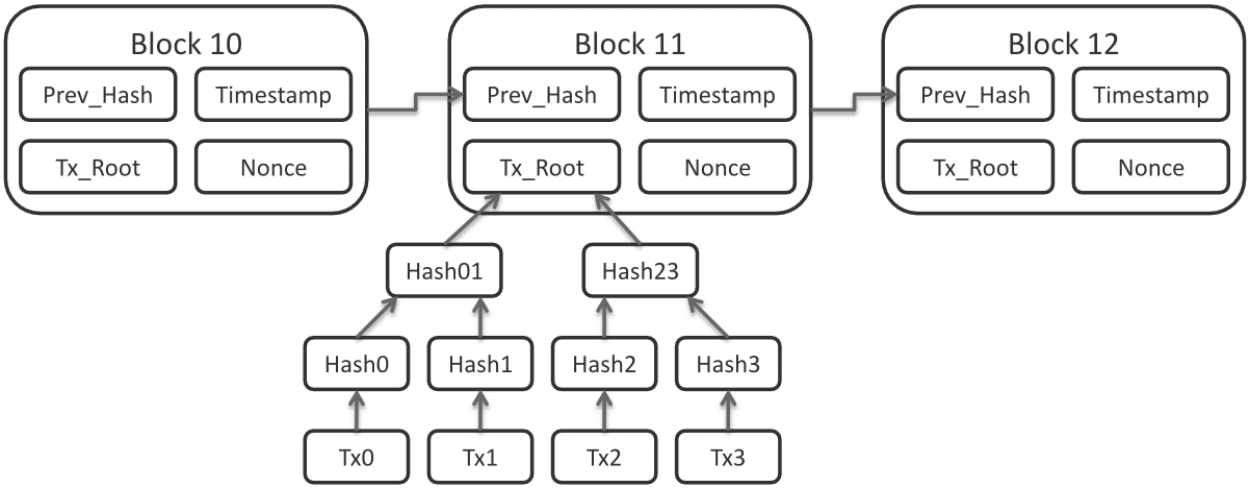


Figure-1: Blockchain Implementation

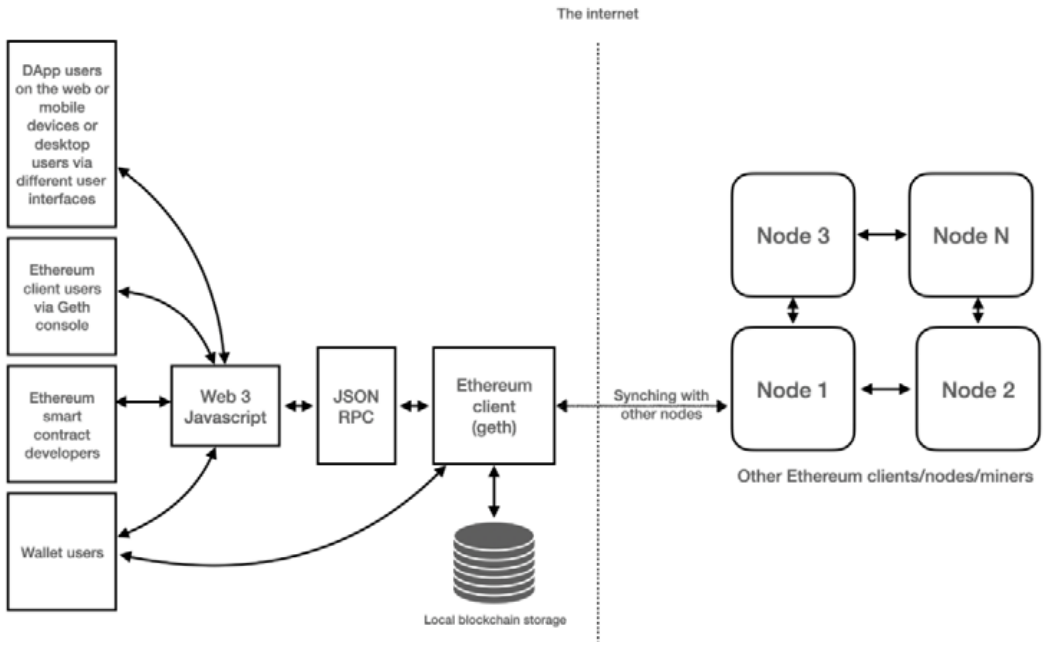


Figure-2: Ethereum high-level ecosystem

About Ethereum Blockchain: Ethereum is an open-source, public,blockchain-based distributed computing platform. It features smart contract (scripting) functionality, which facilitates online contractual agreements. The Ethereum elements include:

• Blocks and blockchain

• Wallets and client software

• Nodes and miners

• APIs and tools

• Supporting protocols

• Programming languages

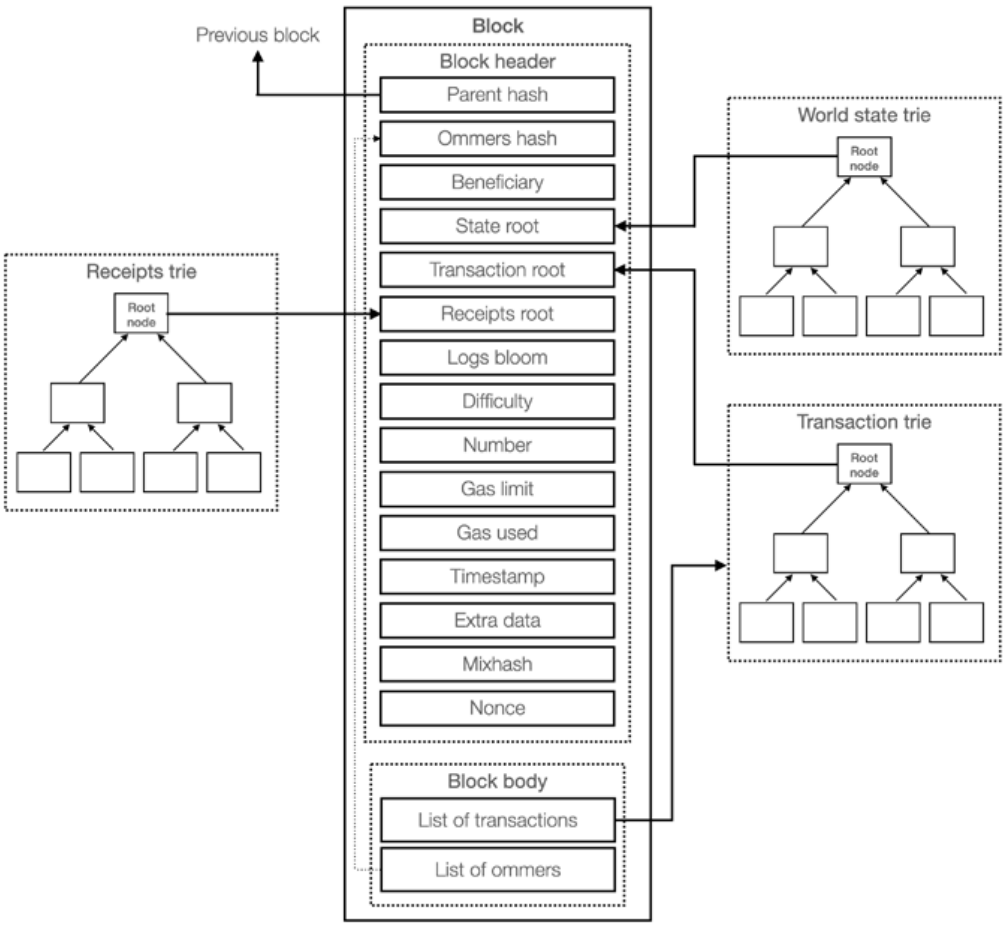


Figure-3: A detailed diagram of the block structure with a block header and relationship with tries

Blocks and blockchain

Blocks are the main building structure of a blockchain. Ethereum blocks consist of various elements, which are described as follows:

• The block header

• The transactions list

• The list of headers of ommers or uncles

The transaction list is simply a list of all transactions included in the block. Also, the list of headers of uncles is also included in the block.

Block header: Block headers are the most critical and detailed components of an Ethereum block. The header contains various elements, which are described in detail here:

• **Parent hash:** This is the Keccak 256-bit hash of the parent (previous) block's header.

• **Ommers hash:** This is the Keccak 256-bit hash of the list of ommers (or uncles) blocks included in the block.

• **The beneficiary:** The beneficiary field contains the 160-bit address of the recipient that will receive the mining reward once the block is successfully mined.

• **State root:** The state root field contains the Keccak 256-bit hash of the root node of the state trie. It is calculated once all transactions have been processed and finalized.

• **Transactions root:** The transaction root is the Keccak 256-bit hash of the root node of the transaction trie. The transaction trie represents the list of transactions included in the block.

• **Receipts root:** The receipts root is the Keccak 256-bit hash of the root node of the transaction receipt trie. This trie is composed of receipts of all transactions included in the block. Transaction receipts are generated after each transaction is processed and contain useful post-transaction information. More details on transaction receipts are provided in the next section.

• **Logs bloom:** The logs bloom is a bloom filter that is composed of the logger address and log topics from the log entry of each transaction receipt of the included transaction list in the block. Logging is explained in detail in the next section.

• **Difficulty:** The difficulty level of the current block.

• **Number:** The total number of all previous blocks; the genesis block is block zero.

• **Gas limit:** This field contains the value that represents the limit set on the gas consumption per block.

• **Gas used:** This field contains the total gas consumed by the transactions included in theblock.

• **Timestamp:** The timestamp is the epoch Unix time of the time of block initialization.

Extra data: The extra data field can be used to store arbitrary data related to the block.Only up to 32 bytes are allowed in this field.

• **Mixhash:** The mixhash field contains a 256-bit hash that, once combined with the nonce, is used to prove that adequate computational effort (Proof of Work, or PoW) has been spent in order to create this block.

• **Nonce:** Nonce is a 64-bit hash (a number) that is used to prove, in combination with the mixhash field, that adequate computational effort (PoW) has been spent in order to create this block.

Problem Statement:

[1] Create autonomous private Blockchain with rules on spending money.

[2] Make a cryptocurrency with a fixed market market supply and tokens to represent real world asset values.

[3] Mine for new Ether by validating transactions.

Ethereum Blockchain Flow Diagram:

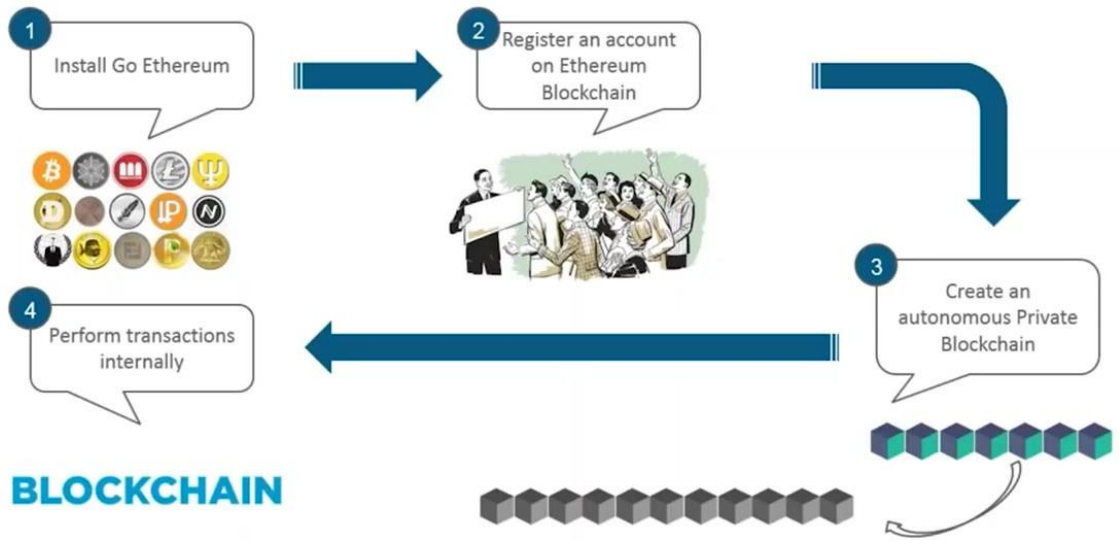


Figure-4: Ethereum Blockchain Flow

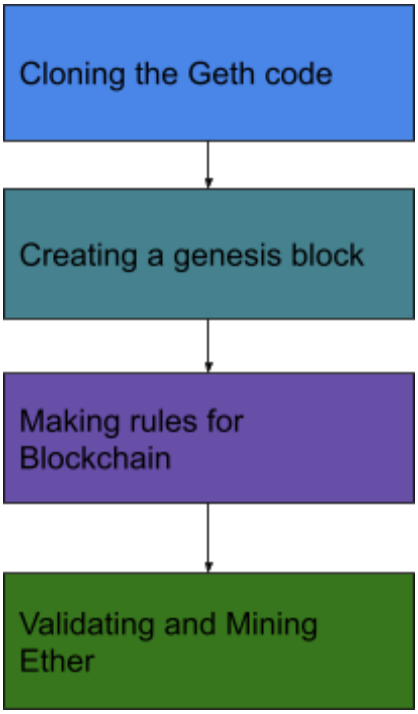


Figure-5: Ethereum Blockchain setup

Procedure:

[1] Install Ethereum Blockchain

Clone it from git and compile it.

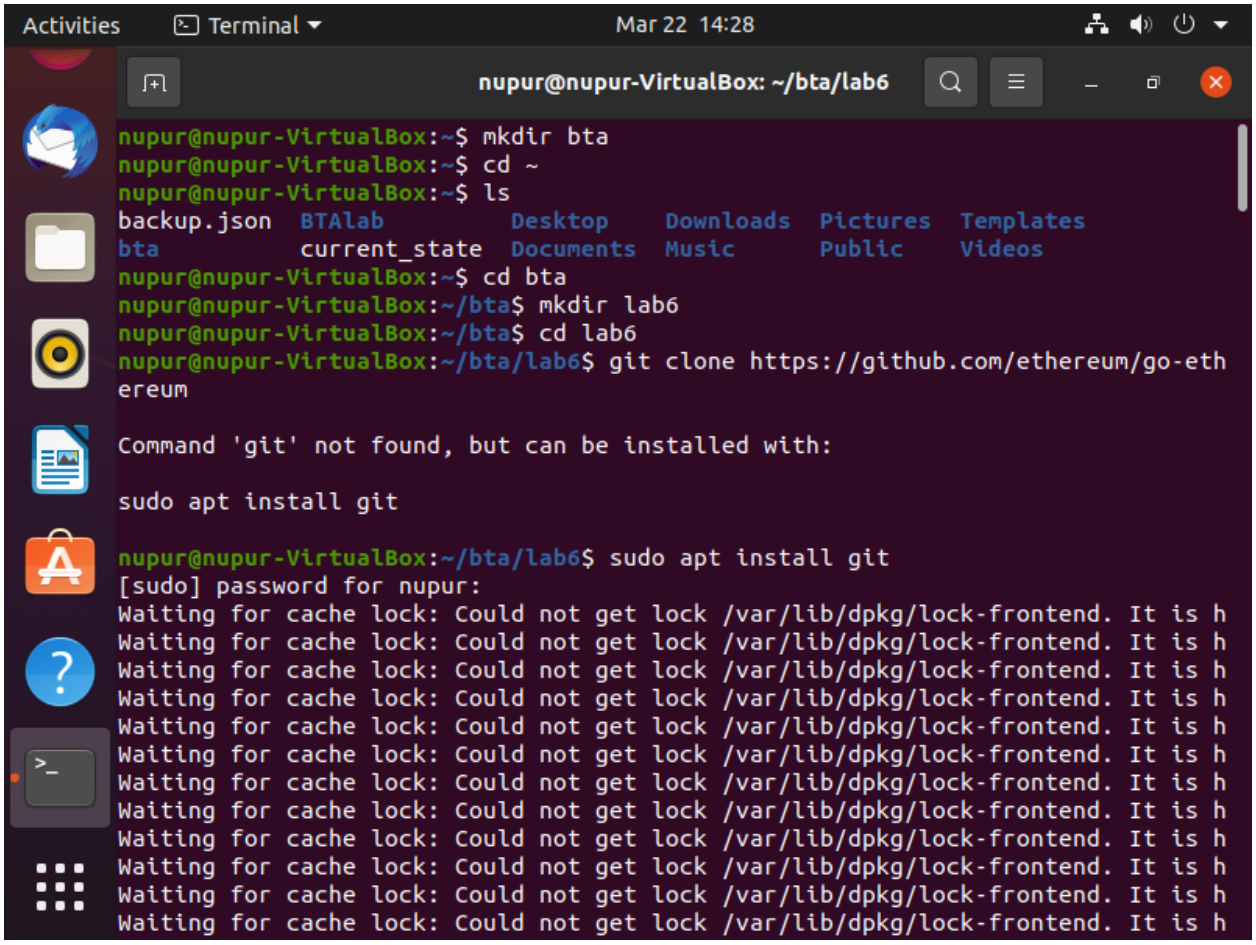
$cd ~

$mkdir BTA

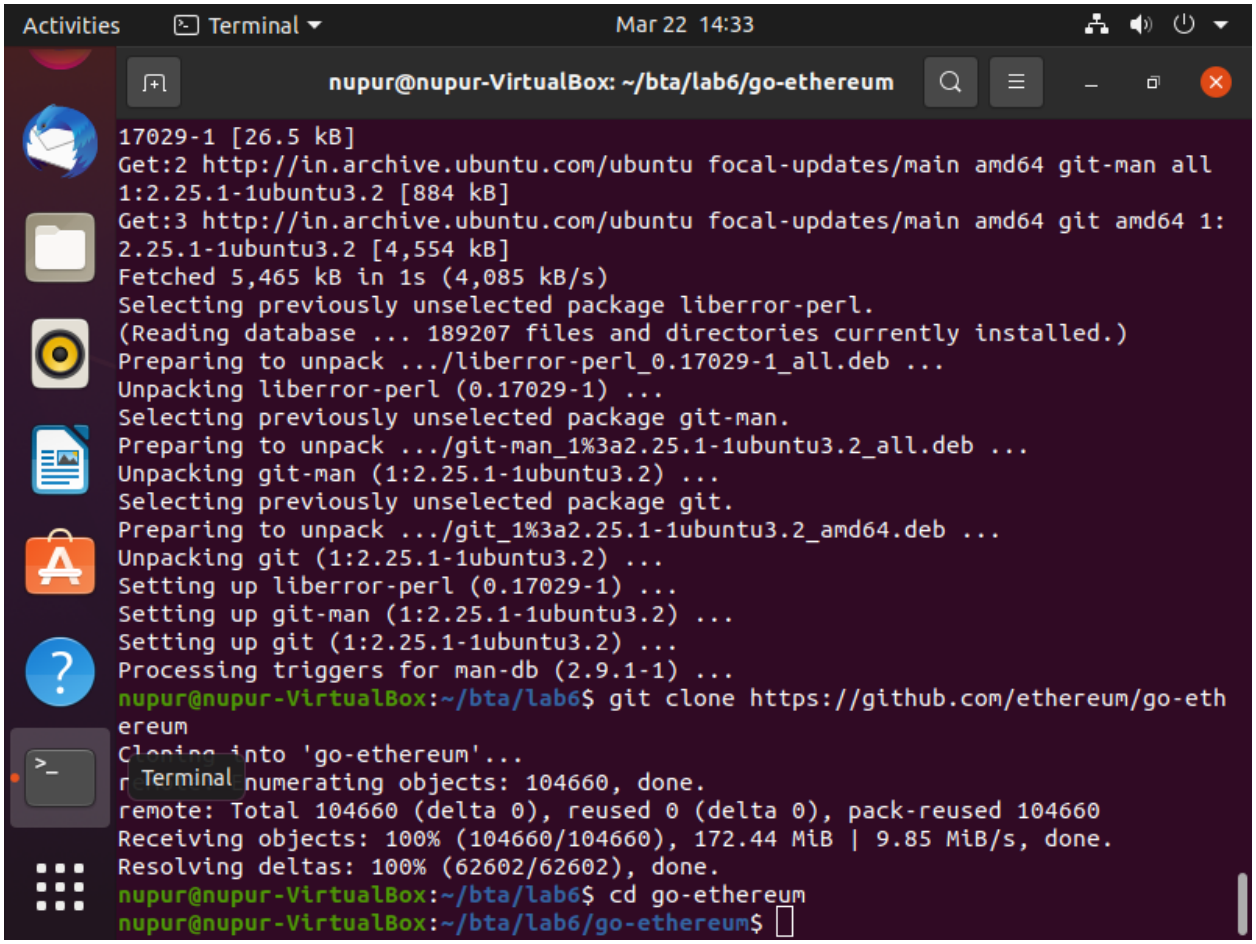
$cd BTA

$mkdir lab6

$cd lab6



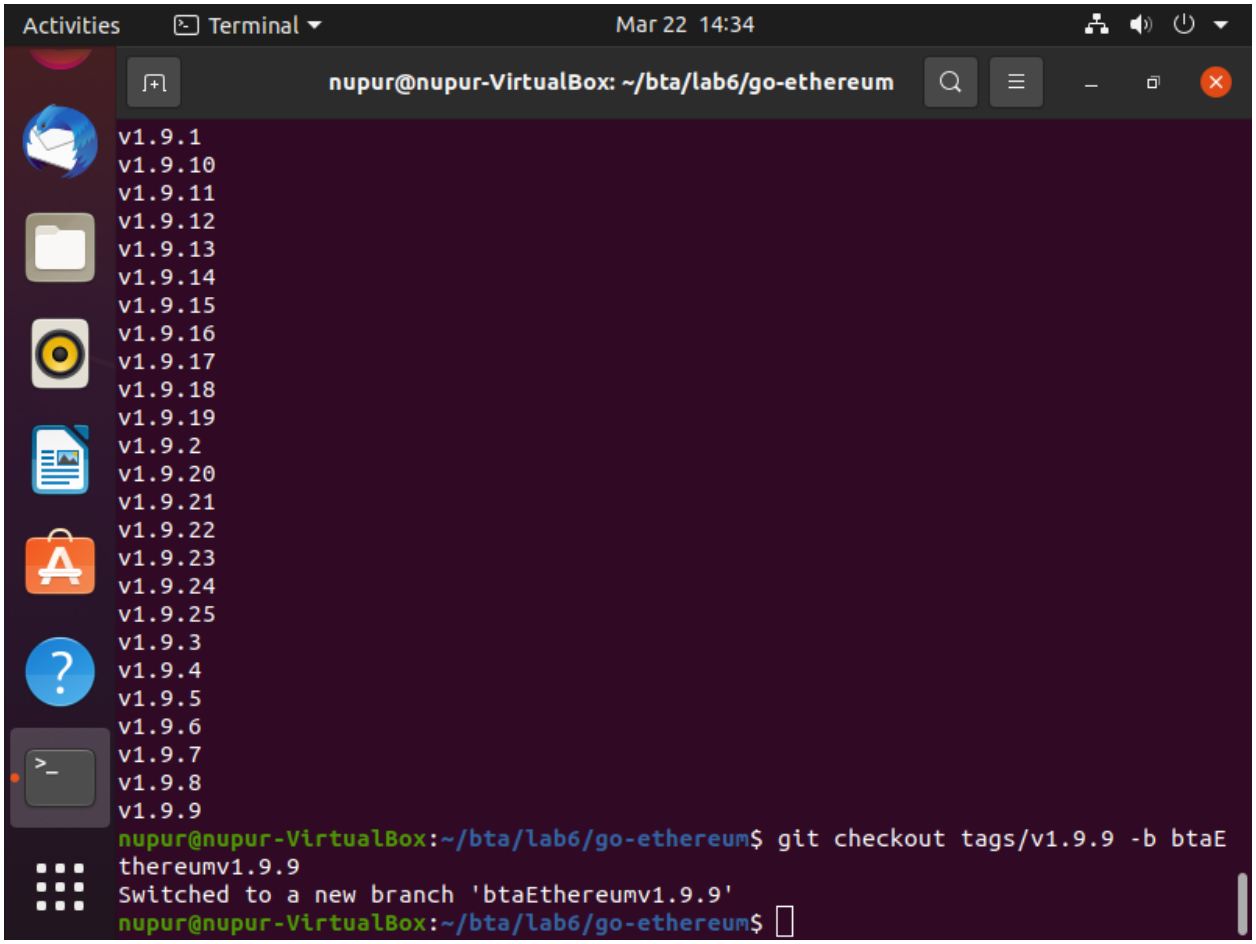
$ git clone https://github.com/ethereum/go-ethereum



$cd go-ethereum

$git tag

$git checkout tags/v1.9.9 -b btaEthereumv1.9.9



#checking the branch

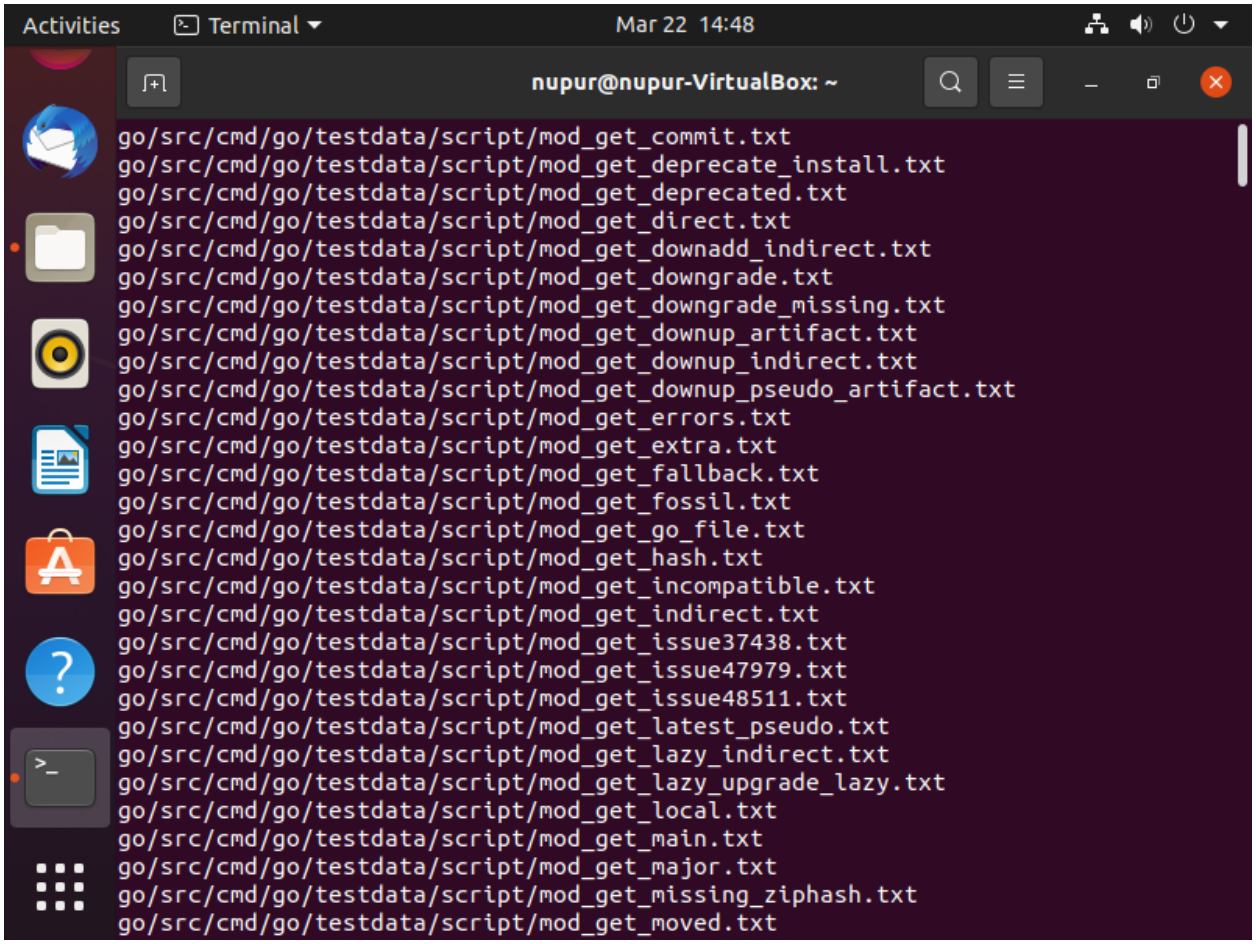
$git branch

#Install golang

Download the golang from the official website of the x86-64 tarball image source.

go1.18.linux-amd64.tar.gz

$tar -xzvf go1.18.linux-amd64.tar.gz



$sudo mv go /usr/local

Append these lines your .bashrc file and save it.

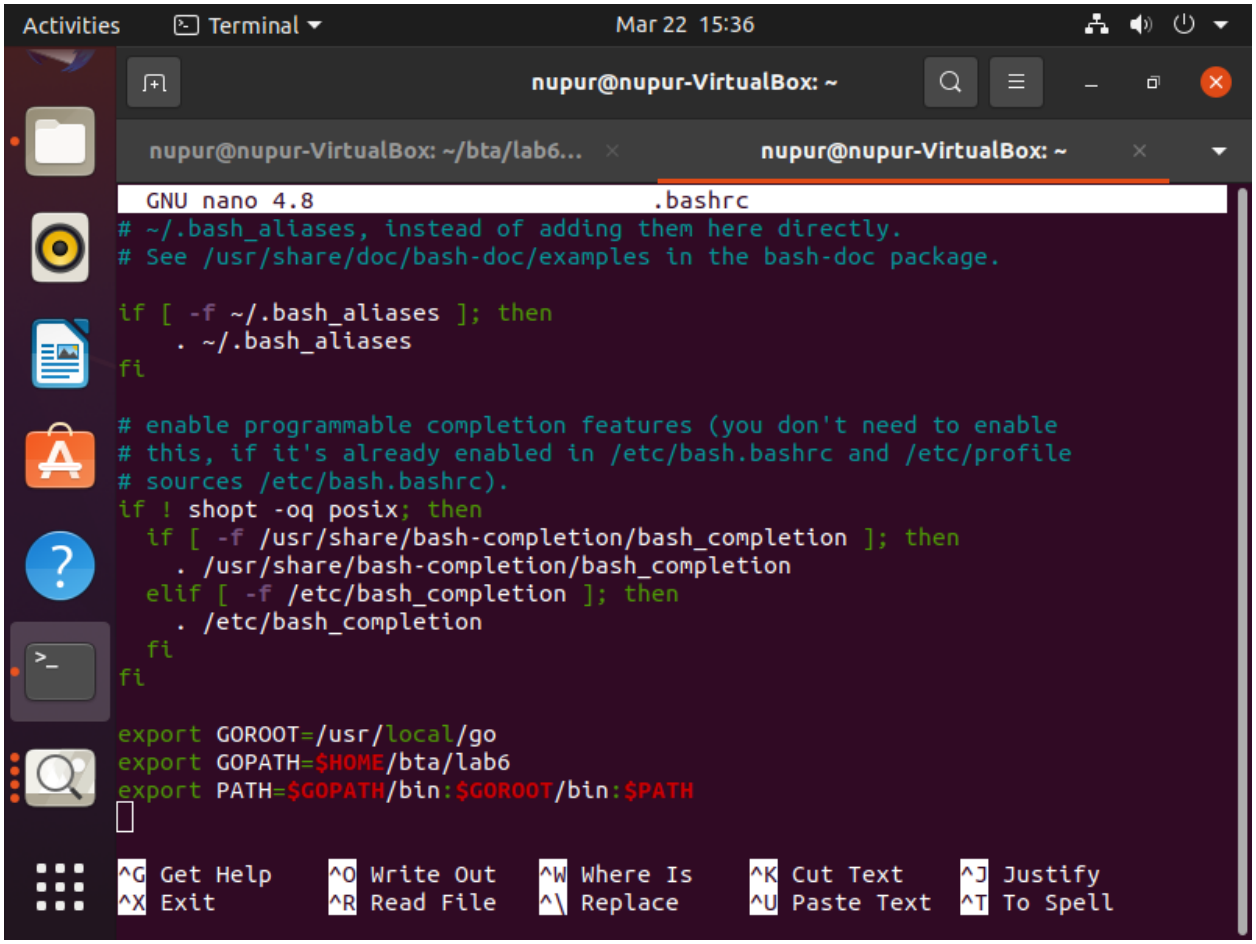
$cd ~

$nano .bashrc

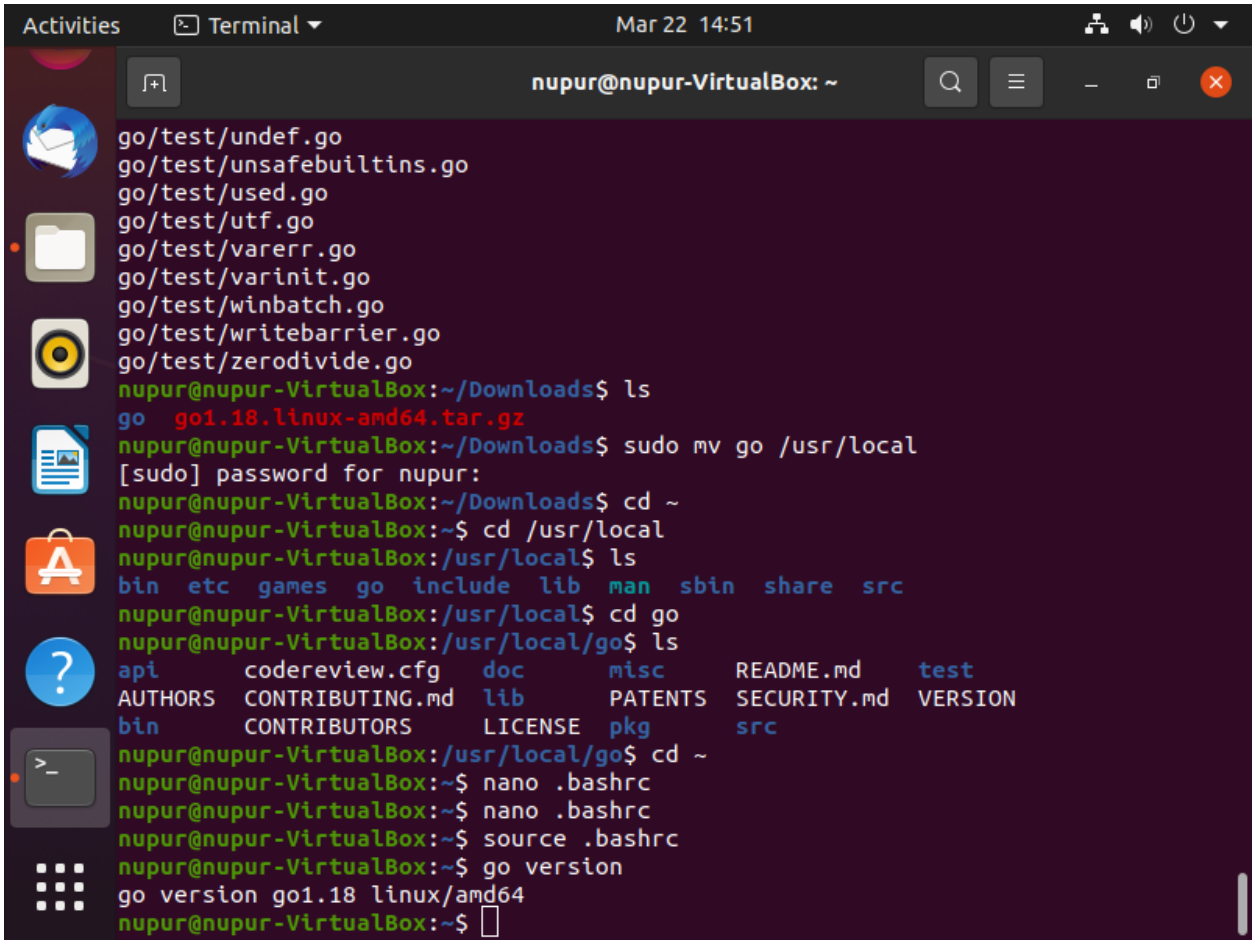
export GOROOT=/usr/local/go

export GOPATH=$HOME/BTA/lab6A

export PATH=$GOPATH/bin:$GOROOT/bin:$PATH



$source .bashrc

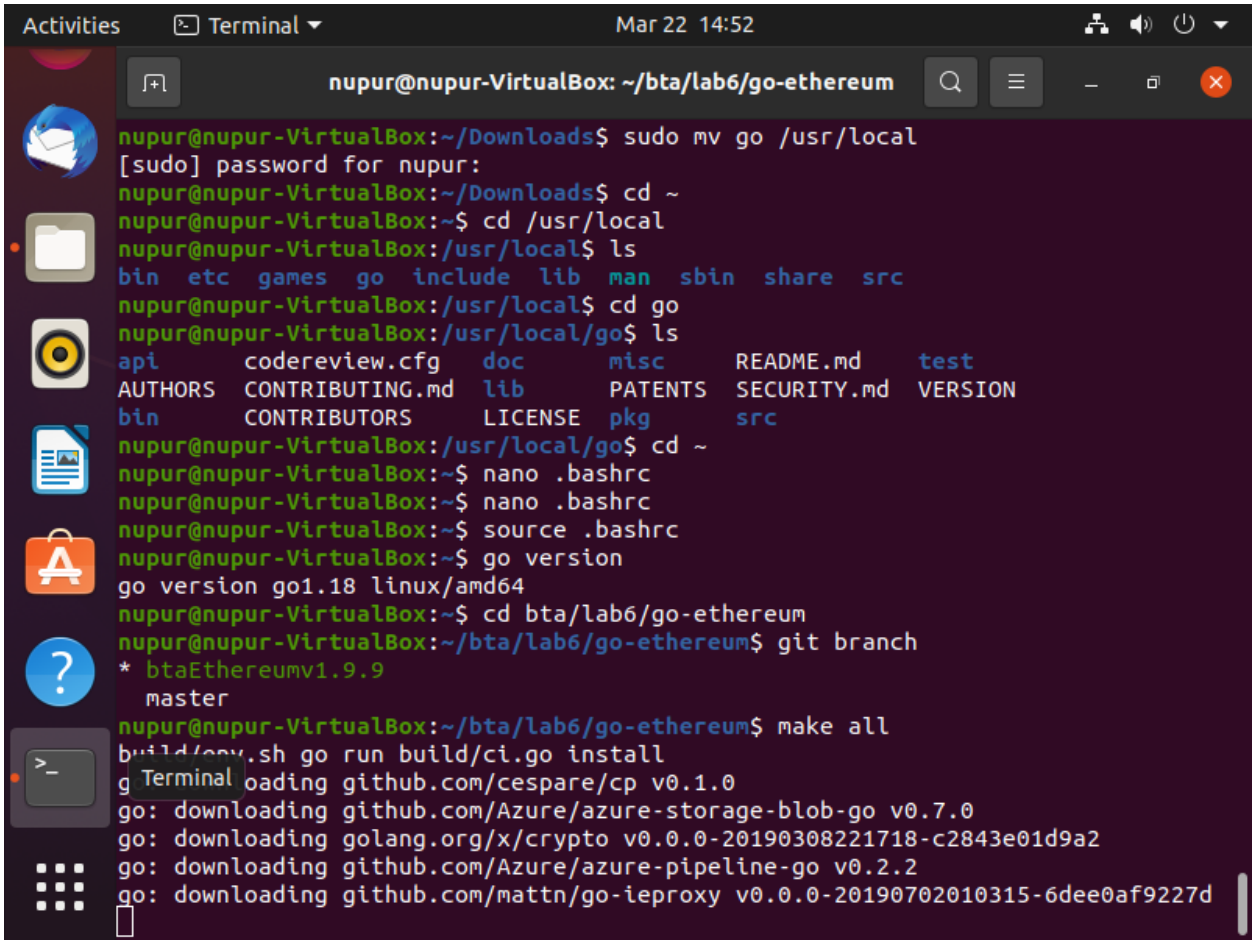


#Check the go version

$go version

$cd BTA/lab6/go-ethereum

$make all



Creating Blockchain- Genesis Block

$mkdir genesis

$ cd genesis

#create the genesis block and add these lines

nano genesisblock.jsom

{ "config":{},

"nonce": "0x0000000000000033",

"difficulty":"0x4000",

"alloc":{},

"mixhash": "0x0000000000000000000000000000000000000000000000000000000000000000",

"coinbase": "0x3333333333333333333333333333333333333333",

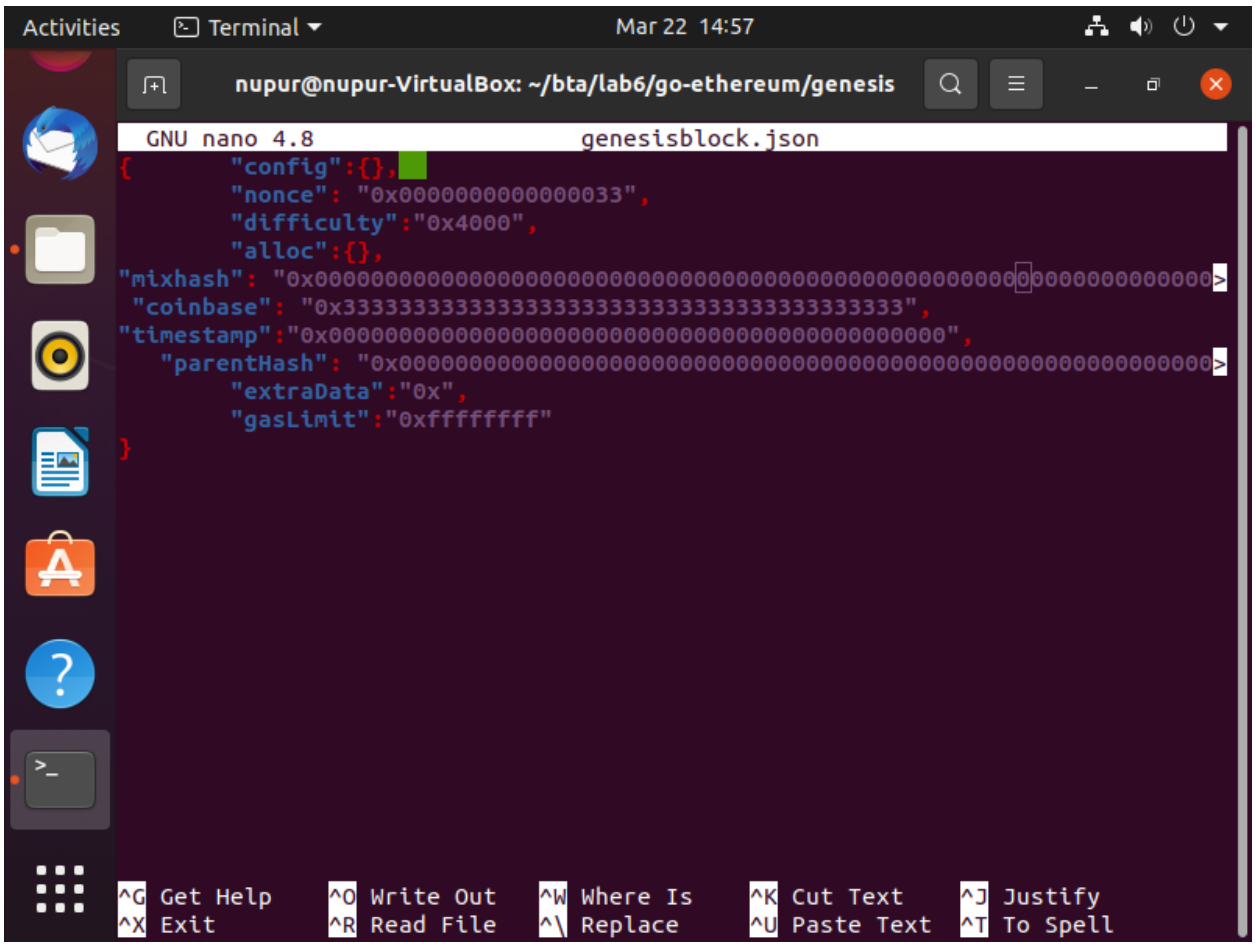
"timestamp":"0x0000000000000000000000000000000000000000",

"parentHash": "0x0000000000000000000000000000000000000000000000000000000000000000",

"extraData":"0x",

"gasLimit":"0xffffffff"

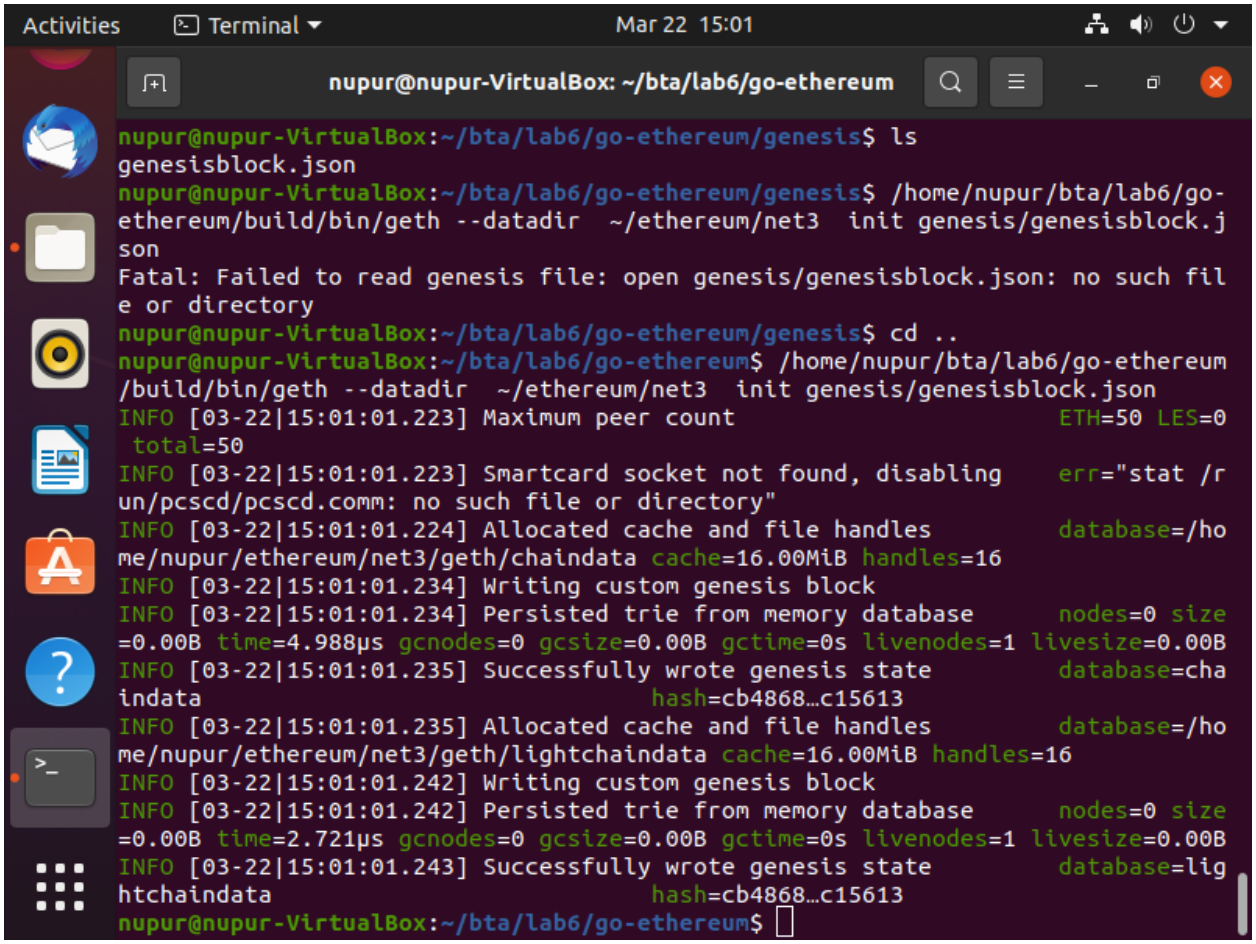
}



Starting the Blockchain

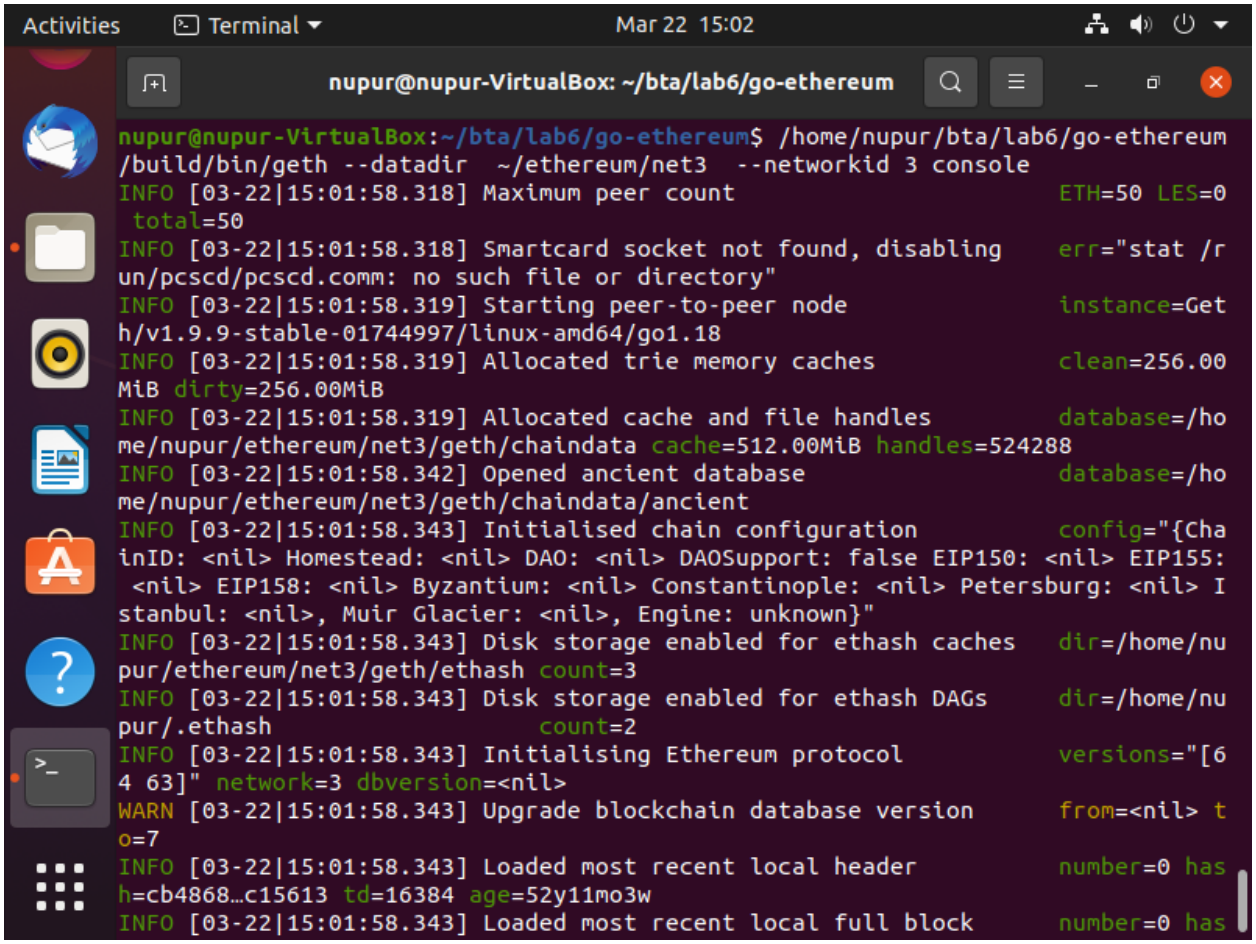
#Initializing the Blockchain

$/home/adaya/BTA/lab6/go-ethereum/build/bin/geth --datadir ~/ethereum/net3 init genenesis/genesisblock.json



#Starting the geth console

$ /home/adaya/BTA/lab6/go-ethereum/build/bin/geth --datadir ~/ethereum/net3 --networkid 3 console



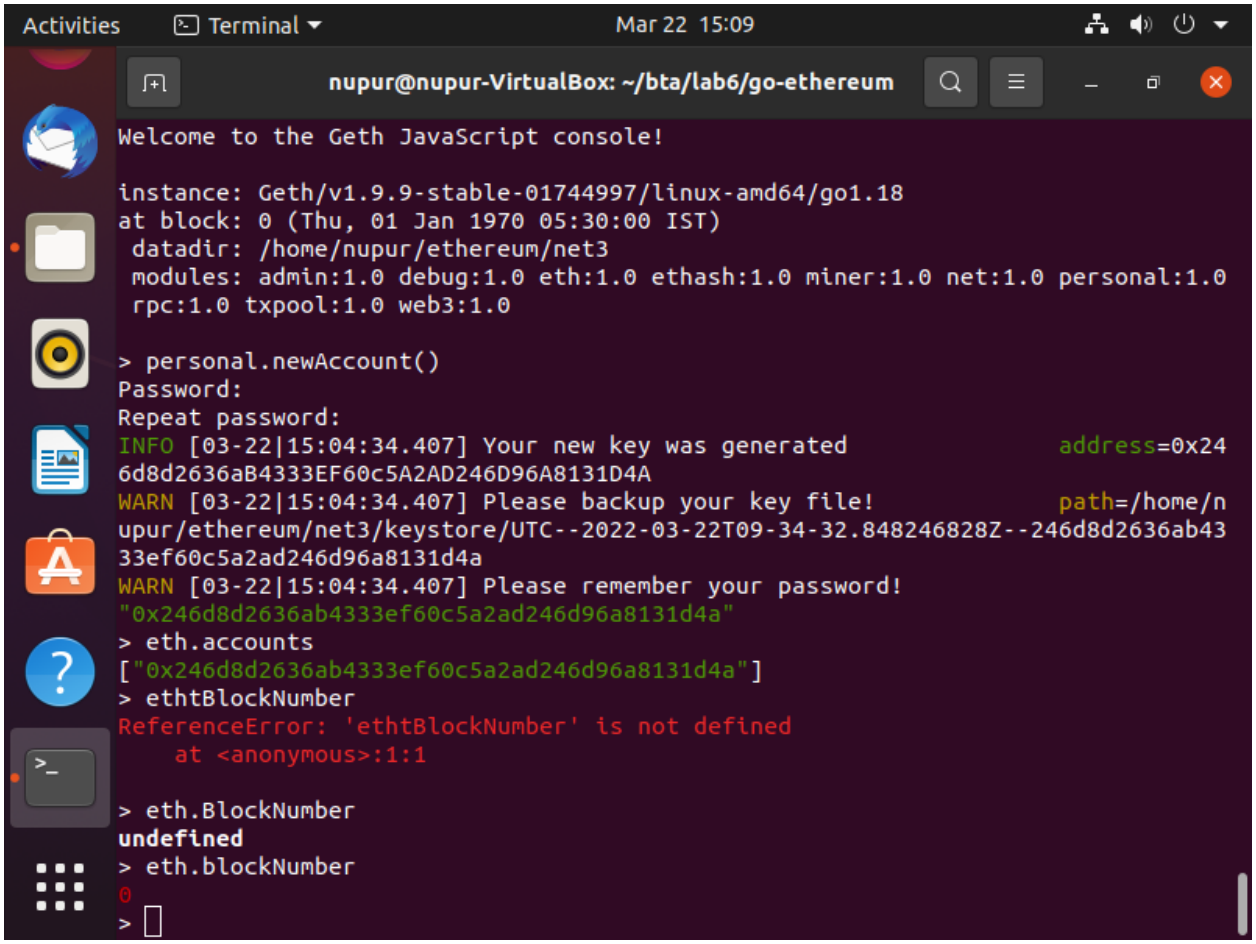
>

 # Starting Blockchain

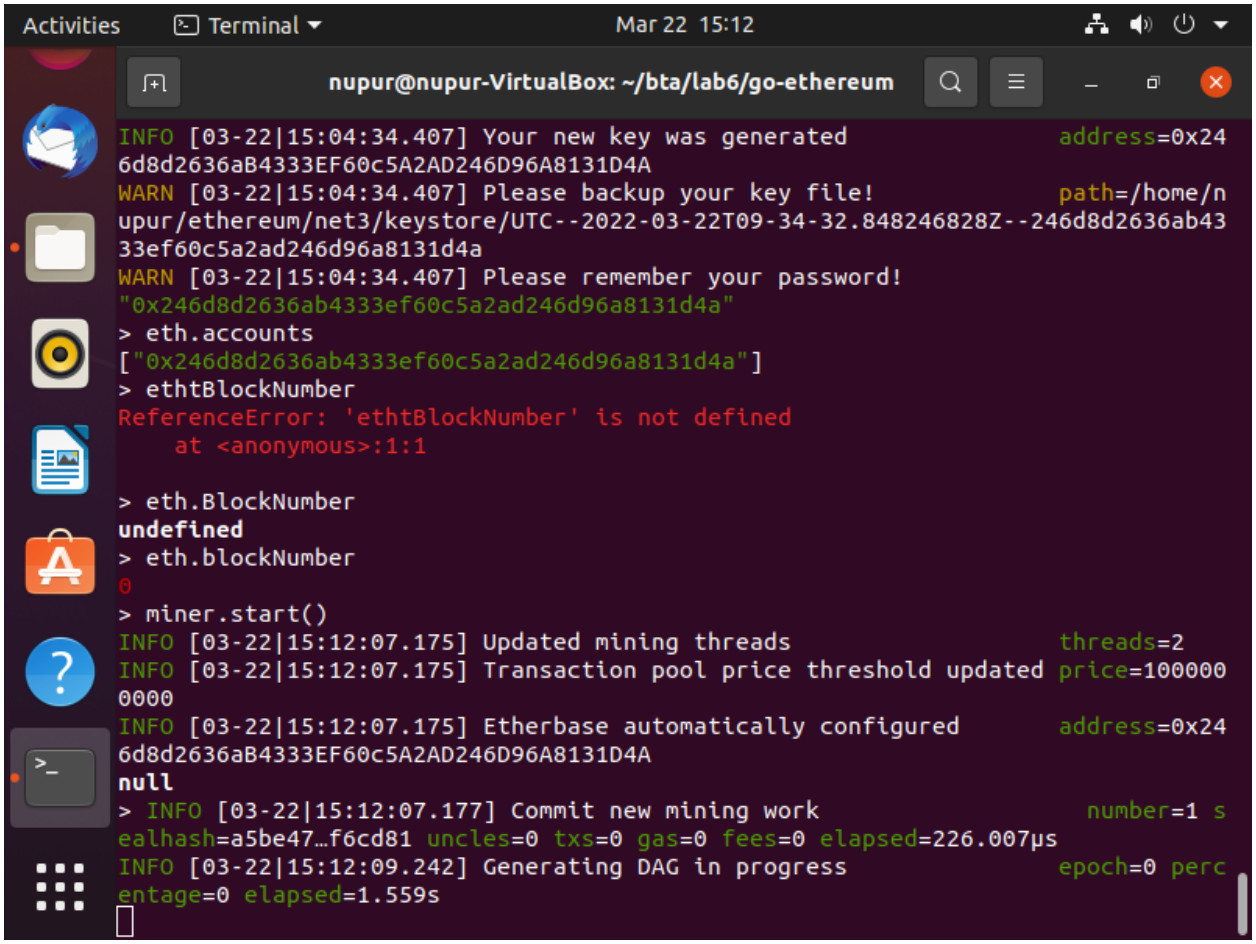
>personal.newAccount()

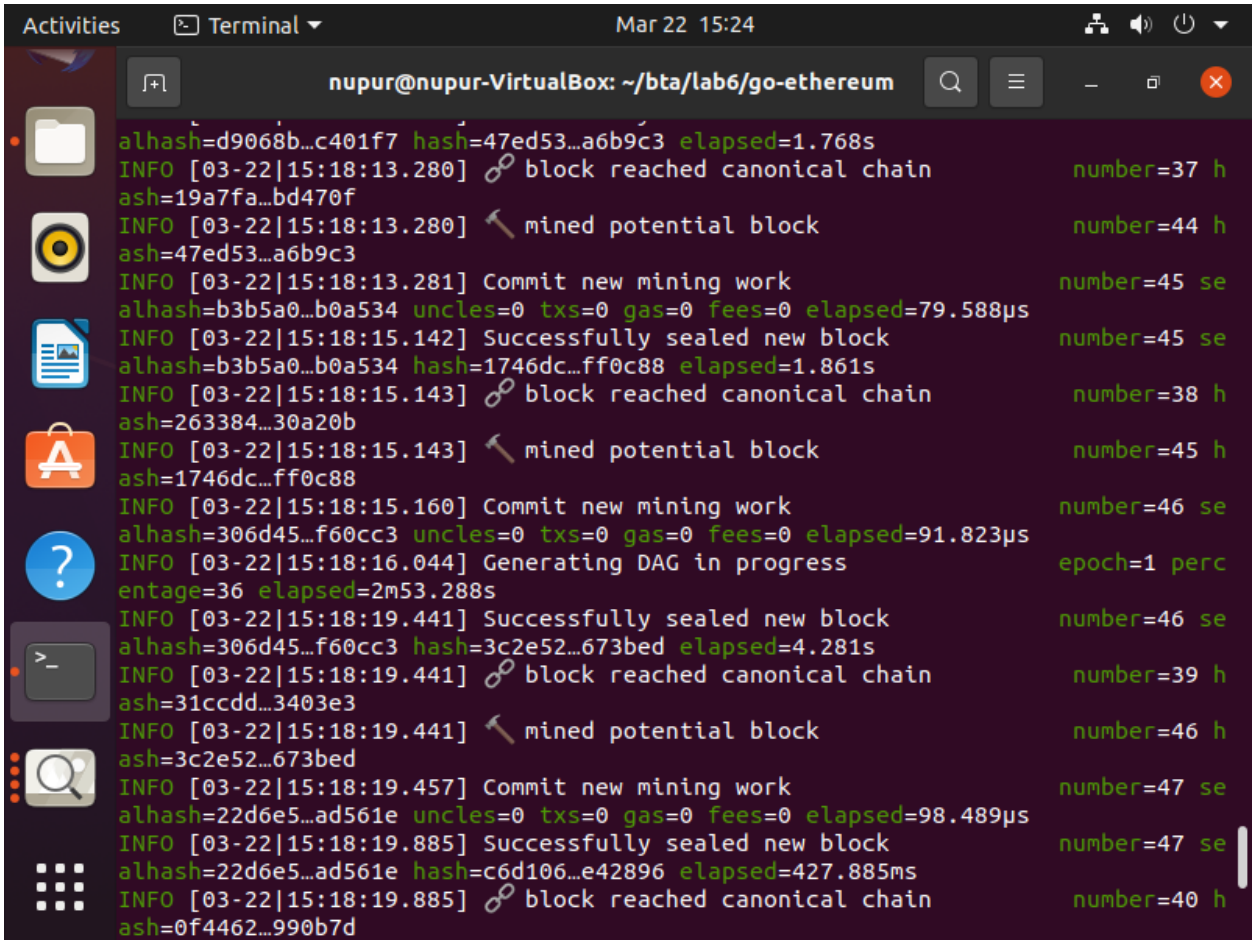
>eth.accounts

>eth.blockNumber

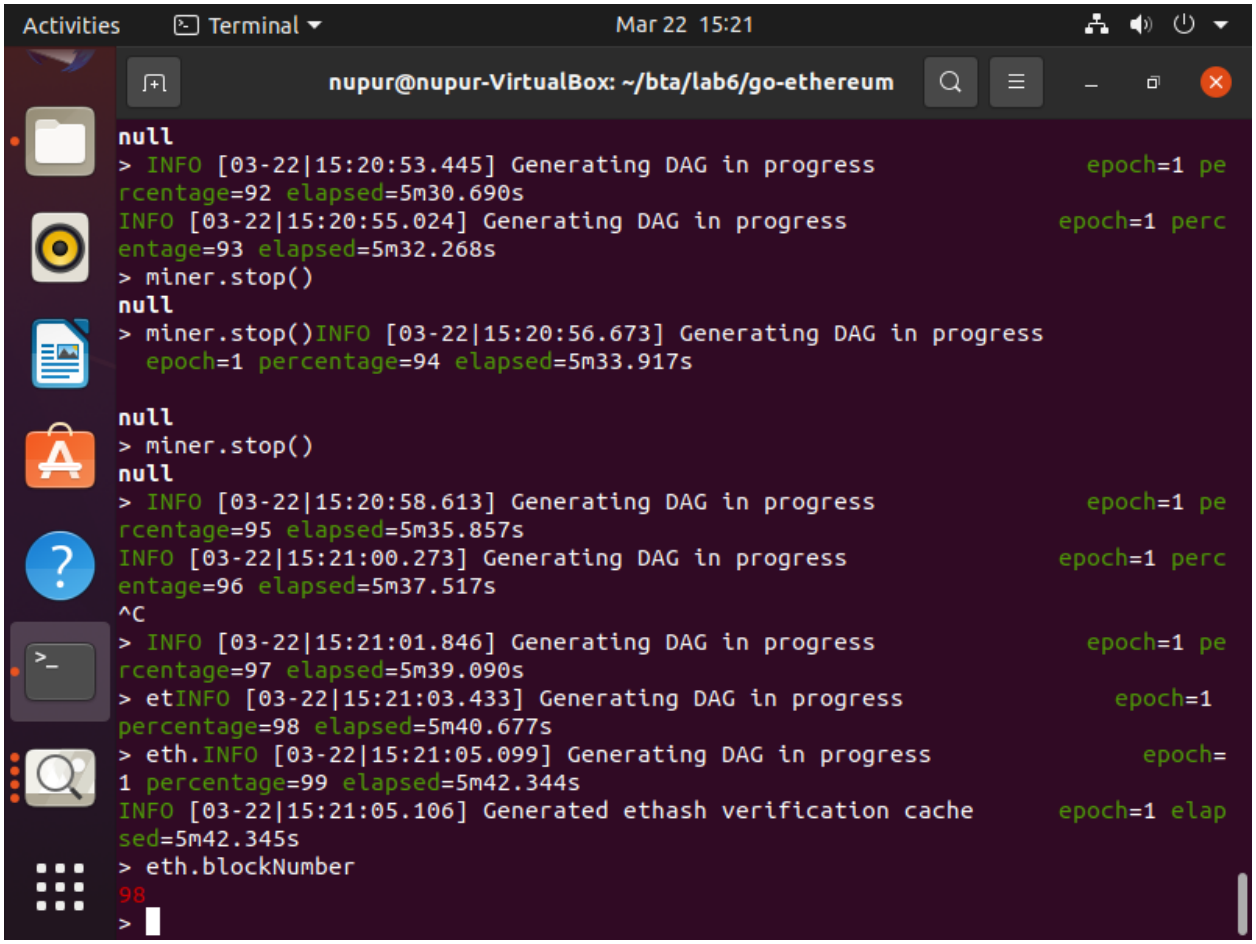

Activities
Terminal
Mar 22 15:09
nupur@nupur-VirtualBox: ~/bta/lab6/go-ethereum
Welcome to the Geth JavaScript console!
instance: Geth/v1.9.9-stable-01744997/linux-amd64/go1.18
at block: 0 (Thu, 01 Jan 1970 05:30:00 IST)
datadir: /home/nupur/ethereum/net3
modules: admin:1.0 debug:1.0 eth:1.0 ethash:1.0 miner:1.0 net:1.0 personal:1.0
rpc:1.0 txpool:1.0 web3:1.0
> personal.newAccount()
Password:
Repeat password:
INFO [03-22|15:04:34.407] Your new key was generated address=0x24
6d8d2636aB4333EF60c5A2AD246D96A8131D4A
WARN [03-22|15:04:34.407] Please backup your key file! path=/home/n
upur/ethereum/net3/keystore/UTC--2022-03-22T09-34-32.848246828Z--246d8d2636ab43
33ef60c5a2ad246d96a8131d4a
WARN [03-22|15:04:34.407] Please remember your password!
"0x246d8d2636ab4333ef60c5a2ad246d96a8131d4a"
> eth.accounts
["0x246d8d2636ab4333ef60c5a2ad246d96a8131d4a"]
> ethtBlockNumber
ReferenceError: 'ethtBlockNumber' is not defined
at <anonymous>:1:1
> eth.BlockNumber
undefined
> eth.blockNumber
0
>

>miner.start()

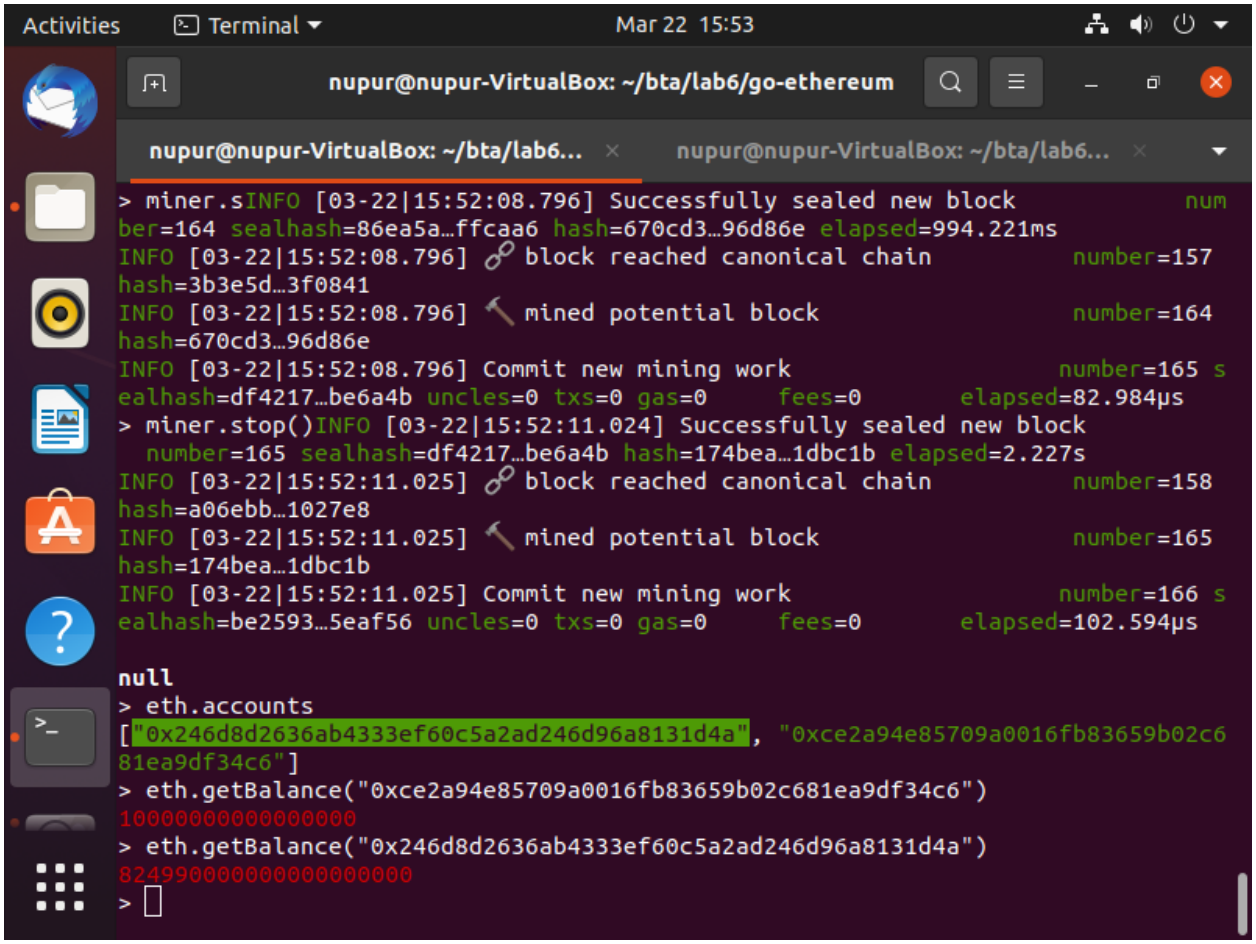

Activities
Terminal
Mar 22 15:12
nupur@nupur-VirtualBox: ~/bta/lab6/go-ethereum
INFO [03-22|15:04:34.407] Your new key was generated address=0x246d8d2636aB4333EF60c5A2AD246D96A8131D4A
WARN [03-22|15:04:34.407] Please backup your key file! path=/home/nupur/ethereum/net3/keystore/UTC--2022-03-22T09-34-32.848246828Z--246d8d2636ab4333ef60c5a2ad246d96a8131d4a
WARN [03-22|15:04:34.407] Please remember your password!
"0x246d8d2636ab4333ef60c5a2ad246d96a8131d4a"
> eth.accounts
["0x246d8d2636ab4333ef60c5a2ad246d96a8131d4a"]
> ethtBlockNumber
ReferenceError: 'ethtBlockNumber' is not defined
at <anonymous>:1:1
> eth.BlockNumber
undefined
> eth.blockNumber
0
> miner.start()
INFO [03-22|15:12:07.175] Updated mining threads threads=2
INFO [03-22|15:12:07.175] Transaction pool price threshold updated price=1000000000
INFO [03-22|15:12:07.175] Etherbase automatically configured address=0x246d8d2636aB4333EF60c5A2AD246D96A8131D4A
null
> INFO [03-22|15:12:07.177] Commit new mining work number=1 sealhash=a5be47…f6cd81 uncles=0 txs=0 gas=0 fees=0 elapsed=226.007µs
INFO [03-22|15:12:09.242] Generating DAG in progress epoch=0 percentage=0 elapsed=1.559s


Activities
Terminal
Mar 22 15:24
nupur@nupur-VirtualBox: ~/bta/lab6/go-ethereum
alhash=d9068b…c401f7 hash=47ed53…a6b9c3 elapsed=1.768s
INFO [03-22|15:18:13.280] block reached canonical chain number=37 h
ash=19a7fa…bd470f
INFO [03-22|15:18:13.280] mined potential block number=44 h
ash=47ed53…a6b9c3
INFO [03-22|15:18:13.281] Commit new mining work number=45 se
alhash=b3b5a0…b0a534 uncles=0 txs=0 gas=0 fees=0 elapsed=79.588µs
INFO [03-22|15:18:15.142] Successfully sealed new block number=45 se
alhash=b3b5a0…b0a534 hash=1746dc…ff0c88 elapsed=1.861s
INFO [03-22|15:18:15.143] block reached canonical chain number=38 h
ash=263384…30a20b
INFO [03-22|15:18:15.143] mined potential block number=45 h
ash=1746dc…ff0c88
INFO [03-22|15:18:15.160] Commit new mining work number=46 se
alhash=306d45…f60cc3 uncles=0 txs=0 gas=0 fees=0 elapsed=91.823µs
INFO [03-22|15:18:16.044] Generating DAG in progress epoch=1 perc
entage=36 elapsed=2m53.288s
INFO [03-22|15:18:19.441] Successfully sealed new block number=46 se
alhash=306d45…f60cc3 hash=3c2e52…673bed elapsed=4.281s
INFO [03-22|15:18:19.441] block reached canonical chain number=39 h
ash=31ccdd…3403e3
INFO [03-22|15:18:19.441] mined potential block number=46 h
ash=3c2e52…673bed
INFO [03-22|15:18:19.457] Commit new mining work number=47 se
alhash=22d6e5…ad561e uncles=0 txs=0 gas=0 fees=0 elapsed=98.489µs
INFO [03-22|15:18:19.885] Successfully sealed new block number=47 se
alhash=22d6e5…ad561e hash=c6d106…e42896 elapsed=427.885ms
INFO [03-22|15:18:19.885] block reached canonical chain number=40 h
ash=0f4462…990b7d

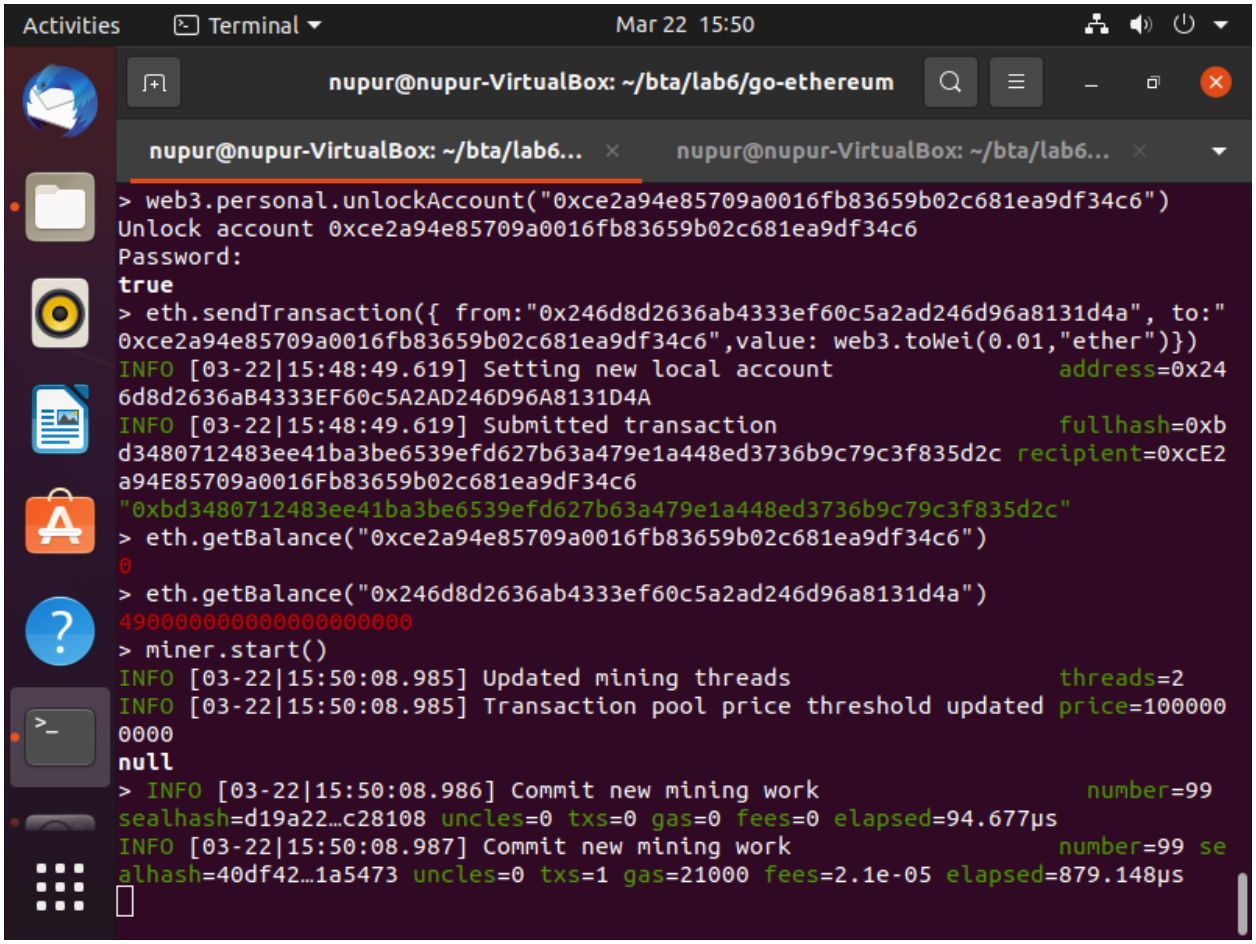
>miner.stop()



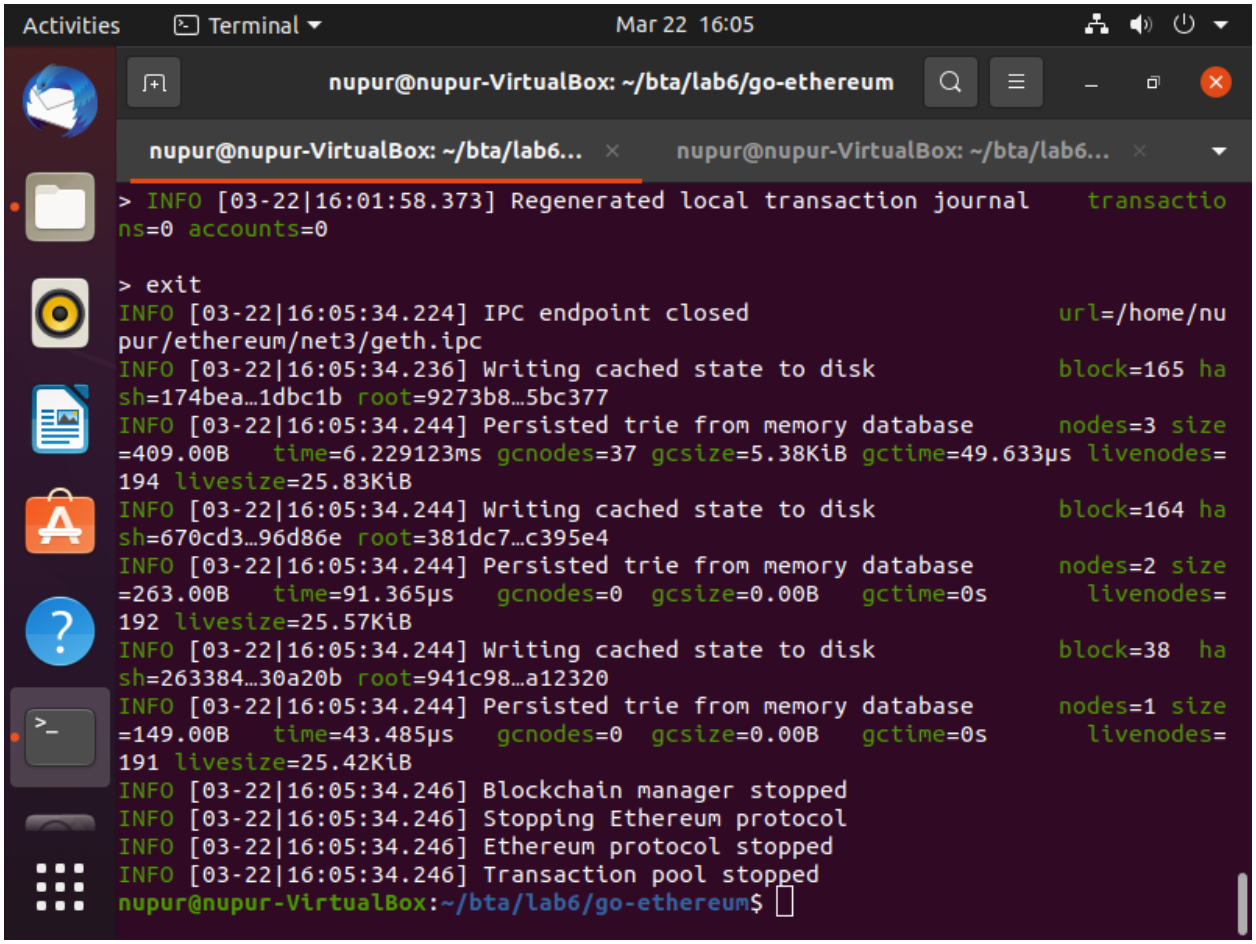
>eth.accounts



>eth.getBalance(“EAO Address”)

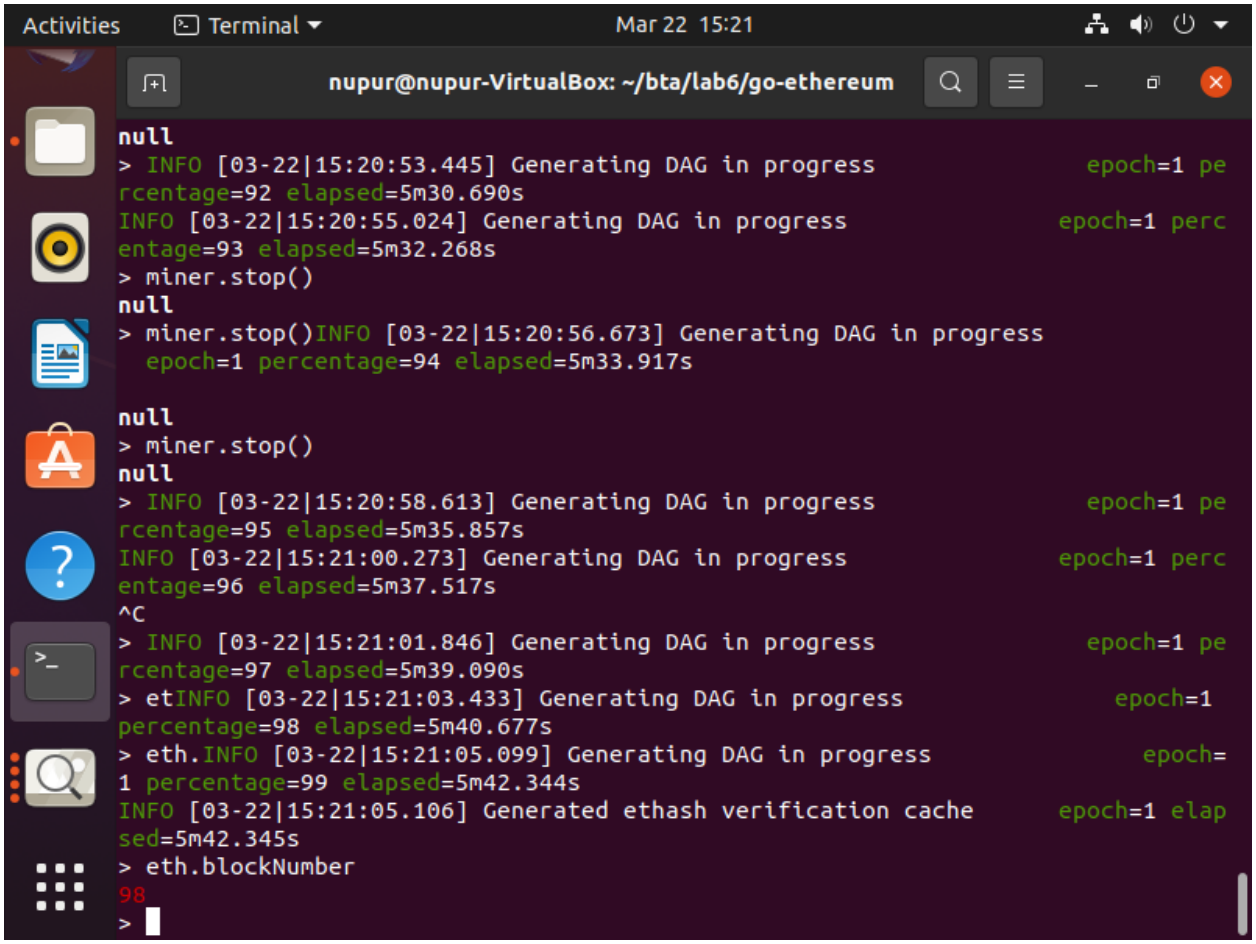

Activities
Terminal
Mar 22 15:50
nupur@nupur-VirtualBox: ~/bta/lab6/go-ethereum
nupur@nupur-VirtualBox: ~/bta/lab6...
nupur@nupur-VirtualBox: ~/bta/lab6...
> web3.personal.unlockAccount("0xce2a94e85709a0016fb83659b02c681ea9df34c6")
Unlock account 0xce2a94e85709a0016fb83659b02c681ea9df34c6
Password:
true
> eth.sendTransaction({ from:"0x246d8d2636ab4333ef60c5a2ad246d96a8131d4a", to:"0xce2a94e85709a0016fb83659b02c681ea9df34c6",value: web3.toWei(0.01,"ether")})
INFO [03-22|15:48:49.619] Setting new local account address=0x246d8d2636aB4333EF60c5A2AD246D96A8131D4A
INFO [03-22|15:48:49.619] Submitted transaction fullhash=0xbd3480712483ee41ba3be6539efd627b63a479e1a448ed3736b9c79c3f835d2c recipient=0xcE2a94E85709a0016Fb83659b02c681ea9dF34c6
"0xbd3480712483ee41ba3be6539efd627b63a479e1a448ed3736b9c79c3f835d2c"
> eth.getBalance("0xce2a94e85709a0016fb83659b02c681ea9df34c6")
0
> eth.getBalance("0x246d8d2636ab4333ef60c5a2ad246d96a8131d4a")
49000000000000000000
> miner.start()
INFO [03-22|15:50:08.985] Updated mining threads threads=2
INFO [03-22|15:50:08.985] Transaction pool price threshold updated price=1000000000
null
> INFO [03-22|15:50:08.986] Commit new mining work number=99 sealhash=d19a22…c28108 uncles=0 txs=0 gas=0 fees=0 elapsed=94.677µs
INFO [03-22|15:50:08.987] Commit new mining work number=99 sealhash=40df42…1a5473 uncles=0 txs=1 gas=21000 fees=2.1e-05 elapsed=879.148µs

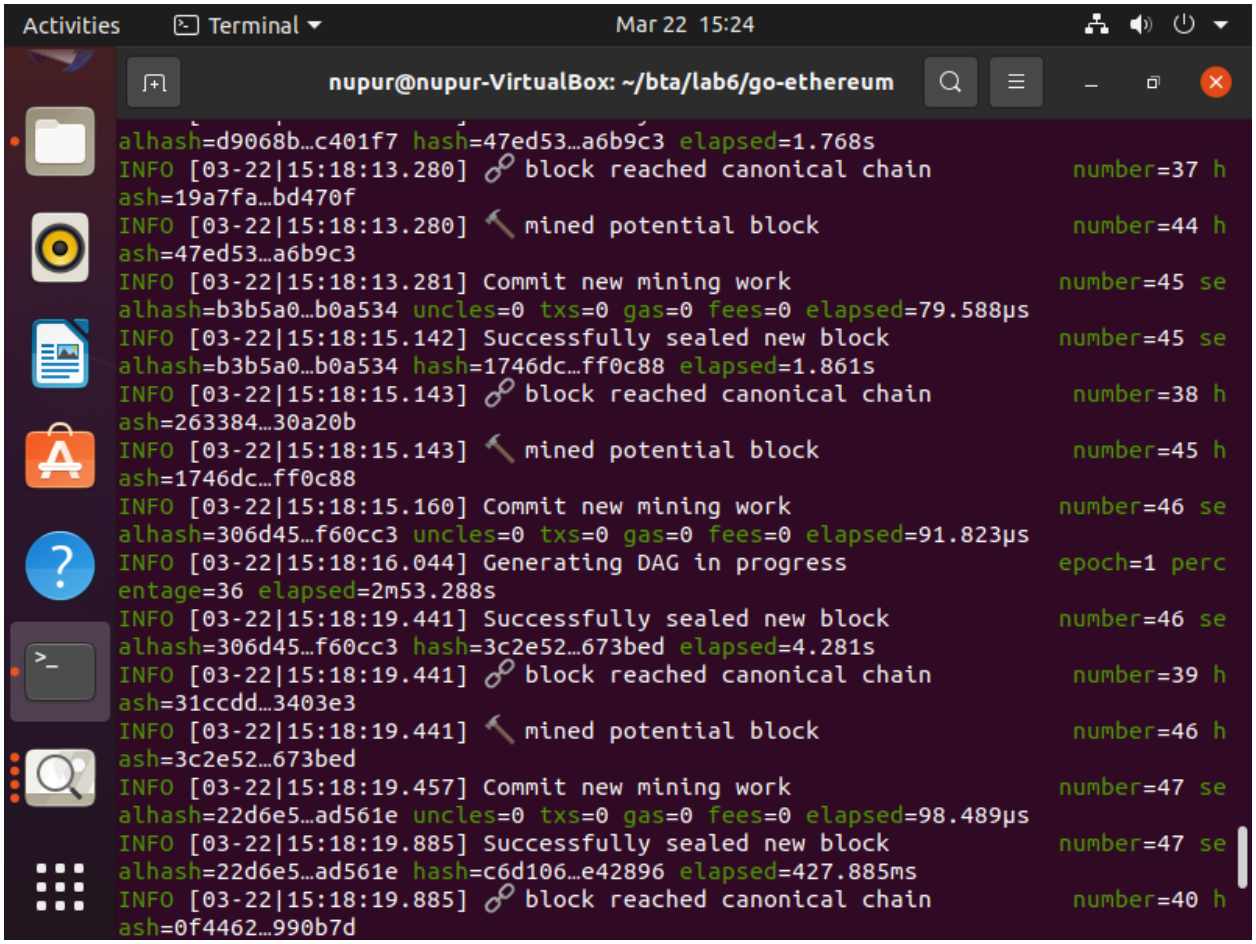
>exit



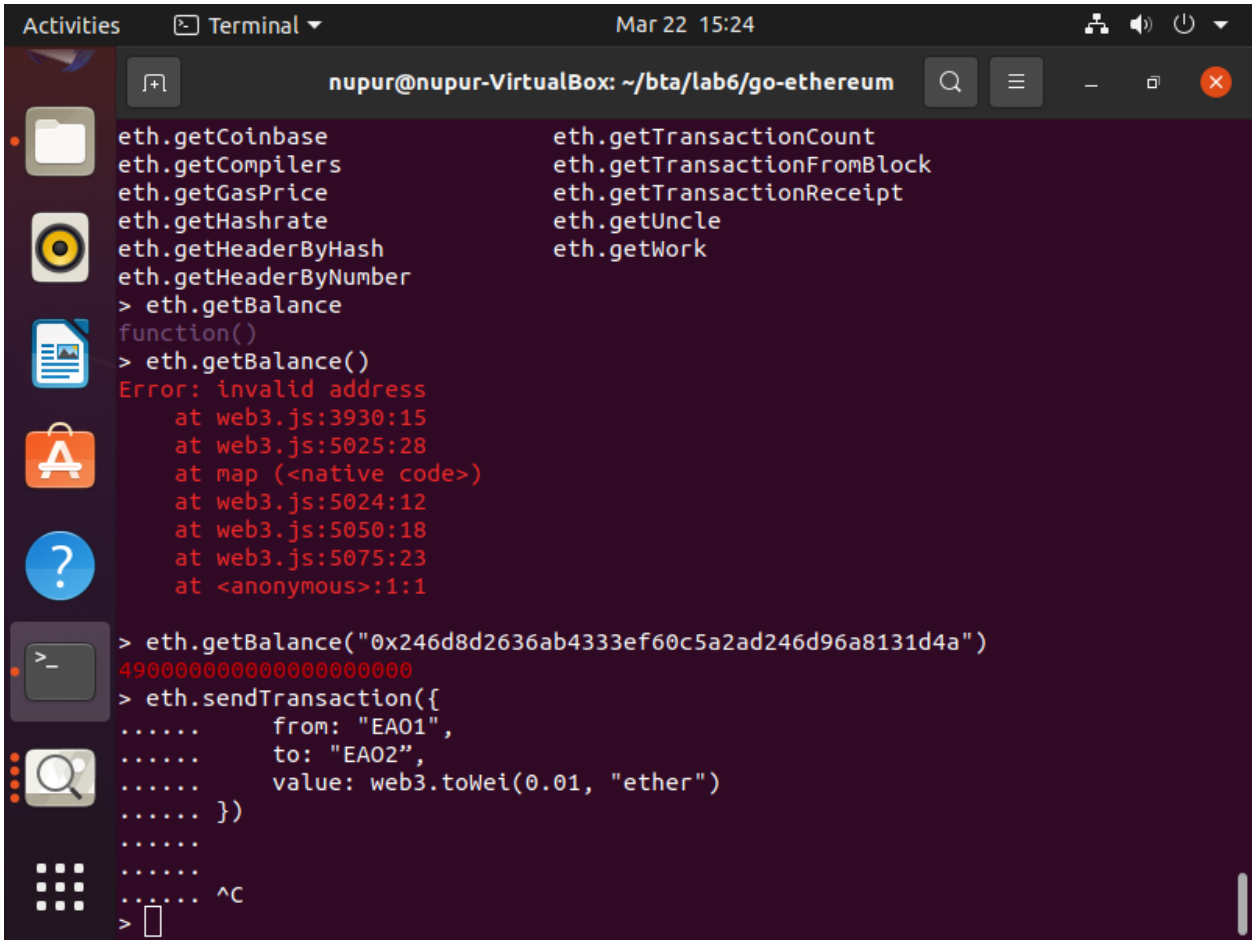
Tasks:

[1] Mine at least 50 blocks and check and verify it


Activities
Terminal
Mar 22 15:21
nupur@nupur-VirtualBox: ~/bta/lab6/go-ethereum
null
> INFO [03-22|15:20:53.445] Generating DAG in progress epoch=1 percentage=92 elapsed=5m30.690s
INFO [03-22|15:20:55.024] Generating DAG in progress epoch=1 percentage=93 elapsed=5m32.268s
> miner.stop()
null
> miner.stop()INFO [03-22|15:20:56.673] Generating DAG in progress epoch=1 percentage=94 elapsed=5m33.917s
null
> miner.stop()
null
> INFO [03-22|15:20:58.613] Generating DAG in progress epoch=1 percentage=95 elapsed=5m35.857s
INFO [03-22|15:21:00.273] Generating DAG in progress epoch=1 percentage=96 elapsed=5m37.517s
^C
> INFO [03-22|15:21:01.846] Generating DAG in progress epoch=1 percentage=97 elapsed=5m39.090s
> etINFO [03-22|15:21:03.433] Generating DAG in progress epoch=1 percentage=98 elapsed=5m40.677s
> eth.INFO [03-22|15:21:05.099] Generating DAG in progress epoch=1 percentage=99 elapsed=5m42.344s
INFO [03-22|15:21:05.106] Generated ethash verification cache epoch=1 elapsed=5m42.345s
> eth.blockNumber
98
>



[2] Check the balances of each EAO accounts



[3] Send Ethers and verify

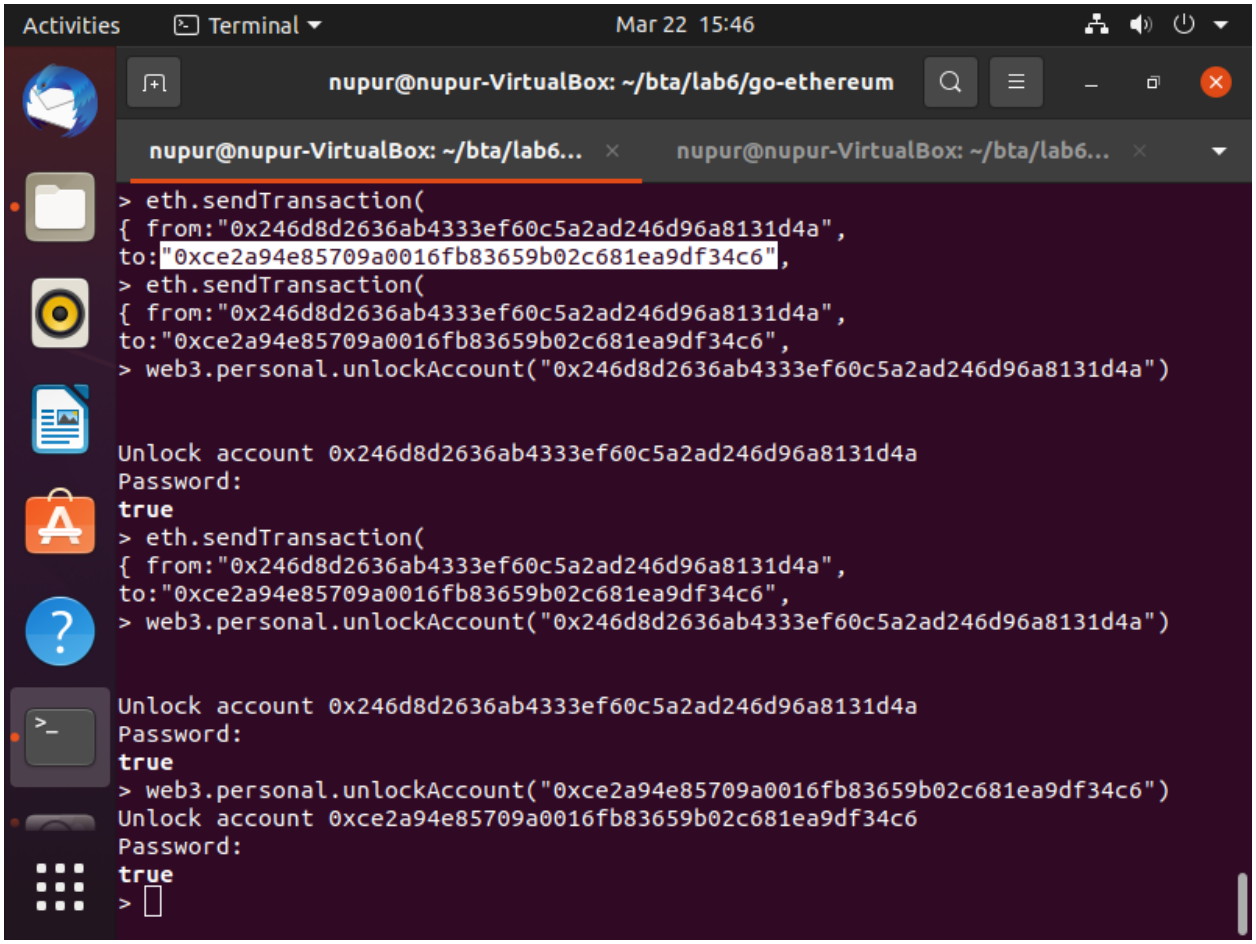
eth.sendTransaction({

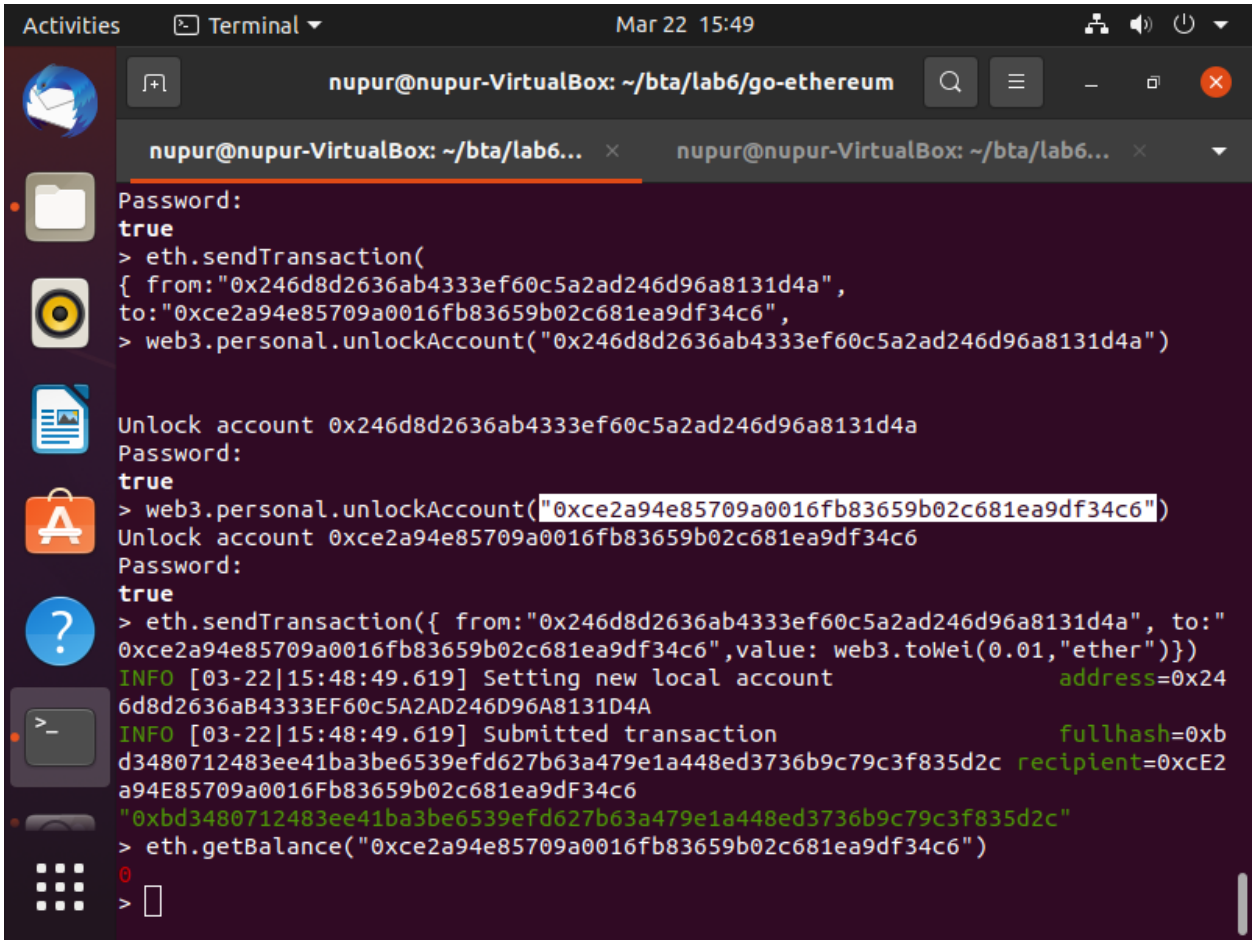
from: "EAO1",

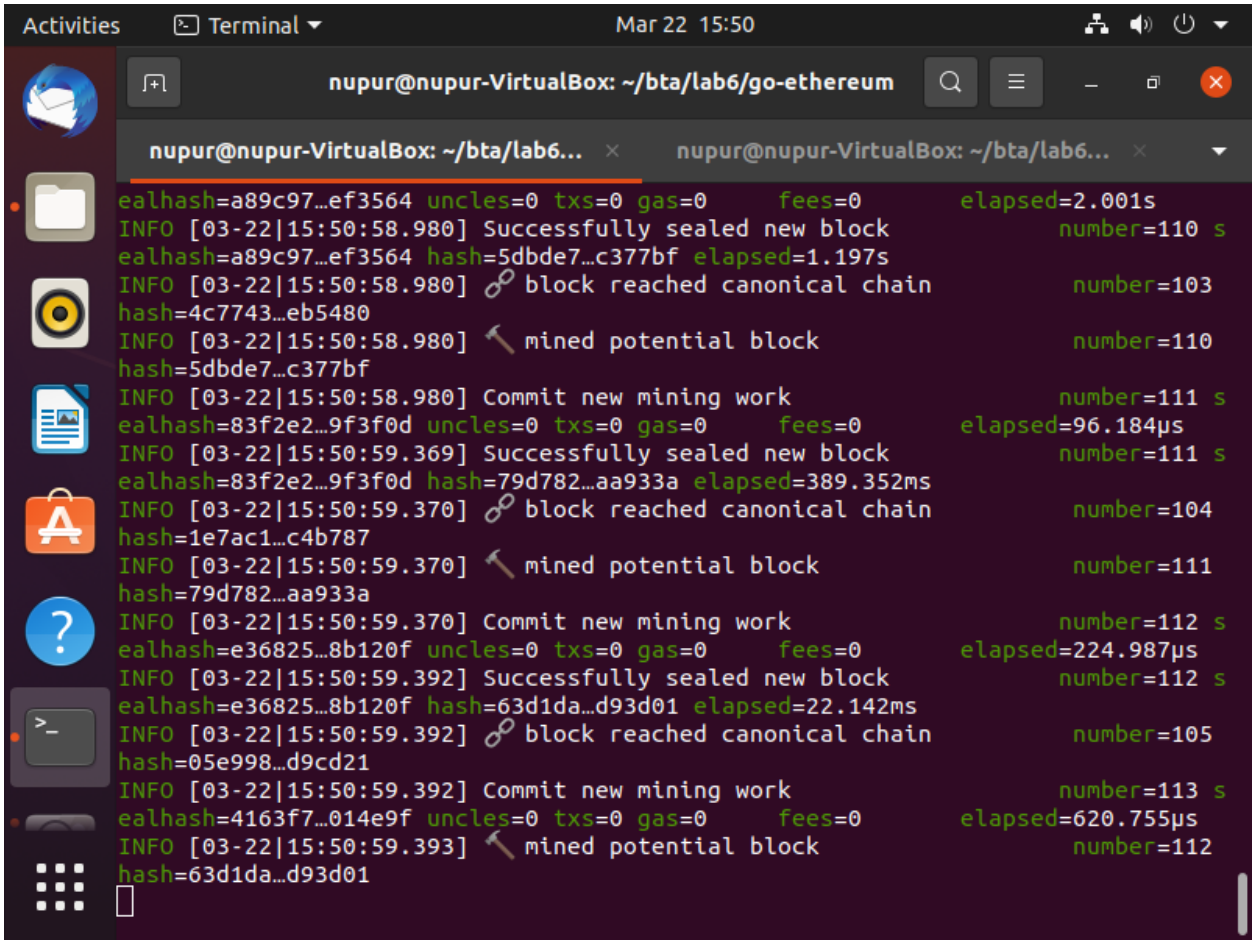
to: "EAO2”,

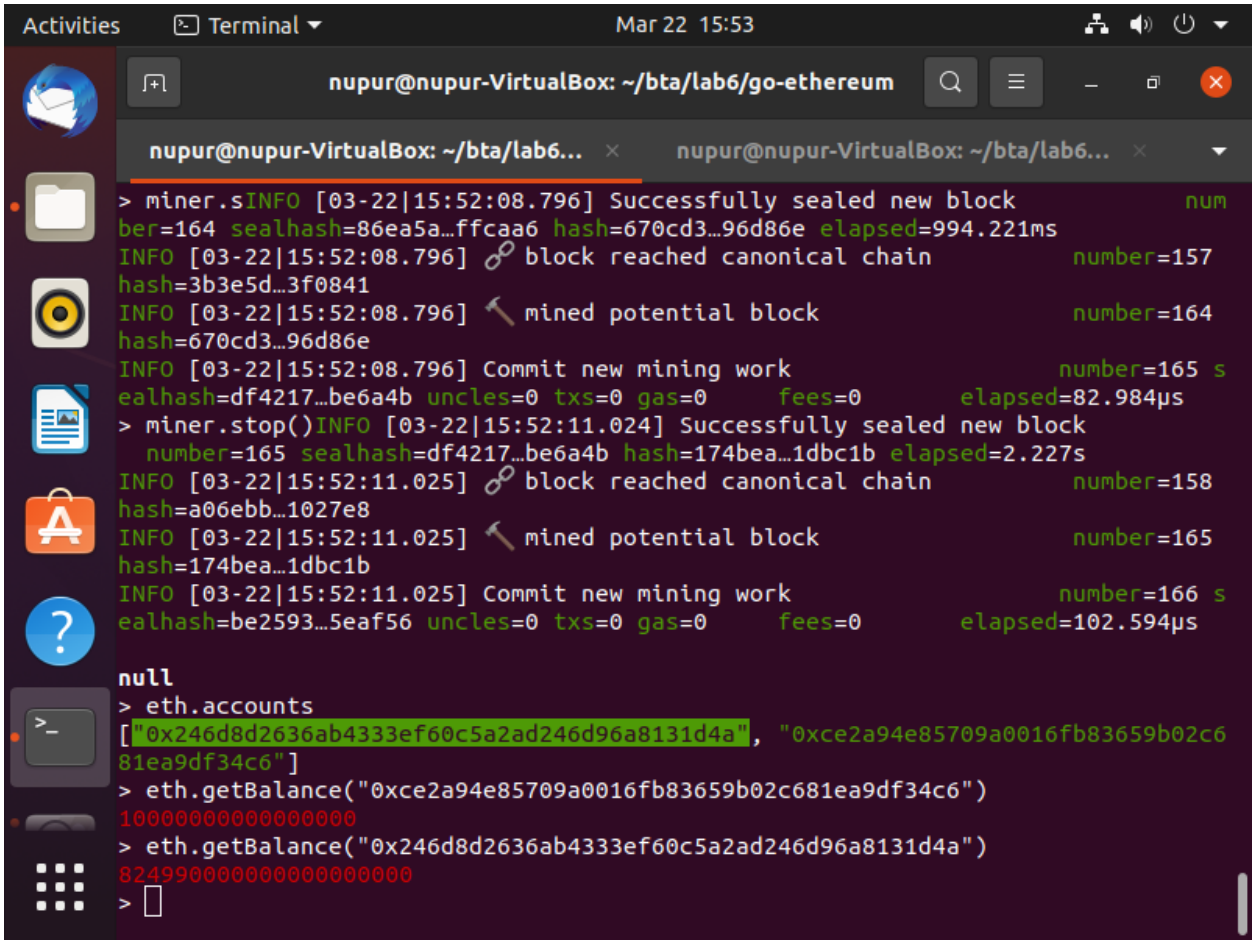
value: web3.toWei(0.01, "ether")

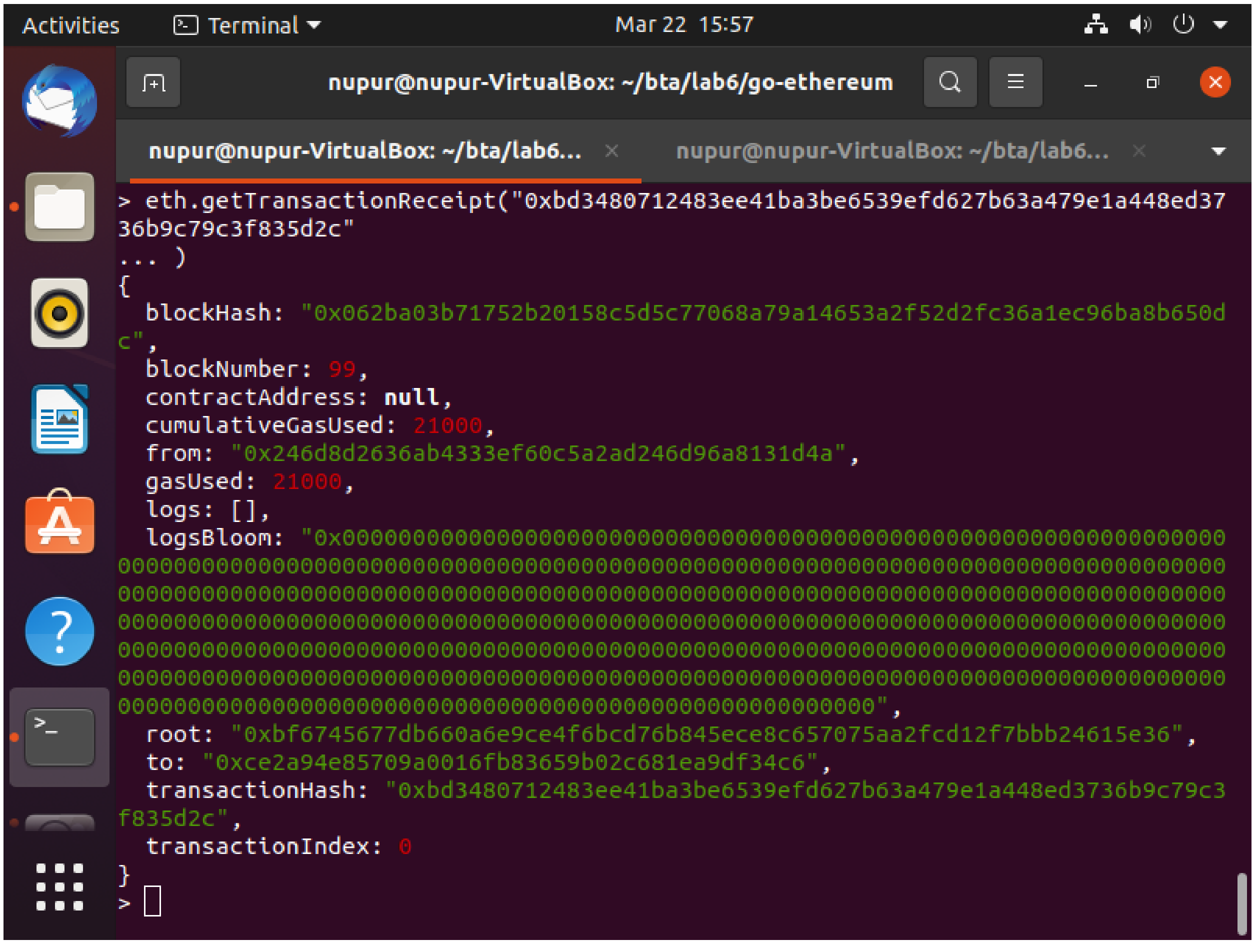
})


Activities
Terminal
Mar 22 15:46
nupur@nupur-VirtualBox: ~/bta/lab6/go-ethereum
nupur@nupur-VirtualBox: ~/bta/lab6...
nupur@nupur-VirtualBox: ~/bta/lab6...
> eth.sendTransaction(
{ from:"0x246d8d2636ab4333ef60c5a2ad246d96a8131d4a",
to:"0xce2a94e85709a0016fb83659b02c681ea9df34c6",
> eth.sendTransaction(
{ from:"0x246d8d2636ab4333ef60c5a2ad246d96a8131d4a",
to:"0xce2a94e85709a0016fb83659b02c681ea9df34c6",
> web3.personal.unlockAccount("0x246d8d2636ab4333ef60c5a2ad246d96a8131d4a")
Unlock account 0x246d8d2636ab4333ef60c5a2ad246d96a8131d4a
Password:
true
> eth.sendTransaction(
{ from:"0x246d8d2636ab4333ef60c5a2ad246d96a8131d4a",
to:"0xce2a94e85709a0016fb83659b02c681ea9df34c6",
> web3.personal.unlockAccount("0x246d8d2636ab4333ef60c5a2ad246d96a8131d4a")
Unlock account 0x246d8d2636ab4333ef60c5a2ad246d96a8131d4a
Password:
true
> web3.personal.unlockAccount("0xce2a94e85709a0016fb83659b02c681ea9df34c6")
Unlock account 0xce2a94e85709a0016fb83659b02c681ea9df34c6
Password:
true
>


Activities
Terminal
Mar 22 15:49
nupur@nupur-VirtualBox: ~/bta/lab6/go-ethereum
nupur@nupur-VirtualBox: ~/bta/lab6...
nupur@nupur-VirtualBox: ~/bta/lab6...
Password:
true
> eth.sendTransaction(
{ from:"0x246d8d2636ab4333ef60c5a2ad246d96a8131d4a",
to:"0xce2a94e85709a0016fb83659b02c681ea9df34c6",
> web3.personal.unlockAccount("0x246d8d2636ab4333ef60c5a2ad246d96a8131d4a")
Unlock account 0x246d8d2636ab4333ef60c5a2ad246d96a8131d4a
Password:
true
> web3.personal.unlockAccount("0xce2a94e85709a0016fb83659b02c681ea9df34c6")
Unlock account 0xce2a94e85709a0016fb83659b02c681ea9df34c6
Password:
true
> eth.sendTransaction({ from:"0x246d8d2636ab4333ef60c5a2ad246d96a8131d4a", to:"
0xce2a94e85709a0016fb83659b02c681ea9df34c6",value: web3.toWei(0.01,"ether")})
INFO [03-22|15:48:49.619] Setting new local account address=0x24
6d8d2636aB4333EF60c5A2AD246D96A8131D4A
INFO [03-22|15:48:49.619] Submitted transaction fullhash=0xb
d3480712483ee41ba3be6539efd627b63a479e1a448ed3736b9c79c3f835d2c recipient=0xcE2
a94E85709a0016Fb83659b02c681ea9dF34c6
"0xbd3480712483ee41ba3be6539efd627b63a479e1a448ed3736b9c79c3f835d2c"
> eth.getBalance("0xce2a94e85709a0016fb83659b02c681ea9df34c6")
0
>

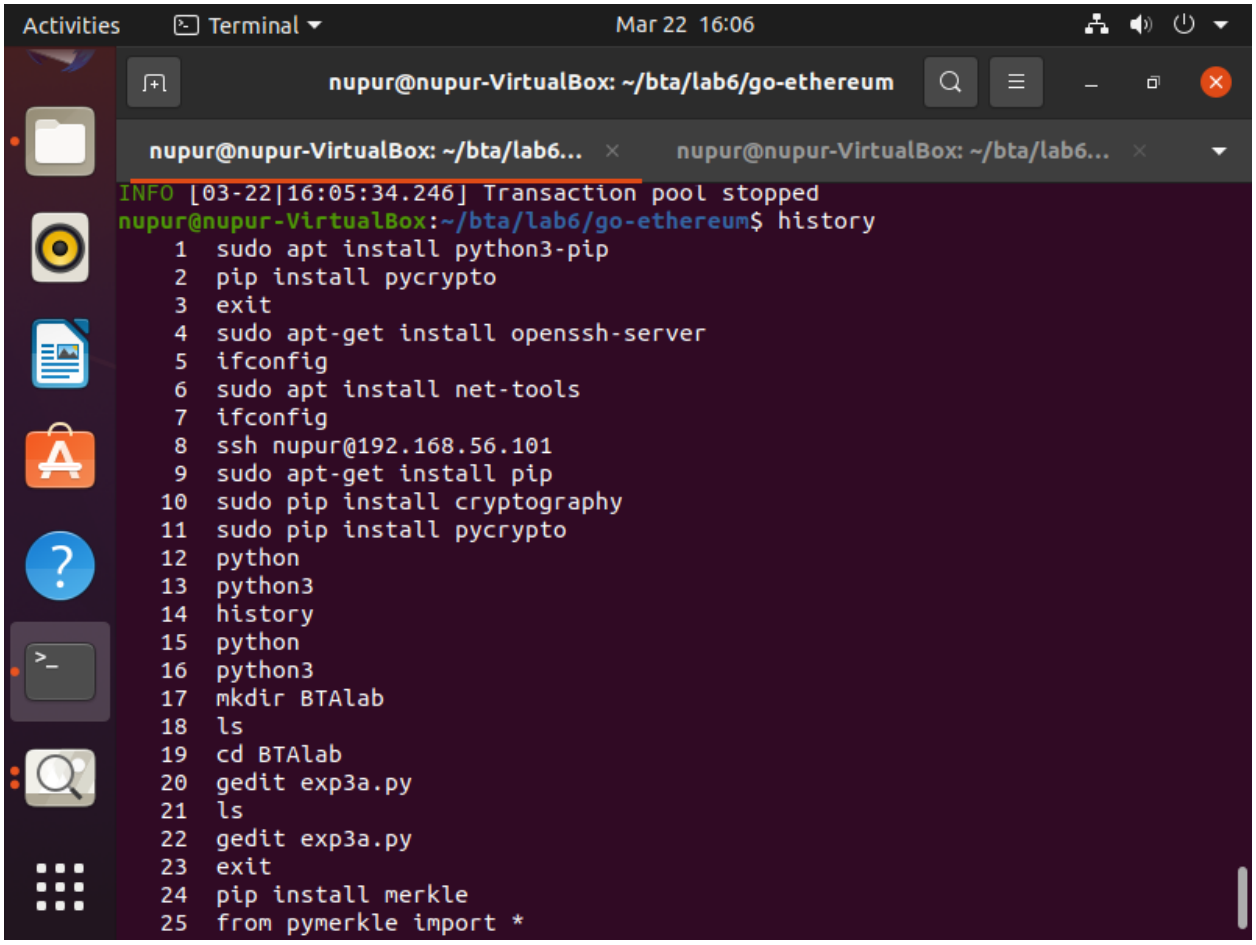

Activities
Terminal
Mar 22 15:50
nupur@nupur-VirtualBox: ~/bta/lab6/go-ethereum
nupur@nupur-VirtualBox: ~/bta/lab6...
nupur@nupur-VirtualBox: ~/bta/lab6...
ealhash=a89c97…ef3564 uncles=0 txs=0 gas=0 fees=0 elapsed=2.001s
INFO [03-22|15:50:58.980] Successfully sealed new block number=110 s
ealhash=a89c97…ef3564 hash=5dbde7…c377bf elapsed=1.197s
INFO [03-22|15:50:58.980] 🔗 block reached canonical chain number=103
hash=4c7743…eb5480
INFO [03-22|15:50:58.980] 🔨 mined potential block number=110
hash=5dbde7…c377bf
INFO [03-22|15:50:58.980] Commit new mining work number=111 s
ealhash=83f2e2…9f3f0d uncles=0 txs=0 gas=0 fees=0 elapsed=96.184µs
INFO [03-22|15:50:59.369] Successfully sealed new block number=111 s
ealhash=83f2e2…9f3f0d hash=79d782…aa933a elapsed=389.352ms
INFO [03-22|15:50:59.370] 🔗 block reached canonical chain number=104
hash=1e7ac1…c4b787
INFO [03-22|15:50:59.370] 🔨 mined potential block number=111
hash=79d782…aa933a
INFO [03-22|15:50:59.370] Commit new mining work number=112 s
ealhash=e36825…8b120f uncles=0 txs=0 gas=0 fees=0 elapsed=224.987µs
INFO [03-22|15:50:59.392] Successfully sealed new block number=112 s
ealhash=e36825…8b120f hash=63d1da…d93d01 elapsed=22.142ms
INFO [03-22|15:50:59.392] 🔗 block reached canonical chain number=105
hash=05e998…d9cd21
INFO [03-22|15:50:59.392] Commit new mining work number=113 s
ealhash=4163f7…014e9f uncles=0 txs=0 gas=0 fees=0 elapsed=620.755µs
INFO [03-22|15:50:59.393] 🔨 mined potential block number=112
hash=63d1da…d93d01

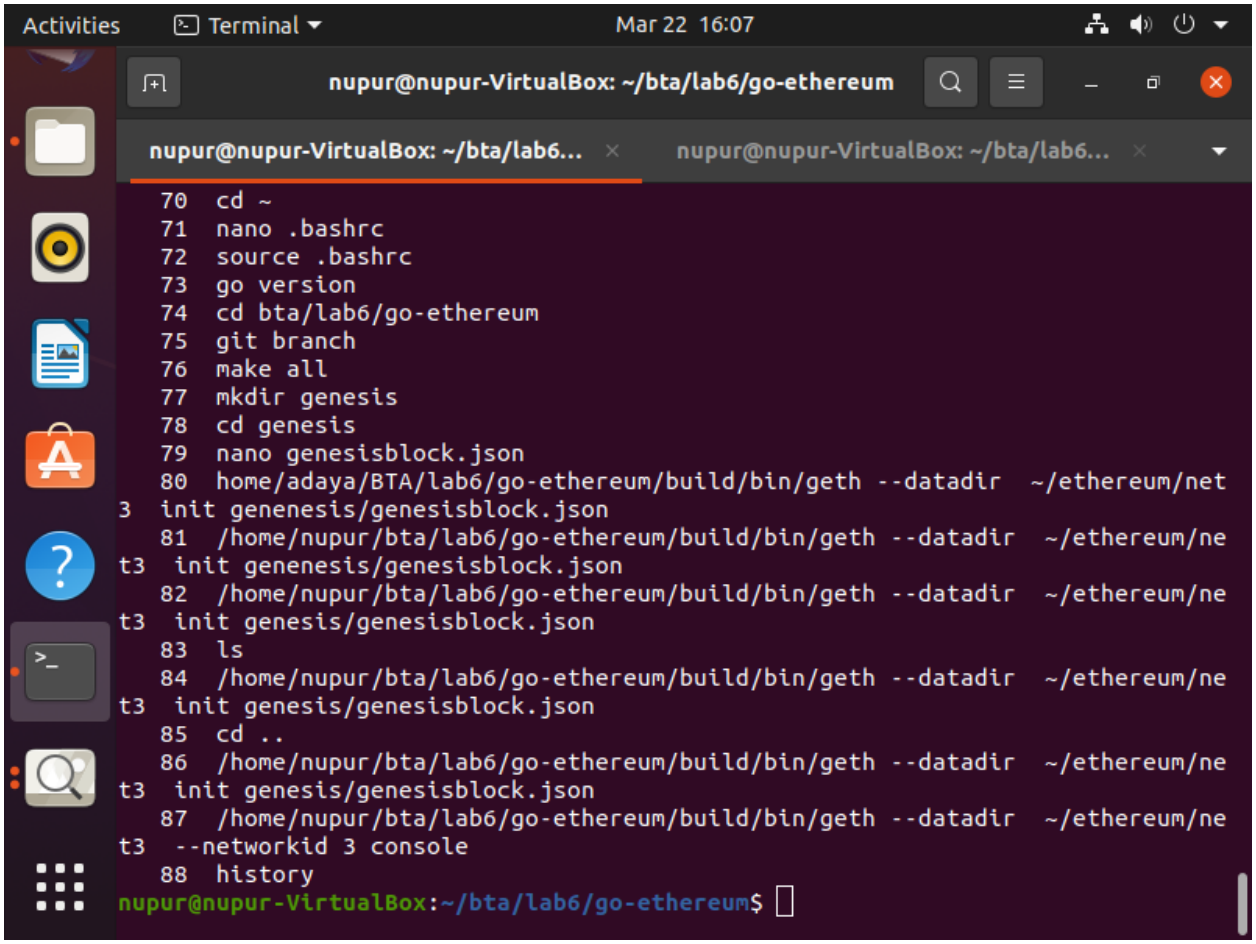

Activities
Terminal
Mar 22 15:53
nupur@nupur-VirtualBox: ~/bta/lab6/go-ethereum
nupur@nupur-VirtualBox: ~/bta/lab6...
nupur@nupur-VirtualBox: ~/bta/lab6...
> miner.sINFO [03-22|15:52:08.796] Successfully sealed new block num
ber=164 sealhash=86ea5a…ffcaa6 hash=670cd3…96d86e elapsed=994.221ms
INFO [03-22|15:52:08.796] block reached canonical chain number=157
hash=3b3e5d…3f0841
INFO [03-22|15:52:08.796] mined potential block number=164
hash=670cd3…96d86e
INFO [03-22|15:52:08.796] Commit new mining work number=165 s
ealhash=df4217…be6a4b uncles=0 txs=0 gas=0 fees=0 elapsed=82.984µs
> miner.stop()INFO [03-22|15:52:11.024] Successfully sealed new block
number=165 sealhash=df4217…be6a4b hash=174bea…1dbc1b elapsed=2.227s
INFO [03-22|15:52:11.025] block reached canonical chain number=158
hash=a06ebb…1027e8
INFO [03-22|15:52:11.025] mined potential block number=165
hash=174bea…1dbc1b
INFO [03-22|15:52:11.025] Commit new mining work number=166 s
ealhash=be2593…5eaf56 uncles=0 txs=0 gas=0 fees=0 elapsed=102.594µs
null
> eth.accounts
["0x246d8d2636ab4333ef60c5a2ad246d96a8131d4a", "0xce2a94e85709a0016fb83659b02c6
81ea9df34c6"]
> eth.getBalance("0xce2a94e85709a0016fb83659b02c681ea9df34c6")
10000000000000000
> eth.getBalance("0x246d8d2636ab4333ef60c5a2ad246d96a8131d4a")
82499000000000000000
>


Activities
Terminal
Mar 22 15:57
nupur@nupur-VirtualBox: ~/bta/lab6/go-ethereum
nupur@nupur-VirtualBox: ~/bta/lab6...
nupur@nupur-VirtualBox: ~/bta/lab6...
> eth.getTransactionReceipt("0xbd3480712483ee41ba3be6539efd627b63a479e1a448ed37
36b9c79c3f835d2c"
...)
{
blockHash: "0x062ba03b71752b20158c5d5c77068a79a14653a2f52d2fc36a1ec96ba8b650d
c",
blockNumber: 99,
contractAddress: null,
cumulativeGasUsed: 21000,
from: "0x246d8d2636ab4333ef60c5a2ad246d96a8131d4a",
gasUsed: 21000,
logs: [],
logsBloom: "0x0000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
000000000000000000000000000000000000000000000000",
root: "0xbf6745677db660a6e9ce4f6bcd76b845ece8c657075aa2fcd12f7bbb24615e36",
to: "0xce2a94e85709a0016fb83659b02c681ea9df34c6",
transactionHash: "0xbd3480712483ee41ba3be6539efd627b63a479e1a448ed3736b9c79c3
f835d2c",
transactionIndex: 0
}
>

[4]

History


Activities
Terminal
Mar 22 16:06
nupur@nupur-VirtualBox: ~/bta/lab6/go-ethereum
nupur@nupur-VirtualBox: ~/bta/lab6...
nupur@nupur-VirtualBox: ~/bta/lab6...
INFO [03-22|16:05:34.246] Transaction pool stopped
nupur@nupur-VirtualBox:~/bta/lab6/go-ethereum$ history
1 sudo apt install python3-pip
2 pip install pycrypto
3 exit
4 sudo apt-get install openssh-server
5 ifconfig
6 sudo apt install net-tools
7 ifconfig
8 ssh nupur@192.168.56.101
9 sudo apt-get install pip
10 sudo pip install cryptography
11 sudo pip install pycrypto
12 python
13 python3
14 history
15 python
16 python3
17 mkdir BTAlab
18 ls
19 cd BTAlab
20 gedit exp3a.py
21 ls
22 gedit exp3a.py
23 exit
24 pip install merkle
25 from pymerkle import *



Conclusion:

In this experiment, created a private ethereum blockchain. Installed go ethereum and created a genesis block. Created an account and then mined for ethers, which is a crypto currency. Performed transactions to transfer ethers from one account to another. After that, again mined for ethers so that the new transaction gets added to the blockchain as a new block and ethers get successfully transferred.

References:

[1] Go Language Installation

https://go.dev/dl/go1.18.linux-amd64.tar.gz

[2] Download or clone and compile ethereum code

https://github.com/ethereum/go-ethereum

[3] Official Ethereum website

Go Ethereum

[4] Mastering Blockchain Technology by Imran Bashir 3rd Edition Chapter 11,12 and 13,Packt Publications